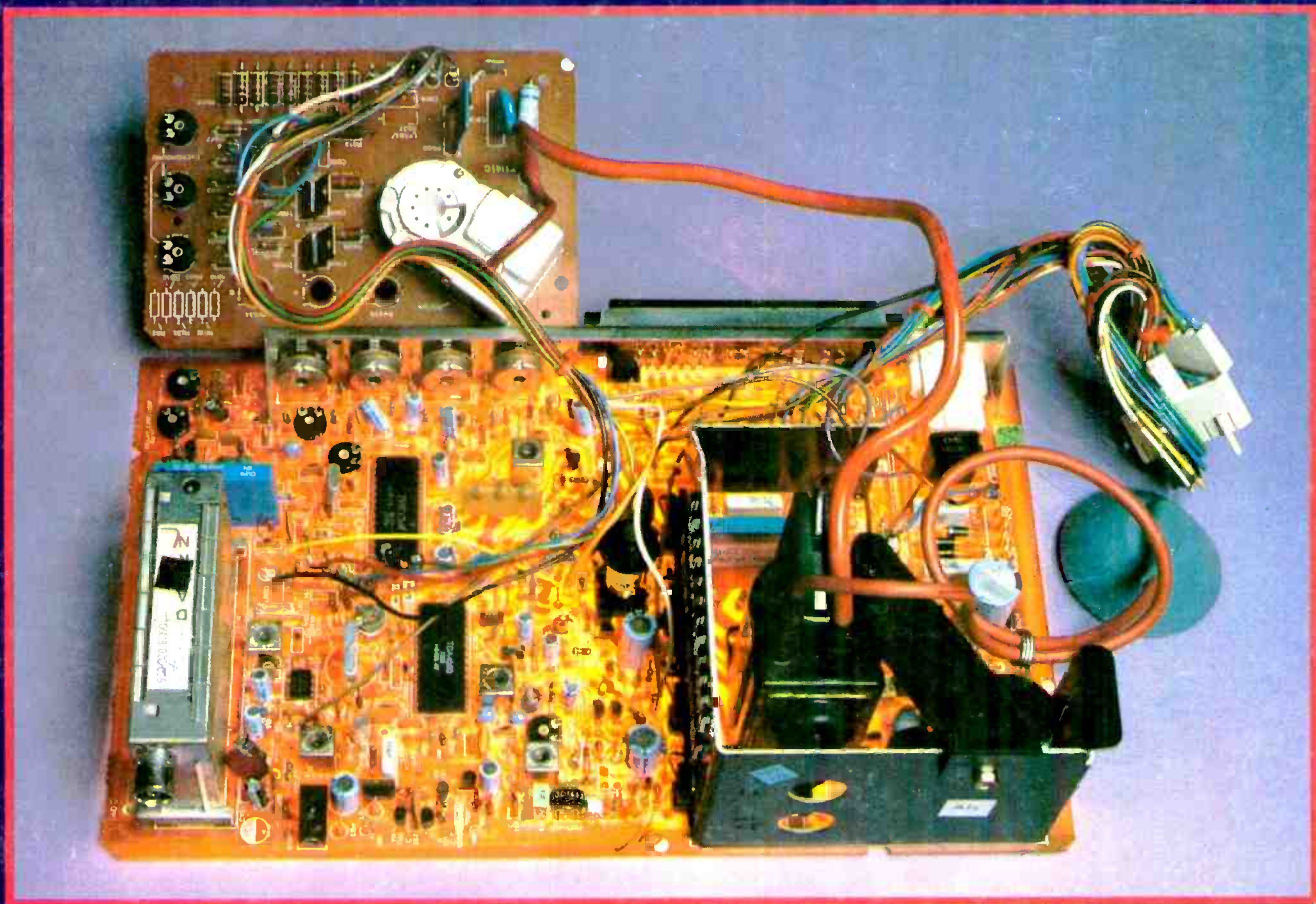
APRIL 1986

Australia $2, New Zealand $2·50, Malaysia $5·75 £1·20

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



New Series:

Modern Receiver Circuitry

VCR Picture Enhancement

Quick Checks: Fidelity CTV14R

Vintage TV • VCR Clinic

TV Fault Finding • DX-TV

TELEVISION

April 1986

Vol. 36, No. 6
Issue 426

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.

BINDERS AND INDEXES
Send orders for binders (£4·50) and indexes (75p) to the Editorial Office, Television, IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS. Prices include VAT and postage. Add 60p for overseas orders.

BACK NUMBERS
Some back issues published during the last six months are available from the Editorial Office at £1·40 inclusive of postage and packing. Address as above.

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 MAY WILL BE PUBLISHED ON APRIL 16

P. V. TUBES

104 ABBEY STREET, ACCRINGTON, LANCS BB5 1EE.
Tel: 0254 36521/32611 Telex: 635562 Griffin G (For P.V.)

HOW TO ORDER

ADD 87p per order P+P (U.K.). Heavier parcels e.g. cable, service aids, degaus. coils please allow £1.50 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. In some cases we may have to supply an equivalent.

SEMICONDUCTORS

AC107	35
AC126	34
AC127	34
AC128	34
AC128K	40
AC141K	39
AC176	35
AC176K	35
AC186	41
AC187	38
AC187K	46
AC188	35
AC188K	46
AD143	82
AD161	54
AD162	54
AD161/62 MP	1.15
AF106	49
AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	53
AF126	53
AF127	53
AF139	63
AF178	1.54
AF239	60
AL102	4.90
AU106	7.50
AU113	5.20
BA157	20
BC107	20
BC108	20
BC109	20
BC114	12
BC115	17
BC116A	35
BC117	30
BC118	24
BC119	36
BC139	32
BC140	32
BC141	30
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
BC157	16
BC158	16
BC159	15
BC160	52
BC161	32
BC170B	15
BC171	15
BC172	15
BC173	16
BC174	10
BC177	27
BC178	26
BC182L	15
BC183L	15
BC184L	15
BC186	35
BC187	25
BC204	10
BC208	13
BC209	10
BC212	15
BC212L	15
BC213	15
BC214	15
BC237	14
BC238	14
BC251A	18
BC252	12
BC261	33
BC262	30
BC300	50
BC301	53
BC303	33
BC307	20
BC308	25
BC323	99
BC327	22
BC328	18
BC337	18
BC338	18
BC461	42
BC547	13
BC548	13
BCX32 = BC637	39
BC549	10
BC550	10
BC557	10
BC558	9

BCY72	13
BD115	45
BD116A	90
BD124P	84
BD131	50
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	1.18
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	82
BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	69
BD508	80
BD509	86
BD510	86
BD278A	81
BD517	60
BD520	75
BD535	82
BD536	91
BD696A	1.49
BD697	1.24
BD698=702	1.50
BD707	95
BDX32	2.10
BF115	38
BF117	36
BF125	28
BF127	47
BF154	15
BF158	18
BF160	27
BF167	24
BF173	36
BF177	52
BF178	46
BF179	42
BF180	39
BF181	39
BF182	36
BF183	29
BF184	42
BF185	36
BF194/394	16
BF195	16
BF196	16
BF197	16
BF198	18
BF199	21
BF200	35
BF224	40
BF225	20
BF241	38
BF256	60
BF257	34
BF258	34
BF259	34
BF262	84
BF263	81
BF271	24
BF273	24
BF274	24
BF336	40
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72
BF371	30

BF392	35
BF422	34
BF423	46
BF435 = BF491	35
BF457	35
BF458	43
BF459	58
BF460 = BF462	86
BF469	63
BF470	66
BF597	16
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	42
BFT43	42
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	32
BFY51	32
BFY52	32
BFY90	95
BR100	34
BR101	95
BR103	83
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	1.31
BT116	1.87
BT119	3.66
BT120	3.66
BT151/800	2.07
BU104	2.00
BU105	1.58
BU108	1.80
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.87
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BUW81A	3.84
BU208/02	2.10
BU326A	2.00
BU407	1.70
BU426	3.07
BU500	2.50
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BU826	4.95
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	84
R2323	67
R2461	1.50
R2540	6.00
RC4558	2.20
RCA16334	90

RCA16029	1.18
RCA16039	1.18
RCA16092	1.18
RCA16040	96
RCA16041	84
RCA16334	90
=ON447	
RCA16335	90
=ON448	
RCA16957	2.88
TIC45	90
TIC46	60
TIL32	65
TIL78	48
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP34B	1.06
TIP41C	47
TIP42C	50
TIP47	93
TIP120	65
TIP2955	90
TIP3055	63
TIS91	32
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	79
2N3702	16
2N3703	16
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	1.82
2SC1096	1.72
2SC1172Y	5.50
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
2SD870 (Sony)	6.35
DEC1	2.20
DEC2	2.20
THY15/80	2.20
THY15/85	2.20
BUW81A	3.84
T6021V	90
T6022V	1.80
T6026V	90
T6028V	66
T6029V	3.98
T6034V	81
T6036V	90
T9002V	1.12
T9003V	60
Transistor mounting kit TO66, TO3, TO220AB	30
STR441	6.50
STR451	6.50
STR6020	8.50

INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	6.37
AN262	4.10
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341N	8.97
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA3065	1.80
HA1151	3.89
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1392	3.95
HA11219	4.21
HA11244	4.04
LA4031P	3.21
LA4032P	3.15
LA4102	3.37
LA4400	3.05
LA4422	3.28
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
MB3712	2.60
MC1307	1.99
MC1310P	1.84
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	2.20
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	8.50
SAA1124	5.34
SAA1250	4.99
SAA1251	5.75
SAA5000	6.15
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAS560S	2.07
SAS570S	2.07
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	7.00
SL917B	9.25
SL1310	1.80
SL1327Q	1.20
SL1430	1.58
SL1432	3.36
SL76544	2.05
SN76023N	2.00
SN76110N	1.42
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.72
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35

SN76650N	1.24
SN76660N	80
SN76666N	1.52
SN76530A	1.47
STK015	7.36
STK032 = STK078	13.25
STK043	15.25
STK433	5.65
STK435	9.06
STK436	6.50
STK437	7.85
STK439	8.40
STK459	9.50
STK441	11.57
STK461=465	12.60
STK463	14.30
STR441	6.50
STR451	6.50
STR6020	8.50
SW153	3.90
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	3.46
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	8.90
TA7172P	8.90
TA7173P	8.90
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
TAA570	3.98
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A	1.49
(A),(S),(AS),(SA).	
TBA120B	1.30
TBA120SB	1.37
TBA120T	1.49
TBA120U	1.49
TBA395	1.75
TBA396	1.75
TBA440N	2.75
(TBA1441)	
TBA440P	2.50
TBA480Q	1.82
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.76
TBA550	3.20
TBA560(Q)	1.93
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	1.38
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	3.30
TDA1011	4.00
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1062	1.56
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1190P	3.50
TDA1180	2.91
TDA1200	2.95
TDA1220A	2.12
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.50
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.40
TDA2140	5.95
TDA2150	2.22
TDA2020	4.66
TDA2030	2.80
TDA2522	2.66
TDA2523	3.40
TDA2524	2.25
TDA2525	4.00
TDA2530	2.70
TDA2532	2.90
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	4.90
TDA2576	3.75
TDA2576A	3.75
TDA2577	4.73
TDA2581	3.30
TDA2582	2.60
TDA2590	3.25
TDA2591	2.95
TDA2593	2.95
TDA2600	6.90
TDA2610	3.20
TDA2611A	2.35
TDA2640	2.92
TDA2652	7.31
TDA2653	5.90
TDA2680	3.40
TDA2690	2.72
TDA2710	5.67
TDA2720/1	6.77
TDA3190	2.00
TDA3500	6.90
TDA3560	6.00
TDA3561	6.66
TDA3562	8.60
TDA3571	3.75
TDA3651A	4.50
TDA4420	5.55
TDA4600	2.95
TDA4600-2D	2.95
TDA9503	4.21
TEA1002	3.50
TEA1009	1.86
UPC554	2.63
UPC566H	2.95
UPC575C2	3.40
UPC576H	2.60
UPC587C2	2.34
UPC1025H	2.95
UPC1028H	2.52
UPC1032H	94
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	3.50
UPC1163H	2.48
UPC1167C2	2.70
UPC1168C	3.20
UPC1176C	2.53
UPC1177H	3.15
UPC1178C	4.21
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	2.48
UPC1185H	3.66
UPC1186H	1.60
UPC1188H	4.99

UPC1190G	1.20
UPC1198C	4.00
UPC1200V	1.18
UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
UPC1216V	1.20
UPC1217G	2.24
UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	4.39
UPC1238V	1.89
UPC1245V	1.35
UPC1350C	4.15
UPC1353C	4.76
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

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	27
ZTX 313	27
LM1889	2.50
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
6264	£9.50

VOLTAGE REG.

7805	78
7808	78
7812	78
7815	78
7818	78
7824	78
78L05	68
78L08	68
78L12	68
78L24	68
7905	98
7906	98
7908	98
7912	98
7915	98
7918	98
7924	98
79L05	72
79L12	72
79L15	72
79L24	72

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
BY224	2.00
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
SKE4F	£1.19
SKE5F	£1.19

ZENER DIODES

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

I.C. SOCKETS

DIL to DIL

8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
24 way	34
28 way	45
40 way	84

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

We try very hard to stock all that we advertise but if for any reason beyond our control we do run out of anything we will inform you as quickly as possible. Some prices may change because of product availability.

THERMISTORS

VA1104	90
VA1040	75
VA8650	55
VA1039	35
GEC DUAL POS.	1.68
GEC DUAL THERM. CKI	1.98

OFFICIAL ORDERS ACCEPTED FROM SCHOOLS, LOCAL AUTHORITIES ETC.

CRYSTALS & FILTERS

6MHz	74
5.5MHz	74
4.3MHz	1.39
8.8MHz	1.48
9.94MHz	6.00
10.692MHz	6.00

L.E.D.'s

5mm Red, Green, Yellow	14
T1 ¾ Amber	22
T1 3mm Red, Green, Yellow	14
Flashing Red CQX21	62
CQX22	66
Panel Clips 3mm	04
5mm	04

P. V. TUBES

TEL: 0254 36521/32611

104 ABBEY STREET, ACCRINGTON

SUNDRY EQUIPMENT

Test Lead Set	4.20
Degaussing Coil Stick	19.00
Signal Ejector	4.00
Elect. Circuit Tester	1.50
5A Choc Bloc (12)	40
Fuse Wire 5A, 15A, 30A	05
4-way 13A Mains Conn.	5.00
Safe Block (mains)	8.50
13A Plug Top (box 10)	4.80
Probes (x10)	10.90
Probes (x1)	10.90
Micro Pliers	4.20
Micro Cutters	5.00
	13.25
Factory recon. Avo meters	119.00
Avo Battery	2.95
Vero Board	2.59
LG Solder Sucker	6.20
Solder 500g	7.00
D.I.Y. Solder	45
Solder Sucker Antistatic	5.40
Nozzles	81
Trim Tools	
Metal End	30
Solda Mop Stnd.	74
Sidecutters sm.	1.20
Long Nose Pliers	1.20
Surge Protector Plug	12.50
Quick Set Adhesive	75
Sm. Neon Screwdriver	40
Lg. Neon Screwdriver	65
I.C. Inserters	1.18
Automatic Wire Strippers	5.95
Scart Plugs	2.95
Scart Leads	3.50
TA81 Car Battery Leads/port. TV Thorn 1690/91	4.47
TA51 Car Battery Leads/port. TV Thorn 1613/1615	3.66
Car Battery Leads/port. TV Philips	3.95
Universal Car Accessory Cable	1.99
Dynascan 467 Rejuv. Testers	399
Dynascan 470 Rejuv. Testers	299

B+K tube bases Dynascan

No. 3	9.50	No. 15	16.44
No. 5	9.09	No. 19	10.83
No. 6	11.08	No. 21	14.40
No. 8	10.08	No. 23	13.86
No. 13	11.11	No. 24	27.07
No. 14	16.63	No. 25	12.57

C15 computer cass.	30
C20 computer cass.	33
5¼" floppy disc s/s s/d	1.61
2M Fly Lead	70
4M Fly Lead	1.20
10M Fly Lead	1.90
Figure 8 Mains Lead	62
Computer to TV	97
7 pin din to 5 pin din	98
5 pin din to 5 pin din	98
Fluorescent Starter 4-80W)	15p
Tinned Copper Wire	
14SWG	2.73
16SWG	1.86
18SWG	1.86
20SWG	2.75
22SWG	2.90
Insulated Copper Wire (0.4mm dia.)	9.11
Battery Press Studs Min.	11
Std.	15

SOCKETS ELECTRICAL BA

320A Single Gang	1.30
320B Single Switched	1.95
320C Two Gang	2.53
320D Two Switched	3.92
Switches	
320E One Gang/One Way	80
320F One Gang/Two Way	1.05
320G Two Gang/Two Way	1.78

CABLES 100m

F031 2 Core Round .75mm^2	15.47
F032 3 Core Round .5mm^2	15.75
F035 3 Core Round 1.25mm^2	28.21
F041 Speaker 7/0 2mm	3.90
Coaxial 75R	13.50

FILAMENT LAMPS

HES ROUND BULBS **15p**
L23m x D11mm
6.5V 0.3A
12V 2.2W

LILLIPUT (L.E.S.) BULBS **12p**
L20m x D5mm
6V 0.025A
12-14V 0.1A

CAPLESS LAMPS **28p**
L11mm x D4m
6V 0.04A
12V 0.04A

TUBULAR LAMPS CAPPED **31p**
L31mm x D6.3mm
6.3V 0.15A
6.3V 0.25A
6.3V 0.3A
8V 0.15A
8V 0.25A
8V 0.3A
12V 0.15A
12V 0.25A
12V 0.2A

WIRE NEONS **9p**
65VAC/90VDC Series res
100K for 110V – 330K for 240V

WIRE ENDED LAMPS **25p**
D3.2mm
6V 0.04A
8V 0.04A
12V 0.04A
14V 0.025A
14V 0.04A
D4.2mm
4.5V 0.06A
6V 0.06A
6.3V 0.025A
6.3V 0.08A
8V 0.04A
8V 0.06A
8V 0.08A
12V 0.04A
12V 0.06A
14V 0.06A
14V 0.08A

TUBULAR LAMPS (Wire ended) **31p**
L22m x D4.25m
3V 0.06A
6V 0.05A
8V 0.05A
9V 0.045A
12V 0.05A
14V 0.05A

PLUGS AND SOCKETS

5 pin DIN plugs 180°	20
5 pin DIN chassis sockets 180°	28
5 pin DIN line sockets 180°	28
5 pin DIN plugs 360°	20
5 pin DIN chassis sockets 360°	28
5 pin DIN line sockets 360°	28
6 pin DIN plugs	28
6 pin DIN chassis sockets	36
6 pin DIN line sockets	28
7 pin DIN plugs	35
7 pin DIN chassis sockets	36
7 pin DIN line sockets	30
8 pin DIN plugs	56
8 pin DIN chassis sockets	64
8 pin DIN line sockets	55
Phono plugs	12
Phono chassis sockets	10
Phono line sockets	20
2.5mm Jack plugs	11
2.5mm Chassis sockets	14
2.5mm Line sockets	17
3.5mm Jack plugs	15
3.5mm Chassis sockets	24
3.5mm Line sockets	18
3.5mm Stereo jack plugs	35
3.5mm Stereo chassis sockets	18
3.5mm Stereo line sockets	28
6.3mm Stereo jack plugs	36
6.3mm Stereo jack line sockets	25
Standard mono jack plugs	20
Loud speaker plugs 2 pin	10
I.D.C. plugs 36 conn.	5.90
I.D.C. sockets 36 conn.	6.90
BNC plugs	1.15
Coax plugs Each 18p Pack of ten	1.80
Line connectors	16
Double ended female sockets	1.20
Car aerial plugs	18
PL259 with reducer	1.30
Reducers for the PL259	16
FM plugs	25
Crocodile Clips	25
In Line Socket (Metal)	25

We have a fully equipped computer store – Come and visit us –

PANASONIC VCR MECHANICAL SPARES

Idler Unit VXP0401	1.08
Idler Unit VXP0344	1.22
Idler Unit VXP0331	1.28
Idler Unit VXP0329	1.32
Idler Unit VDG0141	1.08
Play Idler VXP0243	1.10
Play Idler Unit VXP0433	4.80
Idler Arm Unit VXP0521	4.08
Loading Gear VXP0325	1.63
Loading Gear Unit VXP0520	1.36
Action Gear VDG0016	46
Cam Gear VDG0069	70
Intermediate Gear VDG0017	43

VIDEO PINCH ROLLERS

PANASONIC	NV7000	4.35
PANASONIC	NVB300-333-370-777	4.35
SANYO	VTC9300:VBS7000	4.35
SONY	C7:J7:SLT7	4.35
JVC	TCE 3V00-01-06-16-23-24 JVC HR2200-3320-3330-3660-1100-7700	4.35
AKAI	VS9700	4.35
HITACHI	VT5000	4.35
SHARP	VC6300-6500	4.35

VIDEO BELT KITS 4.50

VEKIT 1	AKAI	VS9300:VS9500:VS9800	
	JVC	HR3300:HR3320:HR3330:HR3360	
	TCE	8903:3V00:3V16:3V22	
VEKIT 2	PANASONIC	NV7000B:NV7200B	
VEKIT 3	SONY	SLC5:SLC5EC:SLC5CH:SLC5E1:SLC5E:SLC5SA:SLC5UB:SLC7E:SLC7UB:SLC7EC:SLC7F:SLC7:SLC5:SLC7:SLT9MER:	
VEKIT 4	SONY	SL8000AS:SL8000E:SL8000SA:SL8000UB:SL8080AN:SL8500:SL8600:SL8600A:	
VEKIT 5	SONY	SL3000UB	
VEKIT 6	PANASONIC	NV3000B	
VEKIT 7	SANYO	9300P	
VEKIT 8	PANASONIC	NV2000B	
VEKIT 9	PANASONIC	NV8600B:NV8610B:V011	
VEKIT 10	TOSHIBA	V8600	
VEKIT 11	SHARP	VC7300	
VEKIT 12	SHARP	VC6300:VC6600	
VEKIT 13	SANYO	VTC5000	1.95
VEKIT 14	SANYO	VTC5300	
VEKIT 15	JVC	HR7650	

VIDEO IDLER TYRES

	O.Dia	I.Dia	Width	
SONY	23.7	17.4	4.9	50p
SONY	24.2	18	5.1	50p
HITACHI	31.8	25	4.9	52p
HITACHI	39.5	30	4.2	52p
PANASONIC	31.2	25	3.1	50p
PANASONIC	37	27	3.9	52p
PANASONIC	34.5	27	3.1	50p
AKAI	26	20	3.9	50p
JVC	32.8	3.4	3.9	56p
JVC	23.9	4.8	4	56p

REMOTE CONTROL HAND UNITS

Some are original some are compatible types.

DECCA 100/101 US **Non** T.Text	US8513	23.80
GRUNDIG TELEPILOT 12 IR	RTP20	13.87
GRUNDIG TELEPILOT 8 IR	RTP05	25.10
GRUNDIG TELEPILOT 160 IR	RTP06	25.10
GRUNDIG TELEPILOT 300 IR	RTP07	18.87
PHILIPS G11 US **Non** Text	US8263	22.00
PHILIPS G11 8 way.IR Text	IR8435	23.80
PHILIPS G11 US 31 Button	69117187	27.00
PHILIPS G11 US 2 function	US8518	21.00
PHILIPS KT3/30 IR Text 1234	IR1234	19.87
PHILIPS KT3/30 IR **Non** Text 1201	IR1201	19.87
THORN TX10/JVC IR Text	TP8431R	22.00
Remote Control Tester	29.94	

DATA BOOKS (Zero VAT)

Pair of A-Z/2N2S TV180	8.50
LIN IC Books (data only not Equiv.)	
LINI	5.95

IC equivalent booklet £3.25 and transistor equivalent booklet £3.25

TURNTABLE DRIVE BELTS ALL £1.20

TB42 Most Thorens Models
TB23 Most Philips Models
TB50 Most Garrard Models
TB70 Most Hitachi Models .
TB60 Some Sanyo Models
TB01 Most Panasonic, Sony, Pioneer, Technics and Sansui.
TB03 Most BSR

SUNDRY VIDEO ACCESS.

VHS Drum Motor	25.50
VHS Capstan Motor	25.50
Sanyo 5000 Reel Motor	20.00
VHS Idler	5.95
Video Lamps	1.41
3V23 Lamps with Plug	1.95
Video Care Kit	3.50
Universal Copying Kit	5.50
Video Head Cleaner	86
Sharp Reel Motor	13.13
Reel Idler (Sharp)	2.48
381/383/386/9100/9300/9500	

VIDEO HEADS

3HSS UHS	32.50
4HS VHS	32.80
PS3B Beta/Sony	37.00
Philips V2000	57.00
Philips 1700	64.00
Sanyo 9300/9455/9500	53.00
Sanyo 5000/5300/5400	53.00
Toshiba V5470A BDP	50.00
Toshiba 9600 Upper Ass.	12.50
Toshiba 9600	50.00
Sharp 2300	58.00
Sharp 6300	58.00
Sharp 7300/7700/7750	58.00
Sharp 8300	58.00
Sharp 3300/9700	56.00

VIDEO TAPE

SKC	E180	3.20
	L750	3.20
Scotch	E30	3.66
	E60	4.00
	E120	5.00
	E180	4.50
Beta	L750	5.80
VCC	240	6.20
	360	8.30
	480	10.21
LVC 1700 Philips 1200		17.50

NEW LABGEAR

* CM7271-MHA 15db	8.66 *
* CM7274 4 Way Dist.	21.45 *

SERVICE AIDS

SERVISOL Freeze-It	1.20
SUPER SERVISOL	1.04
SERVISOL Foam Cleanser	1.02
SERVISOL Plastics Seal	1.14
SERVISOL Silicone Grease	1.30
SERVISOL Tubes Silicone Grease	1.66
SERVISOL Aero Klene	94
SERVISOL Aero Duster	1.28
SERVISOL Excel Polish	96
SERVISOL Video Head Cleanser	90
Super 40	1.66
Fire Extinguisher 640G	3.08
Heat Sink Compound 25G	1.10
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	77

EVER READY BATTERIES

R20S	38
R6B	14
R14S	33
R03B	16
PP3B	52
PP3S	72
PP6	1.09
PP7	1.09
PP9	1.10
1289	60

RECHARGEABLES Ever Ready

RX6 (HP7)	1.29
RX14 (HP11)	2.22
RX20 (HP2)	2.45
RX22 (PP3)	4.55
Universal Charger	7.50

WE HAVE A FULL RANGE OF AERIALS AND ACCESSORIES FROM TRADE COUNTER

AERIAL EQUIPMENT

Outdoor Splitter	5.50
Plastic Tape	50
F.M. Plugs	25
Set Top Aerial	2.30
Loop Aerial	1.00
Aerial Isolator Kit	2.08
Attenuator 6dB, 12dB, 18dB	1.80
27MHz Filter 50dB	2.10
Cable Clips 7mm per 100	1.18
Single Outlets	80
Surface Splitter	1.70
A Splitter	70
100M Coax	15.00
Coax Plugs per 10	1.80
1" U Bolts	30
J Bolts	25

ANTIFERENCE

SB11 Splitter	2.37
COB11 Outlet	96
CS1000 Combiner/Splitter	6.15
PU1240 Power Unit	11.65
UP1300 MHA	9.09
XS2U Xtraset	14.56
4 way VHF/UHF Amp	40.71
6 way VHF/UHF Amp	50.68
XG8 High Gain Aerial A-B-CD-WB	17.10

LABGEAR

CM7261 Power Unit 12V	11.80
CM7262 Reg. Power Unit 12V	12.86
CM7060 MHA 10db 12V W/B	9.86
CM7065 VHF/UHF MHA W/B 12V	15.05
CM7066	14.04
CM7067 UHF 12V MHA (Specify A-B or C/D)	11.25
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	16.74
CM7053 Behind Set UHF Amp. (Mains)	13.01
CM7054 Behind Set UHF Amp. (Battery e.g. Caravans)	10.42
CM7043 Second Set Amp. UHF	12.12
CM7093 Behind Set UHF Amp. 3 Sets	16.03
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	23.27
CM7108 VHF/UHF 8+1 Dist. Amp.	43.26
CM9700 27mhz CB Suppress.	7.83
CM6011 Outdoor Splitter (2 way) W/B	1.54
CM9003 Flush Single Outlet	1.95
CM9010 Flush Twin Outlet	2.04
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD)	8.07
CM6006 6 Way Passive Splitter	11.50
CM7042 TV Games Combin.	3.09
CM9009 Flush TV/FM Outlet	3.20
CM7091 Col. Bar Gen.	133.98
CM9006 VHF/UHF Diplexer	3.78
Televerta up converta 7122	36.20
Televerta down converta	41.01
7064 DA	30.06
7094 DA	21.88

ANTEX SOLDERING EQUIPMENT

C15W Iron 240V	6.20
C240 Element	2.75
Bits 102	1.10
106	1.10
820	1.10
821	1.10
CS17W Iron 240V	6.40
CS240 Element	2.75
Bits 1100	1.10
1101	1.10
1106	1.10
XS25W Iron 240V	6.50
XS240 Element	2.75
Bits 50	1.10
51	1.10
Temp. Controlled	
30W Iron CSTC	16.95
40W Iron XSTC	16.95
Unit for above TCSU1	68.95
Stand	2.10
MLXS Auto Repair Kit	8.40
ORYX Gas Cordless Iron	19.50
Tips for Gas Iron	5.00

WELLER

Heat gun	15.95
Heat gun tips (pair)	57
3/16" Iron tips 25W (MT5)	57

AUDIO HEADS AND MOTORS

Mono record/playback	4.32
Stereo playback	4.79
Stereo record/playback	4.99
Stereo record/playback (Dolby)	6.90
Mono/stereo erase	2.25
Electronic/rotation clockwise motors	
6V MD6515	4.95
9V MD9516	4.95
12V MD12517	4.95

CASSETTE DRIVE BELTS

35m	35	46mm	37	57m	37
66m	39	110m	59	76m	43
90m	43				

LINEOUT TRANSFORMERS

3600	DECCA 100	7.95
3601	DECCA 110	9.80
3604	DECCA 1730/1830	8.50
3599	DECCA 80	7.22
3727	DECCA MS1700-2420	18.13
3729	FIDELITY FTV12/TVR120	5.50
5529	FIDELITY ZX3000 22"	13.95
3808	FIDELITY ZX2000/3000	13.95
3731	GEC 2100/2040	5.50
3732	GEC 2114	9.72
3734	GEC 3133	3.60
3733	GEC M1201/M1501H	12.80
3614	GRUNGIG 5010/6010ETC	12.95
3755	INDESIT 24EGB	11.25
3617	ITT CVC30	7.95
3619	ITT CVC45	9.75
3615	ITT CVC5-8	10.25
3620	KORTING A21100 90° HYBRIO	14.95
4508	PHILIPS E2 CHASS	10.80
2861	PHILIPS G8	7.00
2862	PHILIPS G9	9.95
5305	PYE 691 WIRED	5.00
3628	PYE 725 90°	9.25
3629	PYE 731 110°	8.95
3632	RANK A823	5.50
3634	RANK T16A	8.95
3636	RANK T20A	12.95
3726	RANK T26A	15.50
3637	RANK Z179	11.95
3639	RANK Z718 22"	21.75
3770	REDIFUSION MK1 CHAS	9.30
3771	REDIFUSION MK3 CHAS	12.80
3775	SANYO CTP5101	15.50
3643	THORN 1400 SERIES	5.95
3644	THORN 1500 20"	5.95
3645	THORN 1500 24"	5.95
3646	THORN 1590 SERIES	10.85
3647	THORN 1600 SERIES	10.85
3648	THORN 1615 SERIES	10.94
3649	THORN 1690/91 SERIES	10.42
3713	THORN 1790	8.95
3714	THORN 3787	15.23
3652	THORN 3K 3K5 EHT TX	8.95
3651	THORN 3K 3K5	8.96
6172	PHILIPS G8 SPECIAL	7.85
2868	PHILIPS KT3	10.95

EHT TRAYS

5400	BG1895-641	7.50
5403	BG1897-642	7.50
5404	BG2097-642/333	7.50
3663	DECCA 100	7.25
3665	DECCA 1830	3.00
3662	DECCA 80	5.25
3667	GEC 1028/CS108	3.50
3677	ITT CVC45	7.95
3675	ITT CVC5/9	3.50
3678	KORTING HYBRID	7.95
3683	PHILIPS 550 G8	6.50
3681	PHILIPS 570 (5 LEAD)	9.00
3684	PHILIPS G9	4.00
3685	PHILIPS KT3	9.95
3686	PYE 691/697	6.95
3688	PYE 725/731/741	6.95
5395	SEIMANS TVK186/5	8.50
5393	SEIMANS TVK52	8.50
4696	SEIMENS TVK196/17	11.95
5406	TCE 1400 LARGE SCRN	4.95
3696	TCE 1500 17"-19"	5.65
3697	TCE 1500 23"&24"	4.95
3698	TCE 1600 SERIES	2.95
3700	TCE 4000	4.50
3703	TCE 9000	7.85
3699	TCE3000/3500	7.75
3706	TV11 EHT STICK	0.95
3709	TV20 EHT STICK	0.95
5275	TV45 EHT STICK	2.45
3705	UNIVERSAL EHT TRAY U.K	4.95

TV ELECTROLYTICS

3547	DECCA 10/30 400X2/350V	2.90
3549	DECCA 100 400+800 350/250V	2.90
3548	DECCA 80/100CHAS 100/400V	2.90
5304	FIDELITY ZX2000 330 385V	3.90
5303	FIDELITY ZX3000 220 385V	3.90
3557	ITT CVC20/RRI T20 220/400	1.20
3556	ITT CVC5/9 200X2+25+75ETC	2.60
3560	PHILIPS G11 470UF/250V	1.65
3559	PHILIPS G9 2200/63V	1.55
3561	PHILIPS KT3 200+25X2/385V	1.95
3554	PHILIPS G8/GEC 2110 600/300V	1.90
3558	PHILIPS G9/PYE 731 600/300 PC	3.16
3565	PYE 725/731 800/250V	1.90
3564	PYE 691/697 200+300/350V	2.80
3576	RRI AB23 2500X2/25V	1.40
3588	TCE 3000/3500 1000/70V	0.89
3585	TCE1500 150X2+100/300V	1.90
3587	TCE3000 200+100X2/350V	2.86

MIXED DIALECTRIC CAPACITORS

4270	0.01 600V X5	0.75
4272	0.022 1KV X5	1.40
4273	0.033 1KV	1.40
4274	0.047 600V X5	0.85
4275	0.047 1KV X5	1.00
4276	0.1 600V X5	1.20
4277	0.1 1KV X5	1.90
4278	0.1 1250V X5	0.44
4279	0.1 2KV X1	0.75
4280	0.22 600V X5	1.45
4281	0.22 1KV X1	0.74
4282	0.47 1KV X1	1.02
4283	4700PF 1.5KV X5	1.50
4271	0.01 1KV X5	1.60

SLIDE CONTROLS

4883	100K LIN STD TV	0.55
4884	150K LIN STD TV	0.55
4874	1K LIN STD TV	0.55
4880	22K LIN STD TV	0.55
4881	22K LOG STD TV	0.55
4875	3K3 SEMI LOG STD	0.55
4885	470K LOG STD TV	0.55
4720	470R LG STD	0.99
4719	470R LM STD TV	0.99
4876	4K7 LIN STD TV	0.55
4877	4K7 LOG STD TV	0.55

PRESETS

	STANDARD RANGES	
	VERTICAL STANDARD X 5	0.60
	HORIZONTAL STANDARD X 5	0.60
	VERTICAL MINI X 5	0.60
	HORIXONTAL MINI X 5	0.60

TUNER UNITS

4662	DECCA 30 SERIES MECHANICAL	4.95
4664	ELC 1043/05 EXCH TUNER	6.00
4663	ELC 1043/05 NEW TUNER	8.25
4666	ELC 1043/06 EXCH TUNER	6.00
4665	ELC 1043/06 NEW TUNER	8.25
4972	ELC 2003 EXCH TUNER	12.58
5534	GEC 2100 TYPE REPAIR CHGE	10.25
4675	PHILIPS G8 EXCHANGE TUNER	7.25
4679	RRI RANGER1/2 EXCH TUNER	9.75
4680	RRI 720 NEW TUNER	10.25
4678	RRI RANGER2/3 NEW TUNER	11.25
4668	U321 EXCH TUNER	6.50
4667	U321 TUNER NEW	7.95
4670	U322 EXCHANGE TUNER	6.50
4669	U322 NEW TUNER	7.95
4673	U341 EXCHANGE TUNER	7.25

VALVES

3883	DY802 VALVE	0.89
3932	PCF802 VALVE	0.95
3938	PCL805	1.08
3935	PCL82 VALVE	0.95
3936	PCL84 VALVE	0.85
3937	PCL86 VALVE	0.95
3940	PFL200 VALVE	1.20
3943	PL504 VALVE	1.40
3944	PL508 VALVE	2.06
3945	PL509 VALVE	5.95
3946	PL519	5.95
3947	PL802 VALVE	4.95
3950	PY500A VALVE	2.25
3951	PY801 VALVE	0.95

THORN SPARES

2897	T1590 MAINS TRANSFORMER	9.80
2920	TX10 FOCUS UNIT	7.54
4590	T1600 MAINS TX	7.92
5430	T1690 MAINS TRANSFORMER	9.80
4973	T1690 SLOW MOT. TUN. POT	3.99
2906	T3000/3500 A1 SWITCH	1.15
2904	T3000/3500 MAINS TX	5.00
2908	T3000/3500 METAL CUT OUT	2.34
4587	T3500 100R CONVERG POT	0.85
3277	T3500 200R CONVERG POT	0.56
3278	T3500 500R CONVERG POT	0.56
4585	T3500 50R CONVERG POT	0.65
2905	T3500 5MEG A1 POT	1.17
4589	T3500 SPARK GAP .1/1500	0.51
2907	T3500 THICK FILM VIO LOAD	1.40
4563	T38000 MAINS ON/OFF SW.	3.10
4412	T4000 FOCUS CONTROL UNIT	7.60
3273	T6818 220K BRIGHT CTRL	2.18
2909	T8500 FOCUS CONTROL UNIT	2.56
2911	T8500 MAINS CHOKE	17.45
4415	T8500 MAINS TX	12.75
2910	T8500 PLASTIC CUT OUT	3.72
2918	T9000 FOCUS UNIT	3.95
4556	T9000 FRI THICK FILM	1.65
2919	T9000 OVER VOLT THICK FILM	3.95
4555	T9000 T701 CHOPPER TX.	13.75
4982	T9600 0.33 2KV CAP	2.35
2914	T9600 CHOPPER TX T512	17.65
2916	T9600 FOCUS UNIT	2.95
2913	T9600 SWITCH MODE TX T511	9.98
2917	T9800 FOCUS UNIT	5.93
4429	T9800 MAINS CHOKE	0.00
4437	TX10 .0022 2KV	0.27
4658	TX10 100K TUNING POT	0.64
2938	TX10 CHOPPER DRIVER TX	3.27
5427	TX10 SW NONREM CONT.	2.32
2922	TX10 TUNER DRAWER ASSY	1.95
4859	TX9 4" RND 15R SPEAKER	3.56
2937	TX9 INPUT CHOKE L65	12.05
2936	TX9 L64 BILIFAR CHOKE	4.25

DECCA SPARES

4616	DECCA 100 0.01 2KV CAP	0.98
2933	DECCA 100 BEDIGE TX	2.65
2932	DECCA 100 FOCUS CONTROL	2.65
4615	DECCA 100 LINE DRIVE TX	2.25
2928	DECCA 10SER 470K SH+VOL	2.15
4603	DECCA 2230 10R FUSIBLE	0.65
2930	DECCA 2233 PSH PSH SH	5.14
2931	DECCA 2263 PSH PSH SH	4.20
2926	DECCA 30 SER 3R9 RESIS.	0.50
2924	DECCA 30 SER MAINS TX	11.18
2929	DECCA 30 SER SH+VOL	2.43
2939	DECCA 80 470R SH+VOL	2.45

RESISTORS

CARBON

	STANDARD RANGES	
	1/4 WATT X 10	0.29
	1/2 WATT X 10	0.29
	1 WATT X 10	0.45
	2 WATT X 10	0.60

SAFETY CERAMIC

	STANDARD RANGES	
	5 WATT X 5	0.70
	7 WATT X 5	0.80
	11 WATT X 5	0.95
	17 WATT X 5	1.15

OTHER RESISTORS

3279	2M2 H/V FOCUS RESISTOR	0.43
3280	22M H/V FOCUS RESISTOR	1.50
3281	33M H/V FOCUS RESISTOR	1.50
3282	47M H/V FOCUS RESISTOR	1.50
3283	56M H/V FOCUS RESISTOR	1.50

MAINS DROPPERS

3025	MAINS DROPPER RANK A640	1.20
3013	MAINS DROPPER DECCA 80/100	1.60
3016	MAINS DROPPER GEC 2010	0.90
3031	MAINS DROPPER THORN 3600	0.90
3030	MAINS DROPPER THORN 1600	1.45
4910	MAINS DROPPER DECCA 100 2R5	0.82
3034	MAINS DROPPER THORN 9800	1.40
3027	MAINS DROPPER THORN 1400	1.45
3026	MAINS DROPPER RANK A823	0.89
3028	MAINS DROPPER THORN 1300	1.60
3029	MAINS DROPPER THORN 1500	1.63
3018	MAINS DROPPER PHILIPS G8	0.84
3022	MAINS DROPPER PYE 725/731	1.40
3017	MAINS DROPPER PHILIPS 210	0.90
3019	MAINS DROPPER PHILIPS G8 47R	0.84
3033	MAINS DROPPER THORN 8500/8800	0.90
5385	MAINS DROPPER DECCA 80	2.97
5386	MAINS DROPPER DECCA 100	1.88
5533	PYE CT200 PHILIPS 579 DROPPER	3.45

UNIVERSAL CONVERGENCE POTS

	5R, 10R, 22R, 20R, 25R, 50R, 75R, 100R, 200R, 250R, 500R	0.48

FIDELITY SPARES

2940	CHOPPER TX FIDELITY CTV14R	4.50
2942	DRIVER TX FIDELITY CTV14R	2.25
2941	FOCUS UNIT FIDELITY CTV14R	0.50
5408	MAINS INPUT CHOKE ZX2000	3.45
5504	MAINS FILTER TX CTV14R	2.95
5505	DRIVER TX ZX3000 404387	2.95
6162	ON/OFF SH FIDELITY CTV14R	3.85
6163	ON/OFF SH FIDELITY CTV14S	1.85

GEC SPARES

2965	GEC 1401 CHOPPER TX	16.56
2964	GEC 1401 INPUT CHOKE	9.63
5531	GEC 1501 MAINS TX	5.25
4758	GEC 2100 3R FUSIBLE RES	1.45
4759	GEC 2110 SH2 2KV CAPS	2.39
2959	GEC 2100 ETC FOCUS VDR	1.80
2958	GEC 2100 THERMAL CUT OUT	0.97
2962	GEC 2110 10K CONTRAST CTRL	3.95
2961	GEC 2110 1K BRIGHT CTRL	2.25
4760	GEC 2110 FOCUS CONTROL	5.90
4771	GEC 2110 LUM. DELAY LINE	1.83
4728	GEC 2110 MAINS CHOKE	7.85
4996	GEC 2110 NEONS	0.20
4751	GEC 2114 VOL+SWITCH CONT	1.98
4656	GEC 22K MULTI TURN POT	0.64

GRUNDIG SPARES

2949	GRUNDIG 5010 FOCUS VDR	3.25
4633	GRUNDIG 5010 CONTROL TX	4.76
2948	GRUNDIG 5010 FOCUS UNIT	3.75
4865	GRUNDIG 5010 L515 CHOKE	1.63
4744	GRUNDIG 5010/6010 LID	2.62
4745	GRUNDIG 5011 LID	2.50
4637	GRUNDIG 5011 SH+SLIDERS	11.00
2952	GRUNDIG 6010 MIXIE MDD	22.50
4630	GRUNDIG 6011 MAINS SH	3.80
4631	GRUNDIG 6110 MAINS SH	4.86
2947	GRUNDIG A6400 MAINS SH	4.95

REMOTE CONTROL UNITS

PLEASE STATE MODEL NUMBER

4311	DECCA 100 NONTEXT RCU	20.78
4314	DECCA 100 (TEST+PREST) RCU	20.78
4310	DECCA 80/100 SERIES RCU	19.20
4315	DECCA 90/100 N/TXT RCU	20.78
4324	GEC 2 FUNCTION RCU	18.45
4325	GEC C2057H/2067H RCU	19.20
4326	GEC TELEMASTER 12 RCU	20.03
4327	GEC TELEMASTER 16 RCU	20.03
4328	GEC TELEMASTER 8 RCU	22.13
4332	GRUNDIG TELEPILOT 12 RCU	26.25
4333	GRUNDIG TELEPILOT 16 RCU	25.85
2955	GRUNDIG TELEPILOT 7	29.95
4334	GRUNOIG TELEPILOT 8 RCU	20.83
4357	KORTING 12 CHANNEL RCU	22.13
4358	KORTING 16 CHANNEL RCU	22.50
4380	PHILIPS G11 NONTEXT RCU	19.20
4378	PHILIPS G11 T/TEXT 8CH RCU	20.78
5409	PHILIPS G11 T/TEXT U/SONIC	24.50
5453	PHILIPS KT3 REMOTE RC4001	16.00
4379	PHILIPS/PYE G11 2 FUNC RCU	18.90
4359	PHILIPS/PYE KT3/KT30	16.13
4385	RBM 16CH NONTEXT RCU	19.20
4386	RBM 8CH NONTEXT RCU	19.20
4387	RBM TEXT&V/DATA RCU	20.78
2980	REMOTE CTRL UNIT PHILIPS G9	0.97
4390	TCE 9000CHAS 2 FUNC RCU	20.24
4398	TCE TX10(9653)+TEXT RCU	20.78
4400	TCE TX10(9670)+PREST RCU	20.78
4397	TCE TX9/TX10	19.20

PUSH BUTTON UNITS

2870	4 WAY DECCA ETC	7.50
2871	6 WAY DECCA	9.40
2873	4 WAY HITACHI ETC	8.94
2875	4 WAY PYE/TCE	10.87
2877	6 WAY GEC 2110	11.25
2878	7 WAY GEC 2112	12.95
2879	6 WAY T3500	2.75
2880	6 WAY PYE 713	15.30
2881	6 WAY T9000	3.95
2882	4 WAY BUSH A823	10.65
2884	6 WAY MOD CVC9	12.85
2885	6 WAY 520 PHILIPS	16.46
2886	6 WAY PHILIPS 550	14.98
2887	T1P SWITCH UNIT PHILIPS G11	24.95
2888	6 WAY PHILIPS G11	6.95
2889	PIANO KEY MOD DECCA 2631	22.40
4935	7 WAY ITT CVC5	12.90
5278	GEC 2136 TAPERED	10.95
5279	ITT 6 WAY +VCR	10.70
5280	6 WAY BUSH T20	11.50

ITT SPARES

2972	ITT CP340 PB ASSY	31.50
4501	ITT CP340 SLIDER ASSY	7.50
4683	ITT CV40 FOCUS UNIT	1.95
5543	ITT CVC20 LINE DRIVE TX	3.85
4571	ITT CVC20 MAINS SWITCH	1.36
4787	ITT CVC25 6N2 2KV CAP	1.35
4786	ITT CVC25 8N2 2KV CAPS	2.15
2970	ITT CVC25 BRIDGE COIL	3.95
4789	ITT CVC25 E/W LOAD COIL	1.92
4567	ITT CVC25/30 MAINS SW.	6.00
2969	ITT CVC32 DRIVER TX	2.55
4568	ITT CVC32 REMOTE MAIN SH	6.84
2971	ITT CVC32 SH MODE TX	6.35
4795	ITT CVC45 ON/OFF SWITCH	2.00
3286	ITT CVC5 1MFD 250V CAP	0.40
4569	ITT CVC5 MAINS SWITCH	2.83
4781	ITT CVC5 SHIFT POT 25R	1.82
4780	ITT CVC5 SLIDER BANK	7.41
2967	ITT CVC5-9 MAINS TX	8.40
4570	ITT CVC9 MAINS SWITCH	5.61

FUSES

	STANDARD RANGES	
	20MM Q/B FUSE X 10	0.59
	20MM A/S FUSE X 10	
	63MA - 160MA	1.80
	200MA - 5A	1.20
	1.25" Q/B FUSE X10	
	250MA - 800MA	0.95
	1A - 5A	0.70
	1.25" A/S FUSE X 10	
	250MA - 2A	1.50
	2.5A - 5A	2.30
	PLUG TO P FUSE X 10	
	2, 3, 5, 7, 10, 13A	0.95

SERVICE MANUALS

5011	DECCA 101/100	6.00
5047	DECCA 80 CHASIS	4.50
5442	DECCA/TATUNG 120	7.00
5022	GEC C2055H-C2255H	6.00
5023	GEC C2065H-C2265H	4.95
5026	GEC C2110-C2149	6.00
5068	HITACHI CPT2024	3.00
5074	HITACHI CPT2234	3.00
5094	ITT CVC20	2.00
5095	ITT CVC25+30	9.00
5096	ITT CVC40	5.00
5097	ITT CVC45/1	4.75
5513	ITT CVC800/801	3.00
5093	ITT CVC9	4.00
5123	MITSUBISHI CT200B	1.50
5527	PANASONIC TC2205	4.00
5116	PANASONIC TX2234	3.00
5127	PHILIPS G11 CHASSIS	4.00
5126	PHILIPS G8 CHASSIS	6.00
4515	PHILIPS KT3 SERV.	5.00
5135	PHILIPS T8-E	1.00
5136	PHILIPS TX	2.00
5143	PYE 725 731 SER	4.00
5145	REDIFFUSION MK1	3.00
5146	REOIFFUSION MK3	9.90
5147	REOIFFUSION MK4	4.00
5148	REDIFFUSION MK5	3.00
5167	THORN 1500	1.50
5168	THORN 1600	1.50
5171	THORN 1615	3.00
5172	THORN 1690-1691	3.00
5184	THORN 38030	2.00
5187	THORN 3V01	12.00
5188	THORN 3V16	12.00
5178	THORN 9000	6.00
5182	THORN 9800	10.00

RANK RADIO SPARES

4650	RRI T20 SPEAKER	2.36
5524	RRI T24E ON/OFF + VOL SH	2.35
4842	RRI 1122 SH+VOL 22K PULL	3.10
4843	RRI A823 100K TUNER POT	1.78
4847	RRI A823 FOCUS ASSEMBLY	6.83
2998	RRI A823 PLASTIC CAM	0.40
5300	RRI A823ETC RING SPK GAP	0.55
4988	RRI T20 (TYPE) FOCUS ASY	0.80
3001	RRI T20 3K3 SH+VOL CTRL	2.67
4852	RRI T20 9N1 2KV CAP.	1.98
4853	RRI T20 CONTRAST+AFC POT	3.23
3003	RRI T20 E/W CORR. COIL	3.41
3000	RRI T20 FOCUS ASSY	4.95
3004	RRI T20 SH MOOE TX	11.20
4849	RRI 2718 3K3 SH+VOLUME	3.15

PHILIPS PYE SPARES

4969	PHILIPS 128711 4K7 VOL+SH	3.23
3288	PHILIPS 300 470L VOL+SWITCH	2.87
4449	PHILIPS 570/713 IF MOOULE	7.00
5425	PHILIPS CTX-S EHT LEAD	0.95
5418	PHILIPS CTX-S FOCUS UNIT	4.04
4655	PHILIPS G11 100K TUNER POT	0.64
2983	PHILIPS G11 CVC32 B/COIL	2.31
2984	PHILIPS G11 E/W CORR COIL	1.92
2985	PHILIPS G11 FILTER COIL	0.89
2986	PHILIPS G11 FOCUS UNIT	8.48
2987	PHILIPS G11 G2 CONTROL ASSY	7.98
4575	PHILIPS G11 RND SHAFT SH.	2.32
4576	PHILIPS G11 SQ SHAFT SWITCH	2.32
4645	PHILIPS G11 TDA2600 HOLDER	0.65
5284	PHILIPS G8 100K TUN P/SET	0.84
2977	PHILIPS G8 10K COLOUR CTRL	0.90
4525	PHILIPS G8 10K CON POT (550)	0.87
4524	PHILIPS G8 15R CON POT (550)	1.07
2975	PHILIPS G8 2K2 BRIGHT CONTL	0.85
4526	PHILIPS G8 2H A1 POT (550)	3.00
4522	PHILIPS G8 5N1 1500V CAP.	1.00
4523	PHILIPS G8 5R CONV POT (550)	0.64
4858	PHILIPS G8 6×4" 7OR SPKR	5.90
2979	PHILIPS G8 EQUALIS. COIL	2.25
4503	PHILIPS G8 METAL SH	1.72
2978	PHILIPS G8 RED/GRW SYM COIL	3.33
4504	PHILIPS G8/G11 NON REM SH	1.72
5307	PHILIPS K12 THICK FILM UNIT	12.96
4649	PHILIPS KT3 4X4 SPEAKER	2.85
4566	PHILIPS KT3 MAINS SWITCH	0.60
4907	PHILIPS KT4 THICK FILM UNIT	10.29
4564	PHILIPS T173 MAINS SWITCH	3.45
4648	PHILIPS G11 6X4 SPEAKER	2.85
2992	PYE 169 LINE OSC COIL	3.45
4839	PYE 731 3R3 50W RESISTOR	1.29
4535	PYE 731 47K VOL. SWITCH	3.11
2992	PYE 731 FOCUS UNIT	4.85
5545	PYE 731 L/H 3X 100K PSET	3.20
5546	PYE 731 R/H 3X 100K PSET	3.20
2994	PYE 731 THICK FILM ASSY	1.55
4938	PYE KT2 FOCUS UNIT	2.85
4864	PYE T194/6 SPEAKER	5.05
5556	PHILIPS G11 SHORT SHAFT SH	1.98

THORN VIDEO SPARES (OVER 450 PARTS)

QUOTE THORN PART NUMBER IF POSSIBLE

5561	T3292 BOOSTER	44.62
5562	T3292 CAPSTAN BELT	3.40
5563	T3292 CAPSTAN MOTOR	51.16
5568	T3292 CASSETTE LAMP	1.62
5569	T3292 COUNTER BELT1	0.60
5571	T3292 COUNTER BELT2	0.60
5575	T3292 ORUM MOTOR	47.70
5577	T3292 F/F IDLER	2.82
5582	T3292 GUIDE ROLL. ASSY	11.40
5585	T3292 LOWER DRUM ASY	80.40
5587	T3292 PINCH ROLL. ASSY	9.84
5591	T3292 REWINO IDLER ASSY	7.84
5592	T3292 REWIND RUBBER TYRE	0.60
5621	T3292 UNLOADING BELT	0.60
5622	T3292 UNLOADING IDL. ASSY	6.43
5624	T3292 UPP/DRUM KIT+MOD	35.94
5629	T3V00 CAPS. MOTOR BELT	0.60
5635	T3V00 COUNTER BELT 1	0.60
5637	T3V00 DRUM MOTOR	40.30
5646	T3V00 PINCH ROLLER ASSY.	7.31
5648	T3V00 RECORDING LAMP	2.00
5650	T3V00 SERVICE MANUAL	17.51
5655	T3V00 T/U IDLER ASSY	5.50
5657	T3V00 UPPER DRUM+MOD KIT	35.94
5663	T3V16 PINCH ROLLER ASSY	7.31
5666	T3V00 CAPSTAN MOTOR	51.16
5688	T3V00 TENSION BANO	1.86
5689	T3V00 TIMING GEAR	4.12
5692	T3V00 UNLOADING IDLER ASSY	6.43
5710	T3V01 TENSION BAND	1.86
5716	T3V16 CAPSTAN BENT	3.40
5720	T3V16 CASSETTE LAMP	1.62
5721	T3V16 CHANGE GEAR	0.86
5726	T3V16 DIODE STACK	3.41
5727	T3V16 DRIVE ARM ASSY	4.50
5750	T3V16 SERVICE MANUAL	26.24
5758	T3V16 T/U IDLER ASSY	5.50
5759	T3V16 T/U IDLER ASSY (LA)	7.55
5765	T3V16 UNLOADING IDLER	6.43
5772	T3V22 CAPSTAN MOTOR	51.16
5773	T3V22 CAPSTAN MOTOR BAND	0.60
5774	T3V22 CAPSTAN BELT	3.48
5790	T3V22 F/F IDLER	1.74
5803	T3V22 GUIDE ROLLER ASSY	8.39
5807	T3V22 MICRO SWITCH	4.25
5809	T3V22 PINCH ROLLER ASSY	7.31
5814	T3V22 REWINO IDLER ASSY	7.84
5822	T3V22 SUPP SPOOL CARRIER	4.00
5824	T3V22 TAKE UP IDLER SMALL	5.50
5825	T3V22 TAKE UP IDLER LARGE	7.55
5828	T3V22 TENSION BAND	1.86
5834	T3V22 UPPER DRUM ASSY	35.94
5840	T3V23 BOOSTER	24.71
5844	T3V23 CAPSTAN MOTOR	55.83
5852	T3V23 CONNECT GEAR ASSY	6.56
5856	T3V23 GUIDE ROLLER TYRE	0.60
5862	T3V23 PINCH ROLLER ARM AS	4.10
5868	T3V23 REEL IDLER ASSY	2.47
5869	T3V23 REEL MOTOR ASSY	32.81
5879	T3V23 T/U REEL DISK ASSY	5.17
5880	T3V23 TAKE UP REEL ASSY	2.58
5882	T3V23 UPPER DRUM ASSY	35.94
5885	T3V23 WORM GEAR SPINDLE	5.95
5886	T3V23 WORM GEAR SPROCKET	1.63
5888	T3V24 BRAKE SHOE	8.60
5896	T3V24 CASSETTE LAMP	1.62
5899	T3V24 DEW SENSOR ASSY	9.05
5902	T3V24 F/ERASE HEAD ASSY	10.41
5908	T3V24 LOADING GEAR ASSY	28.91
5909	T3V24 LOADING MOTOR	8.57
5912	T3V24 PINCH RLR LVR ASSY	8.62
5920	T3V24 SERVICE MANUAL	28.50
5945	T3V29/30 BOOSTER	24.71
5946	T3V29/30 BRAKE SHOE	0.67
5951	T3V29/30 CAPSTAN BELT	1.74
5952	T3V29/30 CAPSTAN MOTOR ASSY	27.32
5957	T3V29/30 CASSETTE LAMP	1.40
5962	T3V29/30 EJECT LCK ARM	0.60
5974	T3V29/30 LOADING MOTOR	0.60
5976	T3V29/30 LOHR DRUM ASSY	70.72
5980	T3V29/30 PINCH RLLR ASSY	8.66
5981	T3V29/30 PINCH RLLR SLND	8.26
5985	T3V29/30 REEL MTR ASSY	34.66
5990	T3V29 SERVICE MANUAL	25.85
5991	T3V30 SERVICE MANUAL	15.75
5998	T3V29/30 TAKE UP CLUTCH	0.60
5999	T3V29/30 T/U CLUTCH ASSY	2.36
6001	T3V29/30 T/U LDG RING ASSY	2.73
6003	T3V29/30 T/U SPL IDLER	2.25
6012	T3V31 BOOSTER	32.37
6016	T3V31 CAPSTAN BELT	1.74
6017	T3V31 CASSETTE LAMP	1.71
6027	T3V31 LOADING GEAR ASSY	6.60
6028	T3V31 LONG TRIMMING TOOL	0.93
6030	T3V31 PINCH ROLLER ASSY	8.66
6033	T3V31 SERVICE MANUAL	27.31
6034	T3V31 SERVO TEST JIG	49.94
6038	T3V31 TAKE UP CLUTCH ASSY	2.36
6039	T3V31 T/U LOAO/RING ASSY	2.73
6042	T3V31 UPPER DRUM ASSY	35.40
6044	T3V32 BOOSTER	32.37
6048	T3V32 CAPSTAN BELT	1.74
6053	T3V32 CASS MOTOR ASSY	9.45
6066	T3V32 LOADING GEAR ASSY	6.60
6068	T3V32 PINCH ROLLER ASSY	8.66
6071	T3V32 SERVICE MANUAL	18.50
6072	T3V32 SUPP/LDG RING ASSY	2.58
6081	T3V32 UPPER DRUM ASSY	35.94
6085	T3V35/6 BRAKE PAD X2	0.67
6086	T3V35/6 BRAKE SHOE	0.67
6087	T3V35/6 BRUSH ASSY	2.07
6090	T3V35/6 CAPSTAN MOTOR	23.91
6091	T3V35/6 CASSETTE MOTOR	6.93
6103	T3V35/6 PINCH ROLLER	9.84
6105	T3V35 REMOTE CONTROL	19.43
6107	T3V35/6 SERVICE MANUAL	27.00
6117	T3V35/6 TENSION BRAKE	0.60
6118	T3V35/6 UPPER ORUM ASSY	35.94
6119	T3V40 SERVICE MANUAL	12.00
6158	T3V29/30 UPPER DRM ASSY	35.94

SONY VIDEO

6133	SONY 8000UB FORWARD BELT	1.20
6136	SONY C6UB THREAOING BELT	1.20
6138	SONY C6UB CAPSTAN BELT	1.77
6145	SONY C7UB BRAKE ASSEMBLY	1.77
6150	SONY C5UB CAPSTAN MOTOR	38.75
6152	SONY C6UB MK2 REEL MTR	23.80
6154	SONY C7 DC MTR (BHF/1100)	38.75
6155	SONY C7UB REMOTE CONTROL	43.75
6156	SONY C5UB REMOTE CONTROL	20.63
6157	SONY C6UB REMOTE CONTROL	18.13
4953	SONY C5/7 REWINO KIT	5.40
4954	SONY C6 REWIND KIT	5.40
4948	SONY SL-7/SL-T7 BELT KIT	4.00
4944	SONY SLC7/SLJ7 BELT KIT	5.50
4949	SONY SLT 9ME/J9 BELT KIT	4.50

GEC

6173	V4000H UPPER CYLINDER	34.66
6174	V4000H RELAY	2.81
6175	V4000H PINCH ROLLER	0.00
6178	V4000H CAPSTAN MOTOR	32.63
6181	V4000H TAPE SENSOR LAMP	0.68
6185	V4001H PINCH ROLLER	0.00
6192	V4002H UPPER CYLINDER	34.66
6204	V4004 CLUTCH ASSY	9.51
6212	V4100 AUDIO CONTROL	28.13
6253	V4000H SERVICE MANUAL	7.00
6254	V4001H SERVICE MANUAL	7.00
6255	V4002H SERVICE MANUAL	9.45
6256	V4004 SERVICE MANUAL	7.85
6257	V4100 SERVICE MANUAL	7.00

HITACHI VIDEO SPARES

6214	8000 UPPER CYLINDER	38.99
6218	8000 AUDIO CONTROL	28.33
6220	8000 F/FWD REWIND ASSY	0.59
6224	9300E RELAY	2.81
6230	9300E TAPE SENSOR LAMP	0.95
6231	9300E TUNER	15.53
6240	VT33E UPPER CYLINDER	38.99
6244	VT33E CAPSTAN MOTOR	23.63
6249	VT11E F/FWD REWIND ARM	3.26
6252	VT11E CAPSTAN MOTOR	23.63

VIDEO HEADS

SEE FULL LIST FOR COMPARISON CHART

6258	BETA - A VIDEO HEAD	40.50
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HA11714	£5.75
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HA11716	£8.25
HA11717	£6.25
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HA11724	£18.25
HA11725	£16.00
HA11726	£15.00
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HA11747	£9.50
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HA11749	£4.50
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HA11753NT	£8.50
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HA11788	£4.50
HA11816NT	£6.50
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LA1230	£1.50
LA1240	£1.75
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LA1365	£1.20
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LA1460	£1.95
LA2200	£1.75
LA3101	£1.60
LA3155	£0.95
LA3160	£0.90
LA3201	£0.95
LA3300	£1.40
LA3301	£1.20
LA3350	£1.20
LA3361	£1.20
LA4030P	£2.00
LA4031P	£1.40
LA4032P	£1.40
LA4051P	£1.50
LA4100	£1.00
LA4101	£1.00
LA4102	£1.20
LA4110	£1.40
LA4112	£1.30
LA4120	£2.50
LA4125	£2.00
LA4140	£0.70
LA4182	£2.00
LA4192	£1.95
LA4200	£1.50
LA4220	£1.20
LA4230	£1.75
LA4400	£1.90
LA4420	£1.40
LA4422	£1.20
LA4430	£1.30
LA4440	£2.20
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LA4461	£1.75
LA4500	£2.50
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STK0080	£6.50
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STK2230	£6.00
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STK5421	£8.50
STK5451	£8.75
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TA7051P	£0.88
TA7054	£1.70
TA7063	£0.80
TA7066	£1.50
TA7070P	£1.40
TA7073	£2.25
TA7074P	£1.95
TA7104P	£1.35
TA7108	£1.50
TA7109	£2.30
TA7119	£1.75
TA7120P	£0.50
TA7130P	£1.00

TA7136P	£1.00
TA7137P	£0.80
TA7139P	£1.50
TA7145P	£1.80
TA7146P	£2.50
TA7150P	£1.80
TA7152P	£1.70
TA7173P	£1.60
TA7176P	£1.50
TA7193P	£3.50
TA7200	£2.00
TA7201	£2.00
TA7202P	£2.00
TA7203P	£1.80
TA7204P	£1.10
TA7205AP	£1.00
TA7207P	£1.50
TA7208P	£1.50
TA7210P	£2.00
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TA7215P	£1.80
TA7217AP	£1.20
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TA7222AP	£1.20
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TA7224P	£2.75
TA7225P	£2.50
TA7226P	£2.20
TA7227P	£1.50
TA7229P	£3.00
TA7230P	£1.75
TA7232P	£2.75
TA7310P	£1.40
TA7312P	£1.30
TA7313AP	£1.30
TA7315AP	£1.75
TA7325P	£0.85
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UPC555	£0.60
UPC561C	£2.00
UPC566H	£0.60
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UPC1017G	£1.30
UPC1018C	£0.95
UPC1020	£1.75
UPC1023H	£0.60
UPC1025H	£2.30
UPC1026C	£1.00

UPC1028H	£0.90
UPC1031H	£1.80
UPC1032H	£0.50
UPC1035C	£1.20
UPC1037H	£0.75
UPC1043C	£1.20
UPC1156H	£1.40
UPC1158H	£0.60
UPC1161C	£0.75
UPC1163H	£0.60
UPC1167C	£0.70
UPC1168C	£0.90
UPC1170H	£0.75
UPC1171C	£1.50
UPC1176C	£1.20
UPC1177H	£1.20
UPC1178C	£1.00
UPC1180C	£1.40
UPC1181H	£1.00
UPC1182H	£1.00
UPC1183H	£1.20
UPC1185H	£2.20
UPC1186	£0.80
UPC1187V	£1.30
UPC1190C	£0.95
UPC1191V	£0.95
UPC1198H	£0.70
UPC1200V	£0.80
UPC1208C	£0.95
UPC1211V	£1.90
UPC1215V	£1.25
UPC1216V	£0.95
UPC1217G	£1.60
UPC1218H	£1.40
UPC1222C	£0.90
UPC1223C	£1.75
UPC1225H	£1.60
UPC1226C	£1.25
UPC1227V	£0.95
UPC1230H	£2.50
UPC1238V	£0.85
UPC1245V	£1.00
UPC1277H	£2.75
UPC1278H	£2.50
UPC1350C	£1.20
UPC1353C	£1.75
UPC1356C	£1.50
UPC1358H	£1.50
UPC1360C	£1.60
UPC1363C	£1.95
UPC1365C	£3.00
UPC1366C	£1.50
UPC1367C	£1.50
UPC1368H	£1.75
UPC1370C	£1.95
UPC1373H	£0.75
UPC1378H	£1.95
UPC1382C	£0.75
UPC1384C	£2.50
UPC1458C	£0.90
UPD277	£4.50
2SA103	£0.60
2SA350	£0.60
2SA495	£0.35
2SA539	£0.30
2SA562	£0.30
2SA634	£0.60
2SA643	£0.65
2SA673	£0.35
2SA684	£0.70
2SA699A	£0.85
2SA762	£1.95

2SA899	£0.75
2SA940	£0.80
2SA952	£0.35
2SA1015	£0.30
2SA1102	£1.90
2SA1103	£1.90
2SA1104	£1.90
2SA1105	£2.25
2SA1106	£2.50
2SA1198	£0.35
2SB22	£0.40
2SB54	£0.70
2SB75	£0.60
2SB341V	£2.60
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2SB426	£2.80
2SB471	£3/50
2SB492	£0.75
2SB509D	£1.70
2SB534	£0.60
2SB536	£0.95
2SB546	£1.50
2SB561	£0.30
2SB698	£0.30
2SB754	£0.95
2SB755	£2.50
2SB772Q	£0.90
2SC372	£0.30
2SC373	£0.30
2SC380A	£0.30
2SC458	£0.20
2SC460	£0.30
2SC461	£0.30
2SC503Y	£0.70
2SC536	£0.20
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2SC620	£0.50
2SC632	£0.30
2SC681	£2.20
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2SC710	£0.30
2SC717	£0.50
2SC732	£0.30
2SC733	£0.30
2SC792	£2.85
2SC799	£1.75
2SC828	£0.20
2SC840	£1.50
2SC867	£2.75
2SC900	£0.35
2SC929D	£0.35
2SC930D	£0.30
2SC945	£0.35
2SC1034	£3.75
2SC1061	£0.95
2SC1096	£0.60
2SC1114	£3.50
2SC1115	£3.75
2SC1124	£0.80
2SC1162C	£0.80
2SC1170B	£2.95
2SC1172	£2.75
2SC1307	£1.25
2SC1308	£2.70
2SC1316	£2.95
2SC1317	£0.30
2SC1342	£0.75
2SC1364	£0.40
2SC1417	£0.30
2SC1419B	£0.75

2SC1427	£0.30
2SC1505	£0.70
2SC1546	£0.30
2SC1664	£2.50
2SC1682	£0.30
2SC1741	£0.30
2SC1815	£0.25
2SC1826	£0.60
2SC1849	£0.30
2SC1945	£3.50
2SC1946A	£9.50
2SC1957	£0.80
2SC1969	£1.30
2SC2021	£0.30
2SC2026	£0.65
2SC2028	£0.75
2SC2075	£0.25
2SC2078	£0.75
2SC2091	£0.60
2SC2092	£0.95
2SC2098	£0.95
2SC2166	£0.95
2SC2238	£0.65
2SC2278	£0.70
2SC2335	£1.50
2SC2365	£4.25
2SC2540	£12.75
2SC2570	£0.70
2SC2577	£1.90
2SC2578	£2.20
2SC2579	£2.20
2SC2580	£2.20
2SD24	£0.50
2SD170	£0.60
2SD187	£0.60
2SD313	£0.95
2SD325	£0.65
2SD348	£4.50
2SD352A	£0.50
2SD371	£1.30
2SD401	£1.50
2SD467B	£0.30
2SD468B	£0.50
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2SJ49	£4.00
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2SK38A	£2.70
2SK49	£0.60
2SK120	£0.90
2SK134	£4.00
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SHARP VC6300 (5)	£1.75
SHARP VC7300/7700 (5)	£1.30
SHARP VC8300 (5)	£1.50
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TOSHIBA V547 (6)	£1.70
TOSHIBA V7540 (5)	£1.75
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LATE EXTRA

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HA12038	£6.75
LA1140	£1.75
LA3370	£2.80
LA4126	£2.50
LA4507	£4.85
LA7016	£2.50
LA7215	£2.75
LA7521	£4.50
LA7751	£4.75
LA7755	£2.95
LA7801	£2.95
LA7808	£2.50
LA7910	£1.95
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8000/9000 VT11/14/33/5000/5500	£33.50
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CASSETTE MOTORS

6-9-12-13 2 Volts £2.50

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Mono	£1.50
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SFE 4.5MB	£0.25
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HIGH SELECTIVITY 4 LEAD TYPE

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Enquiries invited for any Japanese 1.6s. As we have imported for over 10 years.

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ITEMS DESPATCHED WITHIN 48 HOURS

TELE-PART

Telegen-1

PRICE £18.35 (Inc. VAT)

- *EXCEPTIONALLY LIGHT AND DURABLE*
- *POCKET SIZE FOR OUTSIDE SERVICE*
- *PP3 BATTERY POWER SOURCE*
- *FIVE DIFFERENT TEST PATTERNS FOR COLOUR & MONO TV*
- *CROSSHATCH GRID * DOT MATRIX*
- *WHITE RASTER*
- *HORIZONTALS * VERTICLES*
- *3.5mm JACK SOCKET FOR OPTIONAL P.S.U.*

A lightweight, extremely portable and versatile pattern generator for black/white and colour T.V. alignment and service at the customer's home. At the turn of a switch, the generator can provide five essential test patterns for correct installation, fast checks and repairs. Pattern stability is first class and compares favourably with other more costly bulky generators only suitable for bench work. The generator is pocket size measuring 10 × 7.5 × 4 cm and weighs only 190 grams. Switched 3.5 mm jack socket allows use of external power supply with battery in situ.

Telegen-2

PRICE £34.45 (Inc. VAT)

- *EXCEPTIONALLY LIGHT & DURABLE*
- *COMPACT 10 × 12 × 4.5 cms*
- *RED RASTER * GREEN RASTER*
- *BLUE RASTER*
- *COLOUR BARS*
- *3.5 mm JACK SOCKET FOR P.S.U.*
- *PROVIDES UHF SIGNAL APPROX. CHANNEL 35*

Telegen 2 is a colour bar generator at a very modest price and yet is extremely effective, stable and durable. It is the perfect compliment to Telegen 1, giving colour bars arranged in the following sequence: white, yellow, cyan, green, magenta, red, blue and black. The unit provides a signal in the UHF band approx. Channel 35 and requires a supply of 14 to 18 volts D.C.

Power Supply

A switchable power supply ideally suited to both Telegen 1 and Telegen 2

PRICE £4.55 (Inc. VAT)

ALL ITEMS POST AND PACKING £1.44 (Inc. VAT)

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DF96	0.75
DK96	2.65
DM71	2.95
DY86/87	0.66
DY802	0.95
CV850	2.50
CV4015	2.80
E180F	6.50
EABC80	0.98
EAF42	1.50
EB91	1.30
EBC41	2.00
EBF80	0.75
ECC81	1.00
ECC82	0.90
ECC83	1.00
ECC84	0.80
ECC85	0.95
ECC86	2.80
ECC88	1.25
ECC189	0.85
ECF80	1.20
ECF82	0.85
ECF83	1.90
ECF86	1.70
ECH35	3.75
ECH81	1.40
ECH84	1.50
ECL85	0.75
ECL86	1.75
EF80	0.75
EF86	1.80
EF91	2.00
EF95	1.68
EF183	0.90
EF184	1.00
EH90	0.98
EL34	3.25
EL36	1.96
EL81	6.95
EL84	1.00
EL85	4.75
EL86	0.90
EL509	7.85
EL519	7.95
EM80	0.85
EM84	1.75
EM87	2.55
EY51	0.90
EY86/87	0.65
EY88	0.75
EY500A	2.50
EZ41	2.80
EZ81	0.80
GY501	1.40
GZ32	1.20
KT66(G.E.C.)	18.00
KT77	11.50

Type	Price (£)
KT88(G.E.C.)	19.00
PC88	1.40
PC92	3.00
PC900	1.40
PCC88	0.80
PCC89	0.75
PCC189	0.85
PCF80	0.95
PCF82	0.95
PCF84	0.75
PCF86	1.25
PCF87	0.50
PCF200	1.95
PCF201	1.95
PCF800	1.20
PCF801	1.05
PCF802	1.05
PCF805	1.60
PCF806	1.20
PCF808	1.60
PCL82	1.00
PCL83	2.50
PCL84	1.00
PCL86	0.90
PCL88	2.50
PCL805	1.05
PD500	2.90
PFL200	1.85
PL33	1.50
PL36	1.75
PL82	0.75
PL95	2.00
PL504	1.40
PL508	2.70
PL519/509	5.25
PL802	5.50
PY81/800	1.10
PY82	1.75
PY88	0.80
PY500A	2.20
PY801	0.68
UABC80	0.85
UAF42	1.25
UBC41	3.00
UBC81	1.50
UCC85	0.75
UCF80	1.20
UCH42	2.50
UCH81	2.00
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UCL83	1.80
UF41	1.25
UF89	2.50
UL84	1.25
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6AV6	1.50
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6K8G	2.75
6KD6	5.50
12AU6	2.00
30FL2	1.70
30FL12	1.60

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Type	Price (£)
AC127	0.28
AC128	0.30
AC128K	0.34
AC141	0.58
AC141K	0.38
AC142	0.56
AC142K	0.38
AC151	0.45
AC152	0.45
AC153	0.57
AC153K	0.46
AC176	0.30
AC176K	0.38
AC187	0.28
AC187K	0.38
AC188	0.28
AC188K	0.38
ACY22	1.50
AD142	0.88
AD143	1.10
AD149	0.72
AD161/162	1.20
AD162	0.52
AF114	1.20
AF115	2.10
AF116	2.10
AF121	0.56
AF124	0.42
AF125	0.58
AF126	0.58
AF127	0.38
AF139	0.40
AF178	2.28
AF239	0.50
AF279S	1.40
AL100	5.40
AL102	4.40
ASY80	5.20
ASZ17	2.00
AU110	2.80
AY102	4.40
B40C200	1.03
BA110	0.68
BA115	0.14
BA121	0.40
BA129	0.38
BA148	0.16
BA155	0.28
BA157	0.12
BB105B	0.28
BB105G	0.38
BB110B	0.42
BC107	0.10
A or B	0.12
BC108	0.10
A,B or C	0.13
BC109	0.10
A,B or C	0.14
BC115	0.12
BC116	0.12
BC117	0.22

Type	Price (£)
BC118	0.16
BC119	0.28
BC125	14
BC140	0.27
BC141	0.24
BC142	0.24
BC143	0.26
BC147	0.18
BC147B	0.14
BC148	0.10
BC148B	0.12
BC149	0.10
BC149C	0.14
BC157	0.10
BC158	0.12
BC159	0.12
B/C	0.14
BC160	0.30
BC161	0.30
BC168B	0.20
BC169C	0.12
BC170/A/B/C	0.16
BC171/A/B	0.12
BC172/B/C	0.12
BC177/A/B/C	0.24
BC182/A/B/C	0.10
BC182L	0.12
LA LD LC	0.10
BC183/A/B/C	0.10
BC183L	0.10
LA LB LC	0.10
BC184	0.10
A B CL LC LB	0.10
BC207	0.15
BC212/A/B/C	0.10
BC212L	0.09
LA LB	0.10
BC213/A/B/C	0.10
BC213L	0.10
LA LB LC	0.10
BC237	0.11
BC238	0.12
BC251/A/B	0.14
BC262	0.20
A B	0.28
BC301	0.30
BC302	0.30
BC303	0.30
BC307A	0.18
BC317A	0.12
BC323	0.90
BC327	0.16
BC328	0.16
BC337	0.12
BC338	0.12
BC350A	0.24
BC351	0.16
BC440	0.36
BC441	0.40
BC461	0.58
BC478	0.24

Type	Price (£)
BC516	0.48
BC547	0.12
A or B	0.10
BC548	0.12
A B or C	0.10
BC549	0.10
A or B	0.10
BC550	0.10
A or B	0.10
BC557	0.10
BC558A	0.10
BCY70	0.16
BCZ10	3.21
BCZ11	2.60
BD124P	0.70
BD129	0.90
BD130Y	0.68
BD131	0.36
BD132	0.36
BD135	0.26
BD136	0.26
BD137	0.28
BD138	0.30
BD139	0.30
BD140	0.28
BD142	1.26
BD145	1.82
BD150A	0.72
BD160	1.58
BD165	0.45
BD183	0.70
BD201	0.52
BD202	0.57
BD204	0.68
BD222	0.80
BD225	0.40
BD232	0.45
BD234	0.30
BD235	0.30
BD236	0.38
BD237	0.38
BD410	0.76
BD434	0.58
BD438	0.58
BD439	0.85
BD441	1.00
BD507	1.05
BD520	1.20
BD687	0.88
BD707	0.88
BDX18	1.00
BDX32	1.48
BF115	0.32
BF117	0.50
BF119	0.82
BF120	0.38
BF125	0.42
BF127	0.41
BF154	0.14
BF157	0.46
BF160	0.23
BF167	0.32
BF177	0.42

Type	Price (£)
BF178	0.26
BF180	0.27
BF181	0.27
BF182	0.32
BF183	0.32
BF184	0.30
BF185	0.28
BF194A	0.15
BF195	0.12
BF224J	0.20
BF240	0.30
BF241	0.30
BF244A	0.30
BF257	0.22
BF258	0.26
BF259	0.30
BF262	0.34
BF263	0.38
BF270	0.30
BF271	0.28
BF273	0.22
BF274	0.34
BF294	0.46
BF336	0.32
BF337	0.28
BF338	0.28
BF355	0.37
BF371	0.27
BF450	0.38
BF457	0.36
BFR51	0.36
BFR61	0.32
BFR90	0.86
BFT41	0.68
BFT43	0.86
BFY50	0.22
BFY51	0.22
BFY52	0.22
BFY90	0.80
BFY90S	1.34
BR100	0.25
BR101	0.40
BR103	0.50
BR303	2.75
BRY39	0.50
BRY56	0.42
BSX20	0.30
BSY52	0.35
BSY95A	0.25
BT100A/02	0.90
BT101/300	2.75
BT101/500	3.25
BT102/300	3.60
BT106	1.15
BT116	1.20
BT119	3.30
BT138/600	1.30
BT151/560R	0.90
BTY79/400R	2.80
BU104	1.80
BU105	1.20
BU108	1.75
BU124AE	0.98

Type	Price (£)
BU126	1.40
BU133	1.90
BU204	1.30
BU205	1.30
BU206	1.50
BU208A	1.40
BU326S	1.75
BU407	1.10
BUX80	3.70
BUY20	2.75
BUY69A	2.60
BUY69B	1.98
BY100	0.80
BY103	0.50
BY122	0.60
BY126	0.10
BY127	0.08
BY133	0.06
BY135	0.35
BY164	0.45
BY179	0.56
BY182	0.80
BY184	0.38
BY187	0.65
BY189	6.75
BY198	0.64
BY199	0.72
BY206	0.14
BY207	0.16
BY210/400	0.21
BY210/600	0.24
BY210/800	0.28
BY227	0.22
BY228	0.24
BY238	0.65
BYX10	0.20
BYX36/150	0.40
BYX36/600	0.48
BYX48/300	0.70
BYX55/600	0.30
BYX71/600	1.18
C106D (400V)	0.48
E1222	0.30
E5024	0.30
MCR106/5	1.20
ME0413	0.70
ME6002	0.26
MEU21	0.62
MJ400	0.45
MJ2955	1.00
MJ3000	1.80
MJE340	0.46
MJE520	0.44
MJE2955	1.60
MJE3055	1.40
MPSA05	0.30
MPSA12	0.30
MPSL01	0.34
MPSU05	1.05
MPSU06	1.18
MR502	0.40
MR854	0.88
OA91	0.07

Type	Price (£)
ORP12	0.85
R2008B	1.20
R2010B	1.20
R2540	2.71
TIP30A	0.32
TIP31C	0.39
TIP32	0.35
TIP33A	0.55
TIP34A	0.70
TIP41C	0.42
TIP42	0.44
TIP47	0.42
TIP121	0.63
TIP2955	0.70
TIP3055	0.58
TIS88	0.50
TIS90	0.27
Y728	0.14
Y969	2.80
IN4001	0.04
IN4003	0.05
IN4004	0.05
IN4006/7	0.07
IN4148	0.04
IN5400	0.12
IN5402	0.13
IN5405	0.16
IN5406	0.17
IN5408	0.19
2N2122A	0.34
2N2222	0.30
2N2904A	0.48
2N2926G	0.14
2N3053	0.30
2N3054	0.60
2N3055	0.65
2N3703	0.10
2N3773	2.80
2SB337	1.80
2SC1098	0.84
2SC1172Y	1.70
2SC1173Y	0.88
2SC1279	0.50
2SC1306	0.92
2SC1413A	2.70
2AC1449	0.60
2SC1507	0.60
2SC1678	1.00
2SC1758	0.68
2SC1909	1.20
2SC1923	0.30
2SC1945	2.88
2SC21953	0.70
2SC1957	0.70
2SC1969	2.80
2SC2028	0.73
2SC2029	2.70
2SC2078	1.05
2SC2091	0.70
2SC2098	2.90
2SC2122A	3.20
2SC2314	0.80
2SC2335	1.50

Type	Price (£)
2SK135	3.80
3N211	3.52
3SK88	0.60
40636	1.65
40673	1.80

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2 amp 12 way	0.22
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74LS00	0.24
74LS01	0.24
74LS02	0.24
74LS03	0.24
74LS04	0.24
74LS05	0.24
74LS08	0.24
74LS09	0.24
74LS10	0.24
74LS11	0.24
74LS12	0.24
74LS13	0.33
74LS14	0.48
74LS15	0.24
74LS19	0.44
74LS20	0.24
74LS21	0.24
74LS22	0.24
74LS24	0.28
74LS26	0.24
74LS27	0.24
74LS28	0.24
74LS30	0.24
74LS32	0.24
74LS33	0.24
74LS37	0.24
74LS38	0.24
74LS40	0.24
74LS42	0.50
74LS47	0.79
74LS48	0.85
74LS51	0.24
74LS55	0.24
74LS73	0.30
74LS74	0.33
74LS75	0.44
74LS76	0.38
74LS83	0.88
74LS85	0.82
74LS86	0.35
74LS90	0.48
74LS91	0.90
74LS92	0.54
74LS93	0.54
74LS95	0.60
74LS96	1.20
74LS107	0.40
74LS109	0.44

Type	Price (£)
74LS112	0.44
74LS113	0.40
74LS114	0.39
74LS122	0.68
74LS123	1.00
74LS124	1.15
74LS126	0.50
74LS132	0.60
74LS135	0.26
74LS136	0.42
74LS138	0.44
74LS139	0.58
74LS145	0.93
74LS147	1.64
74LS148	1.28
74LS151	0.70
74LS153	0.70
74LS155	0.55
74LS157	0.45
74LS158	0.58
74LS160	0.62
74LS161	0.68
74LS162	0.70
74LS163	0.68
74LS164	0.74
74LS165	1.10
74LS166	1.50
74LS168	1.48
74LS170	1.40
74LS173	0.98
74LS174	0.75
74LS175	0.70
74LS190	0.82
74LS192	0.98
74LS193	0.98
74LS194	0.75
74LS195	0.74
74LS196	0.84
74LS197	0.96
74LS221	0.85
74LS240	0.80
74LS241	0.80
74LS242	0.94
74LS243	0.94
74LS244	0.80
74LS245	1.20
74LS247	1.00
74LS251	0.75
74LS257	0.73
74LS258	0.75
74LS259	1.20
74LS266	0.55
74LS237	1.20
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74LS283	0.80
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74LS366	0.50
74LS367	0.50
74LS368	0.50
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709	0.35
741	0.25
747	0.70
AN214Q	3.80
AN240P	3.42
BTT6218	1.98
CA301AT	2.88
CA358	0.66
CA801CM	1.20
CA3020	2.10
CA3065	1.60
CA3080E	0.68
CA3140	0.45
HA1366W	1.59
LA4422	3.20
LC7131	4.90
LC7137	5.40
LM324N	0.48
LM380N8-P	1.15
LM380N14-P	1.80
LM1011N	3.20
LM1488N	0.98
LM3900N	0.85
M51513L	3.18
M51515L	3.18
MC1307P	1.99
MC1327P	1.50
MC1330P	1.60
ML23213	2.10

ML23713	2.30
NE555	0.25
SAA1025	4.00
SAS560	2.50
SAS570	1.85
SAS580	2.85
SN76131N	1.99
SN76226DN	1.70
SN76227N	1.10
SN76660N	0.75
SN76666NO	1.40
STK015	6.20
TA7146P	4.60
TA7203P	2.76
TA7204P	1.50
TA7205AP	1.30
TA7222P	2.32
TAA550	0.50
TAA611A12	3.50
TAD100	2.90
TDA120A	0.80
AS/S/SB/T/U	0.80
TDA120B	1.30
SA/SQ/UQ	1.30
TBA520	1.50
TBA530	1.20
TBA540	1.64

TDA560C	1.50
TDA800	0.80
TBA810S	1.20
TBA950/2A	3.05
TCA270SA	4.02
TDA1003A	5.50
TDA1006A	2.45
TDA1035S	2.20
TDA1170S	1.99
TDA1352A	1.80
TDA2002	1.80
TDA2020	4.00
TDA2030	1.90
TDA2140	2.90
TDA2160	2.50
TDA2522	2.75
TDA2530	2.20
TDA2532	2.80
TDA2560	3.20
TDA2561	4.65
UPC57562	1.48
UPC741G	0.92
UPC1156H	2.75
UPC1182H	2.75
UPC1218H	1.80
UPC1370C2	2.50
UPC2002H	2.78
UPC2002V	2.78

CMOS

4000	0.19
4001	0.24
4002	0.24
4006	0.68
4007	0.24
4008	0.59
4009	0.44
4010	0.39
4011	0.23
4012	0.24
4013	0.35
4014	0.58
4015	0.58
4016	0.38
4017	0.54
4018	0.59
4019	0.59
4020	0.78
4021	0.58
4022	0.68
4023	0.30
4024	0.49
4025	0.24
4026	0.89
4027	0.44
4028	0.44
4029	0.73
4030	0.33
4031	1.28
4033	1.25
4034	1.40
4035	0.68
4036	2.48
4038	0.73
4039A	2.70
4040	0.58
4042	0.48
4043	0.42
4044	0.48
4049	0.38
4050	0.34
4051	0.68
4052	0.58
4053	0.58
4066	0.44
4068	0.24
4069	0.24
4070	0.24
4071	0.24
4072	0.24
4073	0.24
4075	0.24
4076	0.68
4077	0.24
4078	0.24
4081	0.24
4082	0.24
4085	0.58
4086	0.58
4089	1.22
4093	0.37
4094	0.70
4095	0.93

4096	0.98
4097	2.65
4098	0.78
4099	0.75
4161	0.96
4162	0.96
4163	0.96
4174	0.96
4175	1.00
4195	0.99
4501	0.38
4502	0.58
4503	0.38
4507	0.45
4508	1.28
4510	0.54
4511	0.54
4512	0.54
4514	1.10
4515	1.20
4516	0.60
4517	2.70
4518	0.48
4520	0.05
4521	1.10
4522	1.20
4526	0.58
4527	0.64
4528	0.68
4531	1.20
4532	0.64
4536	2.50

IC SOCKETS

Dil to Dil

8 Pin	0.08	0.70/10
14 Pin	0.10	0.90/10
16 Pin	0.11	1.00/10
18 Pin	0.14	1.30/10
22 Pin	0.21	1.80/10
24 Pin	0.25	1.90/10
28 Pin	0.22	2.00/10
40 Pin	0.28	2.60/10

VOLTAGE REGULATORS

78L05/08/12/15	0.30
7805/08/12/15/18/24	0.45
7905/12/15/18/24	0.50
LMC17K	2.40
LMC17T	1.25
LM723	0.65

FUSEHOLDERS

20mm Panel Mounting	0.28
20mm Chassis Carline 1 1/4" holder	0.10

RESISTORS – CARBON FILM 5%

1/4W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
1/2W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100
2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

RESISTOR KITS – each value individually packed

1/4W pack 10 each value E12 – 10R to 1M 610 pieces	5.75
1/4W pack 5 each value E12 – 10R to 1M 305 pieces	3.35
1/2W pack 10 each value E12 – 2R2 to 2M2 730 pieces	7.95
1/2W pack 5 each value E12 – 2R2 to 2M2 365 pieces	4.75
1W pack 5 each value E12 – 2R2 to 1M 353 pieces	15.00
2W pack 5 each value E6 – 10R to 2M2 317 pieces	18.50

RESISTORS – WIREWOUND. Generally 5%

2.5W – 0.22 to 270R – Available in preferred values	0.15
4W – 1R0 to 10K – Available in preferred values	0.18
7W – 0.47R to 22K – Available in preferred values	0.15
11W – 1R0 to 22K – Available in preferred values	0.18
17W –1R0 to 22K – Available in preferred values	0.24

ZENER DIODES

400mW Plastic	3V-75V	8p each. 10/75p.
1.3W Plastic	3V-200V	15p each. 10/£1.40
1.5W Flange	4.7-47V	£1.26 each*
2.5W Plastic	7.5-75V	64p each*
20W Stud	7.5-75V	£1.35 each*

*Only available while stocks last

HV Disc Ceramic (†)

1kV 1.5nF 18p
8kV 10, 47, 56, 82, 100, 120, 150, 180 30p

ZENER DIODE PACK

400mW – 5 each value – 11 values – individually marked and packed – 55 Zener Diodes. **Price £3.50 each.**

All prices are subject to change without notice

TELEPHONE SPECIAL

BT App Telephone Plug + 3m Lead	£1.25
BT App Master Socket inc Wiring instrns	£2.85
BT App Secondary Socket	£1.95
4-way plug	30p each
BT 4-Core Cable per metre	15p/m
	£12.00/100m
Cable clips for above	100/75p

NI-CAD CHARGER

Universal Ni-Cad charger, charges PP3, AA, C, D
Price £5.17

Rechargeable Batteries

AA (HP7)	95p	10/ 85p each
C (HP11)	£2.14	10/£1.98 each
D (HP2)	£2.30	10/£2.10 each
PP3	£3.75	10/£3.65 each

Dry Cell Batteries – Button type for Multimeters – set of 3 £1.50

FUSES Prices per 10

20mm Quick Blow. 100, 125, 160, 200, 250, 315, 400, 500, 630, 800mA, 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A. **40p. 20mm Time Delay.** 100, 125, 160, 200mA **£1.80.** 250, 315, 400, 500, 630, 800mA. **£1.00.** 1, 1.25, 1.6, 2, 2.5, 3.15, 4, 5, 6.3A 85p. 1" **Mains.** 2, 3, 5, 7, 10, 13A **85p.**

REPLACEMENT TV MAINS DROPPERS

GEC2010	8R + 15R + 17R + 70R + 63R + 188R	0.95
GEC 2018	10R + 15R + 19R + 70R + 188R	1.15
Philips G8	2.2R + 68 R	0.80
Philips 70	6R + 124R + 84R	0.68
Philips 300	118R + 148R (with link)	0.85
RRI A640	250R + 14R + 156R 50W	1.05
RRI A816	302R + 70R + 6.2R	0.78
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
Thorn 8500	1K5 + 40R + 50R	1.28

Plus Many More. Please enquire.

MULTISECTION ELECTROLYTICS

THORN	850	100+300+100+16/300V	1.80
	1400	150+100+100+100+150/320V	2.70
	1500	150+150+100/300V	2.00
	3000	1000/63V	0.74
	3500	175/400V+100+100/350V	2.56
	8000	400/350V	2.10
	8000/8500	2500+2500/63V	1.99
	8000	700/250V	2.15
		1000/70V	0.80
	9000	400/400V	3.00
Timer Amp		4700/25V	0.95
DECCA 10/30		400+400/350V	3.20
	1700	200+200+400/350V	3.75
GEC	2047	2048 2083 2084 2104	
		200+200+150+50/300V	2.50
		600/250V	1.85
ITT/KB		200+200+75+25/350V	2.90
		220/100V	1.95
PHILIPS	G8	600/300V	2.20
	G8 G9	600/300V	2.10
	G11	470/250V	1.80
	G9	2200/63V	1.25
EKCO	T148	125+200+100+32/275V	2.65
	691 Series	200+300/350V	2.50
		600/300V	2.20
RANK		300+300/300V	1.75
	A823	2500+2500/30V	1.50
		220/400V	1.85
		600/300V	2.25

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EDITOR
John A. Reddihough

ADVERTISEMENT MANAGER
Roy Smith
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CLASSIFIED ADVERTISEMENTS
Pat Bunce
01-261 5942

Please note that the telephone numbers above are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 345.

The Problem of Spares

The problem of finding sources of spares for the very wide range of TV sets and VCRs that have been sold in the UK in recent years has become quite a bugbear for many shops and service departments. We certainly get more enquiries about this than anything else. It can be very time consuming ringing round various firms in the hope of being able to get hold of say a line output transformer for a set bearing one of the less well known brand names. And that's time which can't be spent on the main matter in hand – getting the sets repaired and out.

There's been a great change in the UK radio and television trade over the last twenty or so years, brought about by the ending of retail price maintenance and the change to 625-line operation. The cozy days of 405 lines, and prices and profit margins that were known and kept to, have long since gone. Twenty years ago the vast majority of sets sold in the UK were locally produced by firms that had very often been in the business since the earliest days of radio, and there was a certain annual ritual – a new range of models incorporating the latest wonders from Mullard and others would be announced to coincide with the annual show at Earls Court. Nowadays few setmakers bother with formal trade announcements of new models – most new sets seem to enter the range when it suits the production line. One result of this is that it's much more difficult to keep tabs on new models and chassis. Then there's the fact that the larger high street multiples have, following the end of retail price maintenance, long since abandoned the traditional trade arrangements. They buy in bulk and often put their own brand name on the set, be it UK produced or brought in from abroad – the Continent, Japan, Korea, Hong Kong, Taiwan, Singapore or elsewhere. This is all very well, the customer no doubt gets a good deal, but sooner or later the set is likely to arrive on the workbench of someone who's not familiar with it. What does the independent shopkeeper or repairer do when confronted by a Saisho, Matsui or Seismo? He won't find any reference to it in any of the usual trade lists, which seem to reflect the trade scene of twenty years ago rather than today. He may well be able to establish the source of the set by asking the owner, but he's still got to track down any spares that might be required.

Mindful of all this we decided to produce a TV/VCR spares guide that comes with the present issue (it not included with export copies since we assume that overseas readers will have their own local sources of supplies). We think that most of the major and also many of the more obscure makes and brands have been included but there are probably quite a few that haven't, especially when it comes to imported monochrome portables. Some of these have been brought into the country by small importers who may have stopped dealing with electrical goods or ceased to trade, leaving no trace of themselves. There are probably many readers who will be able to spot an omission or provide additional information. We'd welcome any comments or further information readers can supply. If a firm has gone out of business it may well be that parts are simply not available. There's also the case of sets imported by individuals – in particular those who've worked abroad or frequently visit foreign parts. These may be converted to UK standards but are often unrepairable thereafter.

The problem of spares is not only a matter of knowing the correct address or telephone number. Since they can't hold stocks for vast numbers of models dating back over many years setmakers impose time limits on what they are prepared to supply. While the setmaker's problem is understandable, it can still cause distress to the owner of say a ten year old set that's had little use. It sometimes comes as a surprise to learn what's now considered to be obsolete. The latest issue of *Ferguson Feedback* for example tells us that Ferguson can no longer supply spares for the 1613 monochrome range and the 9000 series colour chassis – unless parts are common to later chassis. I'm sure that I'm not the only one who regards these sets as being fairly up to date – they're not hybrids, after all! Fortunately this doesn't necessarily mean that spares can no longer be obtained. Advertisers in this magazine can often supply common parts long after the setmaker has ceased to hold stocks. There are other spares stockists who may well be able to provide what's required, such as HRS Electronic Components Ltd. (100 Great Barr Street, Bordesley, Birmingham B9 4BB – 021 771 2525), SEME Ltd. (Units 2E and 2F, Saxby Road Industrial Estate, Melton Mowbray, Leics. LE13 1BS – 066 465 392) and Willow Vale Electronics Ltd. (11 Arkwright Road, Reading, Berks. – 0734 876 444). HRS list spares for some Indesit sets in their catalogue – Indesit themselves can no longer supply spares for brown goods.

Our spares guide is up to date at the time of publication, but one of the things that was brought home to us while compiling it was the considerable changes constantly taking place in the trade. Even large, well known setmakers move their spares/service departments from time to time – Tatung, Toshiba and Sony have all done so in recent months. Then there are the mergers and closures continually taking place. The takeovers of Telefusion and Currys and Rediffusion's withdrawal from TV manufacture are recent examples.

We have our own problems too! Our Post Sales department was closed down recently, which is causing difficulties – particularly with back issues. We are having to impose a six months' limit on back issues and even with this time scale some issues are in very short supply.

FRONT COVER

This month's front cover photo shows the Thorn TX90 as an example of a modern TV chassis. See new series starting on page 363.

CORRECTION

A correction is required to the list of French fifth TV service channel allocations on page 248 of the February issue: the Paris allocations (first quarter, 1986) should have been shown as 33, 36 and 56.

Teletopics

IBA's DBS PLANS

The IBA is proceeding with plans to advertise for contractors to provide up to three DBS TV services for the UK. This follows an announcement by the Home Secretary that sections 37-41 of the Cable and Broadcasting Act are being brought into operation. The IBA's Director General John Whitney commented that "we are enthusiastic at the prospect. DBS will take the UK into television's new space age, introducing wider choice for viewers and opening up new opportunities in the entertainments and electronics industries. We shall be proceeding with all speed while aiming to ensure that the firmest possible basis is laid for the new services." If suitable contractors are found the IBA feels that satellite TV services could be in operation before 1980. The nature of these additional services will be discussed with applicants for the franchises: the IBA says it will be looking for a variety of programming to supplement the comprehensive output already provided by the ITV and Ch. 4 services. Funding could be by advertising, subscription or a combination of the two. Under the 1984 Cable and Broadcasting Act the contractors will be responsible for providing the satellite transponders, subject to specifications laid down by the IBA which, as broadcaster, will be responsible for the quality of the services. The government has made it clear that prospective contractors will be given freedom in the choice of a satellite system.

MIRRORVISION AND PREMIERE TO MERGE

Robert Maxwell, publisher of *The Mirror,* is to take over the 41·2 per cent stake held by Thorn-EMI and Goldcrest's 9·8 per cent stake in the satellite film channel Premiere. The rest of Premiere's equity is held by US film companies. MirrorVision, which superseded the original movie channel TEN, and Premiere will be merged to form a single satellite film channel for UK cable services.

Thorn-EMI has also sold its interest in the pop music channel Music Box to Richard Branson's Virgin Records group.

It seems that Sky Channel is being affected by transmitter problems on the Eutelsat I-F1 satellite. Some loss of power is attributed to partial failure of the travelling-wave tube output devices used by the transponders. Uplink power has been increased to compensate but will lead to overloading and distortion beyond a certain point. It was TWT failure that put the initial Japanese TV satellite out of action.

CABLE FRANCHISES

As mentioned in last month's leader, the Cable Authority has awarded further franchises. Cable Camden is to provide a service for the London borough of Camden, Robert Maxwell's British Cable Services will run the Cardiff-Penarth service, Lancashire Cable Television is to operate the central Lancashire service and Cablevision (Scotland) has been awarded the Edinburgh franchise. There's been a delay in the announcement about the Southampton area franchise due to an ownership change of one of the members of the consortium applying for this. The Authority is to advertise a further franchise covering South Bedfordshire, including Luton, Dunstable and Leighton Buzzard. This will be the first franchise to be advertised by the Authority since its decision last November to defer advertising a further group of franchises in view of cable TV's financial difficulties.

British Telecom has reached agreement to purchase Thorn-EMI's 51 per cent interest in Coventry Cable and its total shareholding in Swindon Cable.

RANK BIDS FOR GRANADA

The Rank Organisation has made a £753m bid for the Granada Group whose largest component is the Granada TV rental chain – in the last financial year this contributed a profit of £48·3m out of a total group profit of £65·9m. It seems that the cash flow generated by the rental group was of prime interest to Rank. It also seems that the bid could be blocked by the IBA which has objected on the grounds that it will not agree to a change of ownership of the Granada Television broadcasting franchise.

FRENCH FIFTH AND SIXTH CHANNELS

France's fifth and first commercial TV network started transmissions in late February. A sixth service has been approved by the government. This will again be commercial and will concentrate on music programmes. The franchise to run the sixth network has gone to a group that includes Films Gaumont, a private radio station and two French advertising groups.

GEC ISSUES TELETEXT WRITS

GEC has served writs on UK TV setmakers and importers claiming infringement of teletext patents held by the company. This seems a strange move considering that teletext services started ten years ago, with an initial agreement to waiver patent rights in the interests of getting the service started, but GEC now wants a royalty of £3 on every teletext set sold. The industry is not very happy with the prospect of lengthy litigation.

COLOUR LCD DEVELOPMENTS

Matsushita and Casio have both announced new colour receivers using liquid-crystal displays – the sets are expected to be on sale in Japan later this year. Matsushita's 3in. Panacrystal set will have a display with 89,000 pixels, compared to a present limit of about 50,000 in this size, giving improved definition. Production will initially be at around 20,000 a month and the retail price is expected to be in the region of £230. Casio intends to introduce a 12in. model.

TVRO EQUIPMENT

Connexions Satellite Systems Ltd., 125 East Barnet Road, New Barnet, Herts EN4 8RF (01-441 1282) have announced a TVRO system at £999 to include installation, VAT and a 1·6m dish. It's being made available through approved distributors and dealers and is an addition to Connexion's range of TVRO systems.

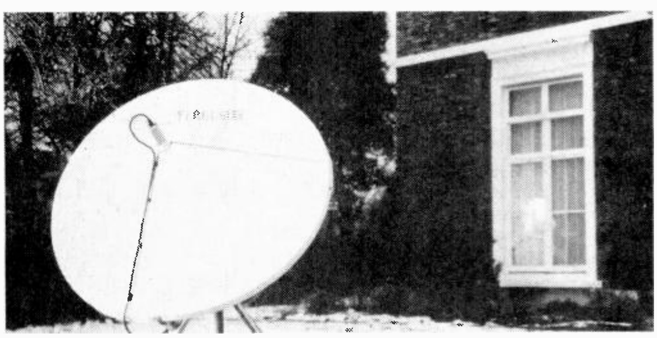
Armstrong Electronics, the specialist Irish distributor of satellite TV receiver systems, aerials and electronics, has announced a new range of dish aerials, both solid and perforated, in sizes ranging from 1·5m to 4m. The dishes are supplied with polar or fixed mounts, with the facility to fit a motor or hand crank if required. Each polar mount is supplied with comprehensive alignment instructions. The dishes are made of spun aluminium and Armstrong say they have reports of excellent reception from customers throughout the UK and particularly in the West of Ireland, where the Intelsat signal levels are lower. Matching WR75 and C120 (NEC type) feedhorns and Houston Tracker motors and control units are available. Additional information on the range can be obtained from the Marketing Distributor, Armstong Electronics Ltd., 4/9 Blessington Court, Dublin 7, Ireland. From the UK phone 0001-309322.

The major TV manufacturers are now getting into the TVRO field. Philips is to launch a range of domestic and professional satellite TV receiving equipment manufactured by its French subsidiary Portenseigne S.A. About 200 domestic and 100 larger systems a month are at present being produced. Philips intend to introduce an adaptor for MAC-encoded DBS signals next year. Ferguson has introduced the ES01 TVRO package at an initial suggested price of £1,495, or around £1,700 installed. The standard dish size is 1·5m but 1·2m or 1·8m dishes are available as options. The equipment is being supplied to Ferguson by Satellite TV Antenna Systems. Ferguson has carried out a survey to determine interest in satellite TV reception in the UK. It found that seventy five per cent of households would like to sample satellite TV provided the cost is less than £15 a month, and estimates that to date there are only some 2,000 domestic TVRO installations in the UK – it expects this total to rise to 30,000 within two years irrespective of the start of DBS services.

Thorn-EMI subsidiary DER has announced a new TVRO deal – its customers can now either rent or buy a TVRO system. The initial DER rental arrangment was mentioned in Teletopics, January. The rental is £50 a month for the first year, falling to £45 and £15 a month in the second and third years, plus a monthly charge of £12 as a programme subscription. Alternatively the equipment can be supplied and installed for £1,500 which includes VAT and the DTI licence required. Installation takes around six hours. The equipment is manufactured by NEC. The cost is increased if reception of both vertically and horizontally polarised signals is required since an extra LNC has to be fitted. DER has installed over thirty TVROs to date – the vast majority of customers have opted for rental agreements.

IN-CAR VIDEO SYSTEM

Blaupunkt has introduced an in-car video system comprising a monitor with 4½in. screen, a portable VTR and an interfacing box. Price is around £1,500 plus VAT. For legal reasons the monitor is for backseat viewing only, being intended for installation between the car's front seats. The system can be used with a camera or, via a modem and Cellnet, as a computer terminal. Headphones and remote control are available and a TV tuner is expected later. Details from Robert Bosch Ltd., PO Box



The Ferguson SD01 dish aerial with SB01 low-noise block (converter/amplifier). Polarisation can be adjusted by remote control.

The Ferguson SM01 satellite receiver module features full infra-red remote control, digital clock and channel display and a 99 programme channel memory. It's compatible with standard system I UK TV receivers and has been specified so that it can be adapted for use with future satellite TV transmissions.

98, Broadwater Park, North Orbital Road, Denham, Middx UB9 5HJ (0895 833 633).

RUMBELOWS TO END RENTALS

Thorn-EMI's electrical retail chain Rumbelows is to pull out of TV and VCR rentals. Rumbelows' 350,000 rental contracts will be transferred to other Thorn subsidiaries – DER, Radio Rentals and Focus TV. The move could involve a loss of up to 650 jobs, mainly in the service and administration departments.

BATC RALLY

Sunday May 4th is this year's date for the annual BATC rally, which will again be held at the Post House Hotel, Crick near Rugby – at turn off 18 on the M1. The doors open at 10·30 a.m. and admission is free. The biennial BATC AGM will be held after the rally, at 4·30 p.m.

The latest issue of the BATC's excellent magazine *CQ-TV* includes, amongst many other things of interest, a complete 1·3GHz ATV transmitter project – it's emphasised that this is not suitable for those with little experience in this field.

SALORA-LUXOR JOINT OPERATIONS?

It's reported that talks have been held between Salora and Luxor with a view to merging some of their UK operations. The talks have been held in Finland: Salora has a 70 per cent interest in Luxor.

CEEFAX ON SIX LINES

BBC teletext signals are now being transmitted on six lines instead of four, giving users a much faster service. The improvement has been brought about by the use of new computer software, which should also ensure a more reliable service.

A new system of network transmission of subtitles for the deaf and hard of hearing has also been introduced on Ceefax. This allows simultaneous broadcasting of subtitles on BBC-1 and BBC-2: page 888 carries subtitles on all channels.

MAINS PLUG-FILTERS

The problem of providing sensitive equipment such as microcomputers with protection against mains-borne interference has led to the introduction of two mains plug-filters. The LCR Components plug (LCR Components, Woodfield Works, Tredegar NP2 4BH) sells at around £16 and incorporates a filter consisting of twin chokes on a ring core and three capacitors. The Duraplug mains filter-adaptor is available for £17·90 including VAT from IML, Blair House, High Street, Tonbridge, Kent. It incorporates a metal-oxide varistor to provide protection.

V2000 SYSTEM OFFICIALLY DEAD

Philips has announced that it will not be producing any further V2000 system VCRs. Production was suspended eighteen months previously but Philips had kept open the option to resume manufacture. Four V2000 machines will continue to be sold in the UK while stocks last. Service and spares will be continued in accordance with the seven year rule and Philips is to ensure that blank and prerecorded cassettes will continue to be available. Between 250,000 and 300,000 V2000 VCRs have been sold in the UK.

SINCLAIR TVs DIRECT FROM TIMEX

Sinclair Research Ltd. and Timex have announced that Timex are now handling the worldwide marketing, sales and distribution of Sinclair flat-screen pocket TV sets, which will in future be packed and despatched direct from the Timex plant in Dundee where they are produced. At the same time a substantial price reduction, from £99·95 to £79·95 including VAT, has been announced. The flat-screen TV set was launched in September 1984: a u.h.f./v.h.f. export model is to be announced shortly.

NEW MULLARD SYNC CHIP

Mullard have announced a new sync/timebase generator chip, type TDA2579, which can handle TV and VCR signals automatically without need for external identification and switching. It's an improved version of the TDA2578A and in addition incorporates a field frequency divider circuit compatible with 50 and 60Hz signals, eliminating the need for manual field frequency adjustment. The chip is intended for use with the Mullard TDA3653/3654 field output i.c.s. It separates the field and line sync pulses and uses them to synchronise an internal line oscillator and a triggered divider system for the field signal. The ability to adapt the time-constant for TV/VCR signals is based on a built-in circuit that measures the noise at the middle of the line sync pulse to determine the type of source: this information is used to set the time-constant of the line phase detector automatically to the optimum value. The i.c. also generates a three-level sandcastle pulse for the colour decoder. An 18-pin plastic DIL encapsulation is used and the chip requires a 12V supply, consuming typically 68mA.

INTERMITTENT CHANNEL SELECTION

Intermittent channel selection problems have been reported with Preh channel selector units used in the Thorn TX9, TX10, TX90 and TX100 chassis. The problem is generally due to oxidised contacts. These are accessible after a certain amount of dismantling that looks more awkward than it is. Full details of how to go about it are given in the current issue of *Ferguson Feedback*.

ADVERTISEMENT CORRECTION

We must apologise to Chromavac and to readers for an error that occurred in the Chromavac advertisement last month, on page 288. The words "free 10 year guarantee on all our tubes" should have been omitted.

DORIC-REDIFFUSION SPARES

Spares for Doric, Murphy and Rediffusion colour TV sets fitted with the Rediffusion Mk. 3, Mk. 4 and Mk. 4A chassis are avilable from Brian Jack Buckle, Hillcrest, Roughton, Nr. Woodhall Spa, Lincoln LN10 6YJ (065 823 247). Now that Rediffusion has ceased TV manufacture the supply of spares could become a problem. We are informed that Brian Jack Buckle holds large stocks supplied by Rediffusion.

Checking ICs

Eugene Trundle

Your need for special probes and prods for i.c. testing depends very much on the vintage of the equipment that comes your way. Chips are found in some quite ancient TV sets. The spacious board layouts used in such sets made checks at i.c. pins an easy matter. With much modern TV equipment however, especially VCRs and cameras, the boards are tightly packed, making it difficult to gain access to the printed tracks – particularly with double-sided boards. It's sometimes necessary to diagnose *and repair* a fault without ever getting to see the underside print pattern. . . .

Teletext decoder servicing is another example – less frustrating – of a situation where much chippery is involved. It may be necessary to hook voltmeters and oscilloscopes to the i.c. pins: with this there's considerable danger of shorting from one pin to the next. I get away with this amazingly often, but the practice can hardly be recommended! A range of test clips that enable i.c. pin connections to be brought out to a row of test points well clear of the board is available – notably from RS Components. This is very useful, but unless some specially prepared, small insulated socket is available to push over these test points the risk of an accidental short is still present. Another point is that the i.c.s nowadays found in consumer electronics products come in a tremendous range of shapes, sizes and configurations: test clips are not available for all of these.

To overcome such problems Tandy is now marketing a special i.c. testing adaptor, catalogue number 270-335. It consists of a single-point probe in a two-pronged insulating plastic shroud. In use, the two plastic lugs slip into the gaps between the i.c. pins. This not only prevents the possibility of shorts, it also positively positions the metal probe tip on to the required pin.

I've recently being trying one out and found that it works well on all types of i.c.s with standard 0·1in. (2·54mm) pin spacing, though there can be a problem in gaining access to the inner pins with a QUIL configuration. Good contact was made even to tarnished i.c. pins – it's quite common to find that i.c. pins have a black oxide coating after exposure to the atmosphere for a year or two.

The very small pin spacing used with some LSI chips precludes the use of this adaptor: how about a tiny version, Tandy/Archer/Radio Shack? Otherwise I was very happy with the device, which costs less than a pound inclusive of VAT. It may not fit your existing multimeter or scope probe tip – the split socket inside didn't fit mine. Tandy sell compatible prod/lead sets however . . .

Modern Receiver Circuitry

Part 1: Power Supplies

J. LeJeune

Over the last decade the switch-mode power supply has come into general use in TV sets for mains only operation. The advantage over alternative systems, for example the use of a series or parallel regulator or a thyristor circuit, is increased efficiency. There are two basic versions of the switch-mode power supply, the series and the shunt type.

Series Chopper

The series type was the first to be adopted in TV sets, starting with the Thorn 3000/3500 series chassis. Fig. 1 shows the basic circuit. Chopper transistor Q1 is switched on and off at a comparatively high frequency, usually at line rate. Its collector is connected to an unregulated d.c. supply derived from the mains by rectification. When Q1 is switched on current flows through the reservoir inductor L1 and the load. When it's switched off the magnetic field built up around L1 collapses and a negative voltage pulse appears at the emitter of Q1. Diode D1 conducts, maintaining the flow of current through L1 and the load. C1 is present to provide smoothing. Regulation is achieved by varying the chopper transistor's on/off times, i.e. the mark-space ratio of the squarewave drive waveform applied to its base. Turning the chopper transistor on for a shorter time during each cycle of operation (duty cycle) reduces the energy transferred to the load. Thus the h.t. falls. Increasing the transistor's on time increases the energy transferred to the load so that the h.t. rises. A resistive network is used to sense the h.t. (via R2) and adjust the on/off timing so that the h.t. is kept constant despite variations in the load demand and the mains input. The series chopper circuit has now fallen into disuse. The alternative shunt circuit has a number of advantages, mentioned below.

Shunt Chopper

The shunt version (see Fig. 2) became popular because of its flexibility and high efficiency. It's also safer in the event of the chopper transistor going short-circuit. The use of a transformer is a bonus in that several secondaries can be used to provide various regulated supplies: it also offers the possibility of mains isolation. Early shunt-type circuits operated synchronously with the line timebase and were difficult to isolate from the mains because of the voltage sensing and synchronising requirements. More recent designs use asynchronous switching and incorporate the highly desirable feature of mains isolation. Most of these later designs are based on the use of the Siemens TDA4600 chopper control chip. We'll look at the operation of this device in greater detail later.

A major difference between the series and shunt circuit is that in the former energy is supplied to the load when the chopper transistor is switched on whereas in the shunt circuit energy is stored in the reservoir inductance when the chopper transistor is switched on and is supplied to the load, after transformation if a transformer is used, when the chopper transistor is switched off – this type of circuit is sometimes referred to as a flyback converter.

Fig. 3 shows the basic shunt circuit with transformer. A squarewave drive waveform with variable mark-space ratio is applied to the base of the chopper transistor Q1. When Q1 is switched on, current flows in the transformer's primary winding. Because of the winding's inductance, the current flow builds up in the form of a ramp (see Fig. 4). If the chopper transistor was left on for too long the current would, after a short while, settle at a steady value: this is not allowed to happen in a switch-mode power supply. At some point during the ramp the chopper transistor is switched off: since this interrupts the flow of current in the transformer's primary winding there's nothing to maintain the magnetic flux in the transformer. The flux collapses, at a rate determined mainly by the inductance of the primary winding, self- and stray-capacitances and the loading on the secondary winding(s). The phasing of the secondary winding is arranged so that rectifier diode D1 then conducts, charging its reservoir capacitor C1. The greater the flux density in T1's core at the instant when Q1 is switched off the greater will be the rate of change of its collapse and hence the greater will be the output from the circuit. Since the flux density established in T1 is directly proportional to Q1's on time, the output obtained can be adjusted by varying the mark-space ratio of Q1's base drive waveform.

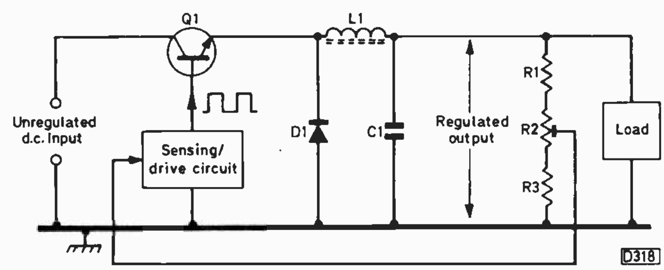


Fig. 1: Basic elements of a series chopper circuit.

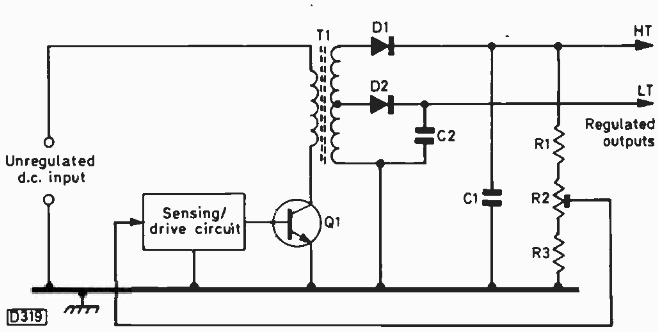
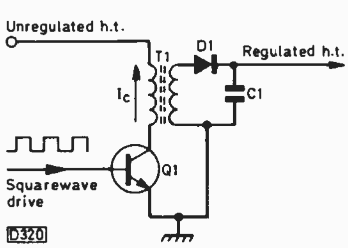


Fig. 2: Shunt chopper circuit with transformer.



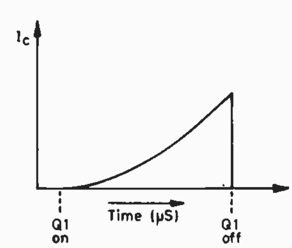


Fig. 3 (left): Operation of the shunt chopper.
Fig. 4 (right): Rise of primary winding current.

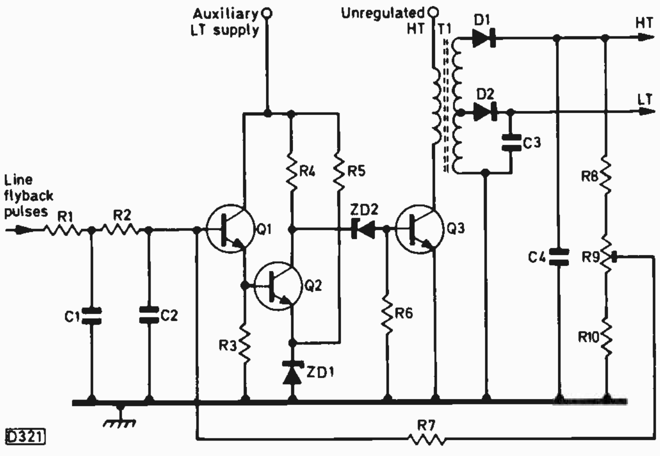


Fig. 5: Synchronous chopper circuit.

By feeding a proportion of the output voltage to a sensing circuit the system will provide self-regulation within limits.

Synchronous Chopper Circuit

In a line-frequency synchronised system it's convenient to use a sawtooth waveform as the basis of the control system since this can be conveniently obtained by integrating the line flyback pulses. The sawtooth waveform is applied to the base of a switching transistor along with a bias voltage which consists of d.c. feedback from the circuit's output. The point at which the transistor switches on during the sawtooth depends on the feedback bias. Regulation is thus achieved. Fig. 5 shows a way of going about this.

Line flyback pulses are integrated by R1, C1, R2, C2 to produce a sawtooth signal at the base of the transistor Q1. The base bias for Q1 is obtained from the slider of the set-h.t. control R9. Q1 is connected as an emitter-follower, providing current gain and a medium input impedance: it drives the base of the amplifier/inverter transistor Q2. The voltage at the base of Q2 required to turn this transistor on is set by zener diode ZD1 in its emitter circuit: this is usually a 6·2V type as these have a near-zero temperature coefficient and are thus ideal as reference elements. The base of the chopper transistor Q3 is forward biased by R4 and ZD2. When Q2 is turned on by Q1 when this transistor conducts, its collector voltage will fall and both ZD2 and Q3 will switch off. ZD2 is included to make Q3's switching action sharper: its value can be chosen for the correct drive amplitude at the base of Q3.

The line-frequency sawtooth waveform and the feedback bias together provide a variable mark-space ratio squarewave drive for Q3. Fig. 6 clarifies this. The sawtooth waveform sits on top of the bias obtained from R9. As the bias rises or falls, in accordance with a rise/fall in the output from the switch-mode regulator, so the point at which Q2 conducts during the sawtooth is either advanced or retarded. Fig. 6(a) shows the case where the output and the d.c. bias have fallen: only the peaks of the sawtooth cross Q2's turn-on voltage, with the result that Q3 conducts for a longer period to restore the output voltage to the correct level. Fig. 6(b) shows the normal operating conditions, with a 50-50 mark-space ratio setting the control circuit at the centre point in its regulation range. In a well-designed circuit this would be the operating point with a standard mains input voltage and average load current demand. Though d.c. coupling is shown between the driver transistor Q2 and the chopper transistor Q3 transformer coupling is normally used to improve circuit efficiency and reliability.

The type of circuit considered so far has fixed-frequency drive. D.C. feedback is required, so that mains isolation is not possible. In some circuits the drive for the line output transistor is obtained from a winding on the chopper transformer, eliminating the need for a line driver stage.

Self-oscillating Chopper

Most recent TV receiver switch-mode power supplies are of the self-oscillating type, using a separate sensing winding on the chopper transformer to provide information on the output conditions. The widely used TDA4600 chopper control chip was developed by Siemens for use in this application. Both isolated and non-isolated versions of this type of circuit are found: Fig. 7 shows a non-isolated circuit. The oscillation frequency is nominally 25kHz but varies under different load conditions.

Q1 is the chopper transistor and T1 the chopper transformer. Pin 9 is the i.c.'s d.c. supply pin. A start-up supply is provided by R1, D1 which charge C4 at switch on – some setmakers provide a more elaborate system for goading the i.c. into life. When the voltage at pin 9 is sufficient to operate the internal stabilisers the chip will come into operation, driving Q1 from pins 7 and 8. The turn-on drive is via R9 and C3: turn-off occurs when the voltage at pin 7 falls below 2V. Once the circuit has got going the output from pin 4 of the transformer will be rectified by D3, producing a higher voltage across C4 than the start-up voltage: D1 is then reverse biased. The i.c. now operates from a supply stabilised by itself: all the internal systems within the i.c., apart from the output amplifier connected to pin 8, are fed from an internal stabiliser. This feature makes the i.c. independent of mains supply voltage variations over a wide range.

Winding 3-5 on the transformer provides the feedback for regulation. The signal at pin 5 is rectified by D2 to produce a negative voltage across C2. This is applied to the bottom of the set-h.t. control VR1. An internal 4V reference supply is available at pin 1 of the i.c. and is applied via R5 to the other end of the control network. As a result pin 3 receives a voltage which is set by VR1 and depends on the output provided by the transformer – under normal operating conditions the voltage at pin 3 is

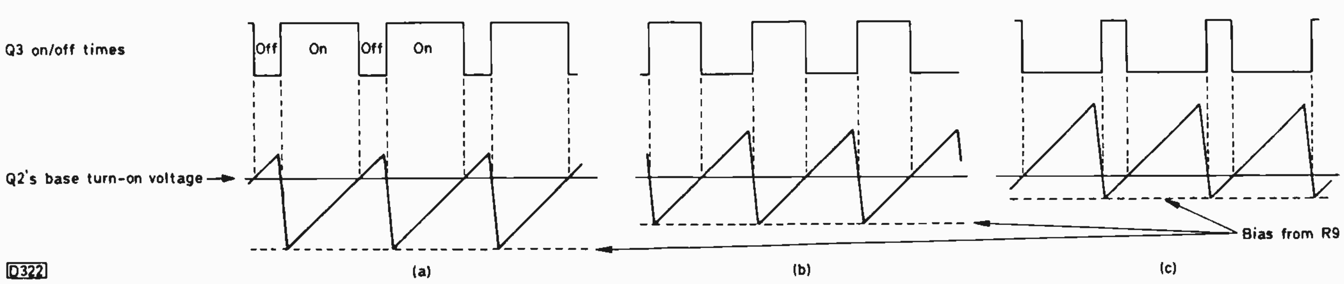


Fig. 6: Production of a variable mark-space ratio drive waveform.

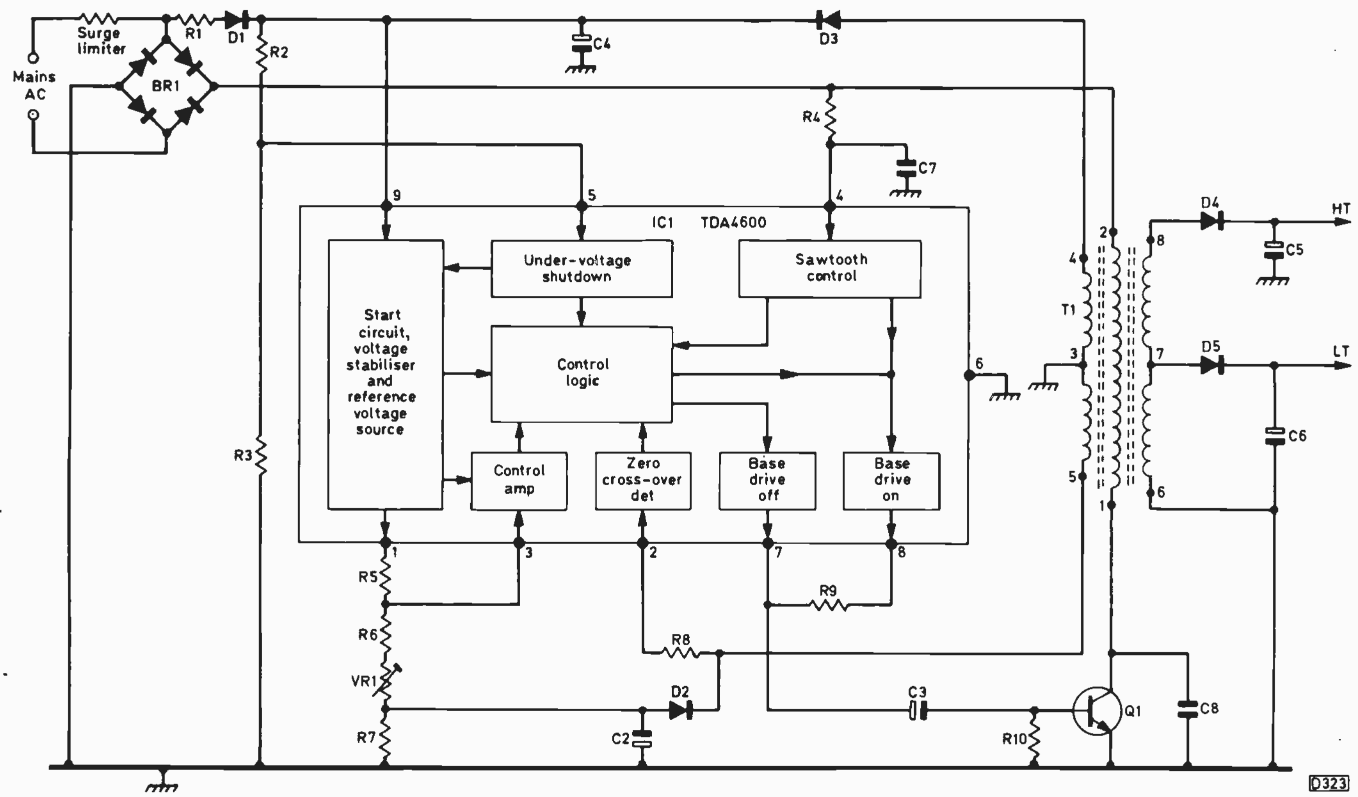


Fig. 7: Self-oscillating chopper circuit of the Siemens type, using a TDA4600 control i.c.

nominally 2V.

An increase in the output provided by the transformer will increase the negative voltage across C2. The reduced voltage at pin 3 is sensed by the control logic within the chip and the mark-space ratio of the drive waveform for Q1 is adjusted accordingly.

When Q1 is switched off the interruption to the flow of current through winding 1-2 of the transformer results in a collapse of the flux developed in the transformer. Positive-going outputs appear at pins 1, 4, 7 and 8. The rectifiers connected to pins 7 and 8 provide the supplies for the receiver, across C5 and C6. D3 provides the supply for the chip, as we've seen. C8 is included to delay the rise time of the voltage at the collector of Q1: this reduces the transistor's dissipation at switch off.

The output at pin 5 of the transformer is also fed to pin 2 of the chip via R8 to provide zero-crossover information for the control circuitry within the i.c. Zero voltage at pin 2 of the chip corresponds with zero energy in the transformer: the zero-crossover detector within the i.c. delivers an output to the control logic which in turn switches Q1 on again. This method of detecting the zero transition has the advantage that Q1 acts as a damping element. Thus the transistor's off period is determined by the time taken for the energy stored in the transformer to decay to zero, the zero-crossover point signalling that Q1 should be turned on again.

Should a short-circuit occur on the output side of the power supply the output at pin 5 of the transformer will fall, as will the negative-going voltage produced by D2. The voltage at pin 3 of the chip will rise and at 2·3V an internal bistable will be set, putting the chip's control logic in the short-circuit mode. In this condition the mark-space ratio falls to 1:244, the frequency of operation is reduced to 1·4kHz and the power consumption is just 4W. The unit can operate in this mode indefinitely.

The *RC* network R4/C7 produces a sawtooth at pin 4 of the chip when Q1 is conductive – when Q1 is off pin 4 is at chassis potential. The sawtooth has a dual purpose. The rising portion provides the base drive for Q1, via the base drive amplifier. This holds Q1 in the saturated condition during its conductive period, preventing excessive dissipation. The amplitude of the sawtooth is also sensed within the i.c. to gauge the transistor's dissipation limit: should the peak-to-peak amplitude of the sawtooth exceed 4V the drive will be clamped to a safe level by the control logic, protecting the transistor and the transformer. This arrangement relies on the stability of R4 and problems with failed chopper transistors in sets employing a TDA4600 can often be traced to this resistor having increased in value from its usual 270kΩ or so to something much higher.

Pin 5 of the chip is concerned with under-voltage protection. If the voltage at pin 9 is low the TDA4600 may not operate correctly: pin 5 is supplied from pin 9 via potential divider R2/3 and when the voltage at this pin falls below 2V the under-voltage shutdown circuit comes into operation.

As previously mentioned the nominal operating frequency of the circuit is 25kHz. Under no-load conditions the frequency rises to in excess of 76kHz. Although this is well outside the normal operating limits no harm will result provided the chopper transistor and transformer are suitable for operation at this frequency. Under stand-by conditions, with consumption of 5-10W, the operating frequency is around 60kHz: some designers include a pre-load resistor on one of the main supply rails to limit the frequency rise in this condition to a value acceptable to the whole circuit.

With a typical efficiency of 83 per cent, low dissipation and temperature rise, high stability, ability to handle a wide range of input voltages and an economical component count it's no wonder that this type of circuit has proved to be so popular.

Quick Checks: Fidelity CTV14R

S. Simon

These sets continued in production for some time. Apart from a few common faults they've given good service. The weak link is undoubtedly the type of line output transformer originally fitted. The type of transformer used in a set can be immediately ascertained by noting where the focus and first anode preset controls are situated. If they are on the tube's base panel the transformer is of the original type. With later types and replacements the controls are integral with the transformer: two knobs are present to prove the point and there are no controls on the tube base panel.

Symptoms

The symptoms when line output transformer trouble is brewing are many and varied. The usual initial warning comes when it's reported that the screen flashes and the receiver goes off intermittently, the channel selector returning to 1. This could mean something other than transformer trouble of course. It could mean nothing more than a dry-joint, the location of which may call for the removal of the main panel from the plastic frame as the faulty connection may be under one of the struts of the frame. Fortunately however the trouble may well be in full view when the chassis is upended: it's often around the BUX84 chopper transistor or one of the wire-wound resistors.

When we first started to sell these sets the main troubles seemed to centre around the front control panel, with cracked tracks and the like. Since then the real villain has turned out to be the line output transformer.

We've mentioned that replacement line output transformers have the focus and first anode controls built in. This is not the only difference. They also have a different base, so that a subpanel has to be added when fitting. The existing focus and first anode preset controls have to be removed from the tube base and the wires from the transformer fitted directly to the panel. Unfortunately the replacement type of transformer, though far more reliable, seems to be particularly sensitive to dampness. If a set is constantly used in the kitchen, which is quite common, the transformer tends to arc and spark to nearby chassis mounted components etc. This is more often the case with the Mk. II version of the similar CTV14S, where the transformer is situated farther to the rear and closer to other items.

Chain Reactions

It's often the case that other components will fail when there's a short in the line output transformer. The h.t. feed resistor R901 (4·7Ω, 5W) very rarely fails; the preceding h.t. smoothing resistor R828 (10Ω, 2W) often does, as its rating would suggest. If this resistor is found to be open-circuit, with h.t. at one end and nothing at the other, switch the set off and measure the resistance to chassis, using the low ohms range. If the reading is very low, check also at R901 to see whether the reading here is lower. If it is, suspect the BY127 efficiency diode D29 or the BU208 line output transistor TR14 (disconnect to test) before condemning the line output transformer.

To check the BU208, remove the collector lead (body) and measure the resistance between the collector (black probe) and the emitter or base (red probe). Any reading should condemn the transistor. If the transistor is in order, disconnect one end of the BY127 and check this (black probe to the cathode). If these two items are o.k. it's likely that the transformer is at fault with a short between windings.

Troublesome Controls

The focus control contacts are a frequent cause of intermittent channel changing and a dry-joint will quite often be found at one end – we refer to the original type of focus control mounted on the tube's base board. Other causes of this trouble include faults on the front control board – the cracked tracks etc. previously mentioned.

The on/off switch (100Ω relay at rear end) can give trouble, sometimes going completely open-circuit to give the no results symptom, sometimes arcing to give the symptoms described for a defective line output transformer. This is a separate item secured by two screws: it has four contacts for the mains supply and two on the rear for the "off" relay.

The Signals Panel

The right side signals panel produces its share of faults: problems include cracked tracks and poor connections. One connection problem we've had on several occasions concerns the supply to the TDA3190 sound channel chip IC7. The supply comes via a 10Ω resistor (R509), through the flexi lead on the front end. It's our habit to run a short lead on the underside from the edge connector direct to the resistor. This seems to overcome the problem, despite there being no visible sign of a break in the track.

Field Timebase

The TDA1170S field timebase chip IC9 is heatsinked and mounted on the rear edge. Its 25V supply is derived from the line output transformer via rectifier diode D35 (RGP10B). If the chip shorts, which it can do, the resultant load can shut the receiver down or perhaps result in the rectifier diode going open-circuit. If the receiver continues to operate there will be a white line across the centre of the screen and the somewhat tedious task of removing first the heatsink and then the chip must be undertaken.

Power Supply

The regulated power supply is of the series chopper type, with a secondary winding on the chopper transformer providing the drive for the line output transistor. The BUX84 (or BUV46) chopper transistor is at the rear left side. The chopper and line timebase circuits are controlled by a TDA2581 chip. There's also a BF460 chopper driver transistor (TR11).

The TDA2581 is occasionally the cause of faulty operation – but in our experience not as often as rumour would have it. We've more often found that the associated

BC558 transistor TR12 is the cause of trouble due to its base being dry-jointed. This transistor is located farther to the centre at the rear edge.

The supply to the collector of the BUX84 chopper transistor comes from a bridge rectifier via a 2Ω, 2W resistor (R802 or R830) and a 1A fuse. The supplies for the chopper driver transistor TR11 and the TDA2581 chip are tapped from a point between the 2Ω resistor and the fuse. A 12V zener diode (ZD5) stabilises the voltage applied to the TDA2581 and also the voltage at the emitter of TR11. The feed resistors for the 12V zener diode and TR11 are those on the rear left edge. They are rated at 8W and although they rarely go open-circuit they can develop dry-joints which give the effects already described, i.e. intermittent operation or a dead set. The mains bridge rectifier consists of four BY133 diodes.

Letters

PHILIPS KT3 SERIES CHASSIS

Further to S. Simon's comments on the Philips KT3 chassis in the February issue there are one or two points I'd like to mention about this and the associated chassis since they cover at least ninety per cent of the faults so far encountered by us.

When replacing the 4·7Ω surge limiter resistor it's worth checking the four mains bridge rectifier diodes since these also suffer occasionally and will shatter the fuse alarmingly if not detected before switching on. This appears to be more prevelant with the CTX chassis. The other major cause of a dead set is the power switch.

Almost inaudible tripping usually indicates that the line output transistor is short-circuit: a BU208 is a suitable replacement. Other causes of tripping are a faulty tripler (where one is used) or breakdown of the e.h.t. lead, anode cap or tube surface, especially when the set is used in a smoky environment. The tripler can be replaced with a universal type: take the pulse and earth leads jointly to C1566.

Both the tuner and i.f. module in the KT3 and K30 can be responsible for a snowy raster. Ensure that the i.f. module matches the tuner when you fit a replacement since more than one type has been used.

Phil Ireland, Servatron Ltd.,
Paignton, Devon.

UNCERTAINTY AND COSMIC RAYS

In the 'forties *The Listener* published an article entitled "The Uncertainty Principle". In brief, the article stated that it was impossible to predict accurately the path that an electron would take since the mere act of inspection (by whatever means) to confirm this would deflect it from the path it would otherwise have taken. From this it went on to suggest that it was impossible to predict the precise outcome of any given set of circumstances, and that the only certain thing is that you'll never know for sure what will happen next!

Years after reading the above I was the proud owner of a TV set and a son, and in getting up in the small hours to fetch a drink for the latter was fascinated by the flashes of light appearing from the former, even though it was disconnected from the aerial and supply. These flashes turned out to be cosmic particles – those omnipresent charges that bombard us from outer space.

I never thought to link these two phenomena till recently. In this age of microprocessors however we're beset with VCRs that don't record what they should, tuners with amnesia on odd channels, telephones that dial wrong numbers, petrol pumps that give you more if your CB is on and cashcard machines that swear they gave you money they didn't. The respective explanations of finger trouble, hasty installation, BT at it again and blatent dishonesty (twice) don't ring true at all.

Just think of all those unshielded microprocessors and microcomputers ticking away and of all that energy from cosmic rays arriving by the bucketload: the chances of a zero being turned into a one by external influences are pretty high, and that's all you need to upset a program recirculating in a micro or cancel whole parts of it when you get a parity error. After all the only difference between £10.00 and £1000. is the position of that little black dot.

Add to this the Uncertainty Principle's suggestion that the device won't handle information the same way every time and I begin to wonder whether we can really trust our little silicon friends implicitly! Granted most of them behave most of the time, but even with a 1 in 10^6 possibility there are so many of them about that there should be a good handful of errors introduced every day to keep us service engineers busy, albeit puzzled. So unless I've got it wrong again, hang on to that old sliderule. It might come in handy again.

Harold Peters,
Lowestoft, Suffolk.

SIGNAL QUALITY

Many thanks for Jeff Allan's straightforward and cost-effective signal strength meter (December 1985). I'd just like to expand a little on his last paragraph.

(1) No, the meter won't lie. But it tells you only the signal strength, not its quality. If a customer is getting only 200μV at his aerial and a booster amplifier raises the level of this unsatisfactory signal to 1·2mV at the TV set's aerial socket the meter will not be able to prove the point!

(2) For the same reason it won't help when problems are created by ghosting (teletext breakup etc.).

(3) It's probably not a good idea to blame the aerial (unless you're absolutely sure). The rigger may have done his best already. Advise the customer that he has a reception problem.

John Pitt-Francis,
Honiton, Devon.

CONNECTION PROBLEMS

After witnessing another Consumer Electronics Sales Spree (CESS), otherwise known as Christmas though Quertymas would perhaps be a better name this year, I think it's high time that the gods up there in the temples of consumer electronics started to educate Joe Public in the mysterious and sacred art of connecting things together. It used to be that all old Joe (or Mrs. Joe) had to know was how to wire up a mains plug. Life was much simpler then! Nowadays Joe's got a video or two and a stereo or three, not forgetting little Joe's computer(s). And the trouble is that all these things require a spider's web of connections – phone plugs, DIN plugs, coaxial plugs, jack plugs, spades, wire ends, monos, stereos, etc., etc. You can imagine how Joe feels when faced with all these as he unpacks his latest technological wonder. It's bad enough for us chappies in the business, who've spent possibly years trying to come to grips with all the different connections, levels, polarities and impedances.

Perhaps we should set ourselves up as gurus or connection psychologists, and from the warmth and security of our well padded consulting rooms (while drinking tea that doesn't taste of old rubber belts) pronounce well considered judgements on the folly or wisdom of connecting the "aux in" on an electric toothbrush to the "cass out" of a 32 bit mega-flop. Alternatively perhaps the aforementioned gods could collectively spend a little on a public education campaign. Just the basics – polarity, voltages etc. As you can probably guess this would be called Public Introduction to Technology (PIT). Because as we all know whenever you have a CESS you should also have a PIT . . .

Alastair J. Downs,
Newtongrange, Midlothian.

GEC V4000H VCR

I must disagree with the answer given in Service Bureau, February to the problem (intermittent stopping in all modes) with a GEC V4000H VCR. Whilst the answer would be correct for play and record it has no bearing on fast forward or rewind. I think the fault was probably somewhere in the take-up sensor circuit as this operates in all modes. A test for this is to select play and pause as this makes the machine ignore the take-up sensor.

D. Snelling,
Brownhills, Staffs.

VCR MAINS FILTER CAPACITOR RATINGS

With reference to John Cahill's comment on a Toshiba V57 (VCR Clinic, February, page 255), switching the machine off and on with the remote control handset is not what caused the mains fuse to blow and the mains filter capacitor to go short-circuit. The capacitor is rated at 250V d.c. and the mains supply is 240V a.c. The actual mains potential is greater than 250V d.c. of course. I've had to replace these items in a number of machines, including the Ferguson 3V35/3V36/3V38/3V39 etc., Baird 8943/8944, Toshiba V55/V57 and the ITT 3905/3975, and find that using an 0·22μF capacitor rated at 1kV d.c. results in no further recalls.

C. Taylor,
Kendal, Cumbria.

THE HITACHI CPT2024

In later versions of the CPT2024 Hitachi made some improvements to the sound output department but in doing so paid no attention to the correct wiring (polarity) of the speakers, which means that the sound is even worse. Rewiring the woofer SP401 and tweeter SP402 as per the circuit diagram, with positive polarity from the speaker disable switch, gives a marked improvement in the sound quality. On your right, looking from inside, negative polarity is the red wire in the plug connection from the audio output transformer – connection (PL)D2 on the circuit diagram. Remove the tweeter, turn and replace: connect via the 2·2μF reversible electrolytic capacitor which should be across the two red tabs on the tweeter, wiring the tweeter across the woofer negative to positive and positive to negative.

P.C Rowe,
Camborne, Cornwall.

Developments in VCRs

Part 3

Steve Beeching, T. Eng.

The playback luminance signal requires some additional processing after demodulation and adjacent track crosstalk cancellation (see last month). There's still high-frequency tape noise (in audio terms hiss) to be reduced and the picture must be crispened. In earlier machines picture sharpening was done by means of an "aperture correction" circuit. In later machines a similar but not identical technique is used: it avoids the edge noise that's so prevalent when sharpening pictures.

Picture Sharpening Circuit

Fig. 1 shows the sharpening circuit. Q10 is an emitter-follower which in addition has a peaking coil L21 in its collector circuit: the coil has maximum response at 1-2MHz. Light h.f. filtering is used in the emitter path to reduce the h.f. response here. The h.f. component from the collector circuit is added to the signal from the emitter circuit at the junction of R41/42. The amount of h.f. signal added back is determined by the damping of the peaking circuit provided by Q12. Since this is a field effect transistor its source-drain resistance will vary with the gate bias applied: it therefore acts as a voltage-variable resistance, controlling the h.f. signal level and thus the picture sharpness. Since this circuit also adds picture noise it's followed by a noise-reduction system.

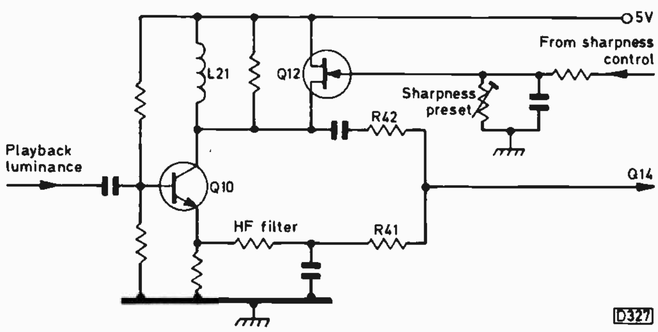


Fig. 1: New sharpness circuit.

Noise Reduction System

This is shown in Fig. 2. The noisy signal shown at A is buffered from the sharpness circuit by the emitter-follower Q14 whose output is split between two paths. The main path is via a low-pass filter and the buffer transistor Q15: this removes the h.f. noise but unfortunately the edges of transients are softened, as shown at E. The second path is to the emitter of Q13 via a high-pass filter: the output from this common-base stage consists of noise and large-value h.f. signal components – see waveform B. The video component has to be reduced to the general noise level to prevent it interfering later with the main path signal. This is done by the following limiter, which produces waveform C.

A portion of this waveform is returned to the base of Q14 as negative feedback, reducing the noise at this point and aiding the action of the low-pass filter. The waveform is also applied to a non-linear filter consisting of the h.f. filter components between pins 14 and 15 of IC5 and the following two diodes which are connected in reverse parallel. The output from the h.f. filter reduces the level of the general noise to less than 0·6V (1·2V peak-to-peak): this is insufficient to pass via the diodes. The wanted video signal spikes, being of higher amplitude, make the diodes to conduct, producing waveform D. When this is added to the main signal by the mixer in IC5 the result is a crispened picture, the softened edges of the video signal having been rebuilt (waveform F).

Techniques Compared

With the earlier type of aperture corrector circuit the spike level can be adjusted by the aperture control but the

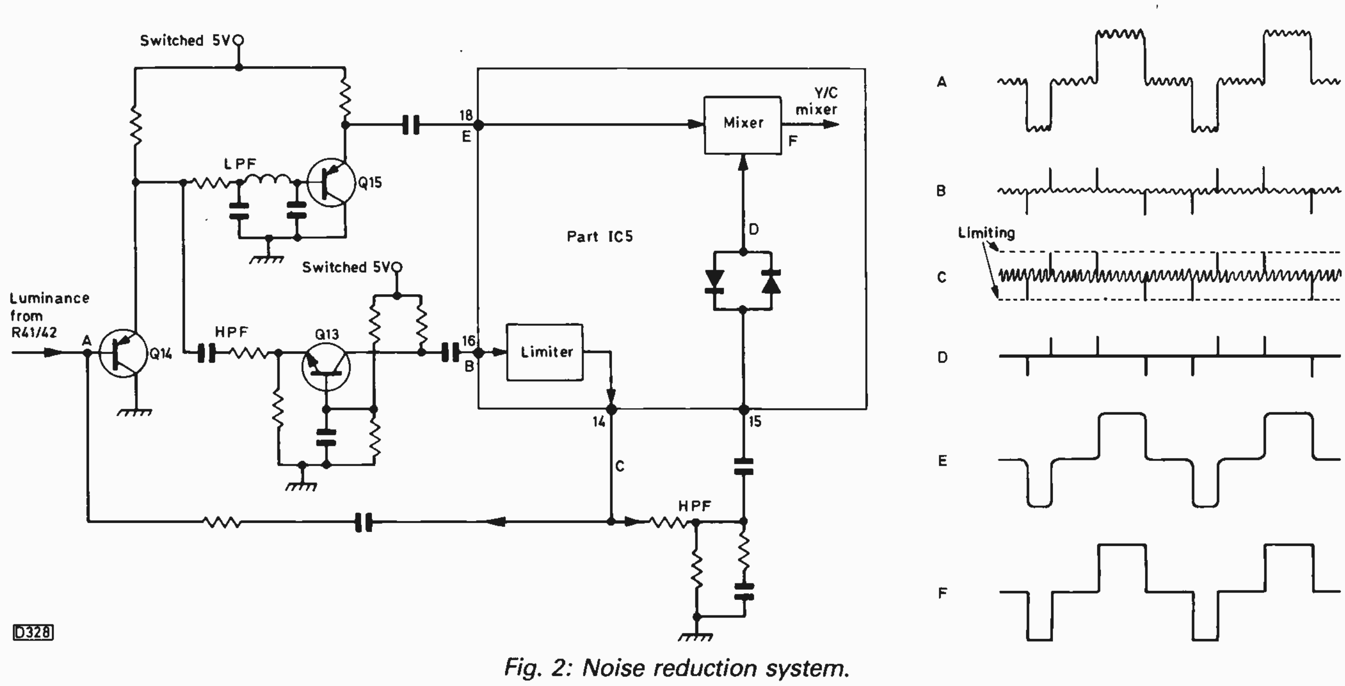


Fig. 2: Noise reduction system.

spikes contain noise which is added back to the signal to a degree where it becomes noticeable as edge noise. The newer technique, by making the h.f. variable and fixing the level of the crispener spikes, gives a greater degree of sharping with a much reduced level of edge noise.

Dynamic Aperture Correction

A new switch appeared at the rear of the JVC HRD725, labelled "dynamic apercon". In the Ferguson version it's labelled "local/distant", a misnomer if ever there was one. It switches the dynamic aperture control circuit, in principle a record picture crispener, in or out. Before we look at this in greater detail let's consider the effect of a picture crispener on a transition from black to white. Fig. 3 shows the effect we've just been considering – adding a derived video spike to a video signal to recondition it. The spike contains h.f. noise: if the amplitude of the spike is too high the noise will be deposited on the video signal as an overshoot. An improvement would be obtained if we could devise a way of giving emphasis to the transition with a reduced level of noise on the edges. The method that's been developed involves the production and addition during recording of preshoots as well as overshoots: this method is called dynamic aperture control.

Fig. 4 shows the system in block diagram form, with waveforms. The luminance signal to be recorded is, following a.g.c., fed to the junction of C169 and R201. We'll assume it consists of the squarewave A – a portion of white during a line period, e.g. a vertical white bar. The signal path then splits two ways: the direct path via equaliser two and the indirect path starting at R201.

L50 is an unterminated delay line of period t = 100nsec. The signal passes along the delay line to the mixer

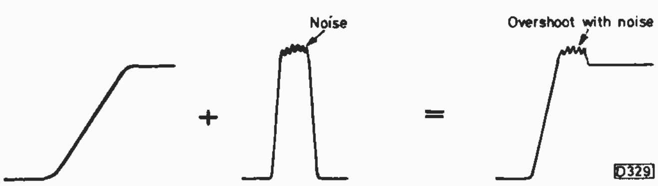


Fig. 3: Edge noise on a sharpened video signal transition.

amplifier, delayed as shown by waveform D. Since an unterminated delay line reflects a signal like a mirror, the signal also travels back through the delay line. This reflected signal will have undergone a second delay, to 2t as shown in waveform B. Thus at the junction of R201/L50 we get A + B = waveform C. D is inverted by the mixer amplifier and added to C: in effect, D is subtracted from C, giving waveform E. This waveform is then passed through a noise filter and is also inverted. In addition, its level is adjusted by the gain control circuit. It's then fed to the mixer in the direct signal path, where it's added to the original signal A which has also been delayed by time t in the equaliser to give us F. When inverted E is added to F the result is waveform G: the output from the circuit is thus the original signal (delayed) to which a preshoot and an overshoot have been added on each positive and negative transition. The edges of the transients have in this way been enhanced and the picture information crispened.

The point to note is that the system works only on low-level rise and fall edges, not on high average picture signals, as inverted E is of low level. If the input is very noisy the action of the dynamic aperture corrector will have an adverse effect by crispening the noise. Hence the facility to switch it out of circuit – I suppose this is why Ferguson call it a local/distant control.

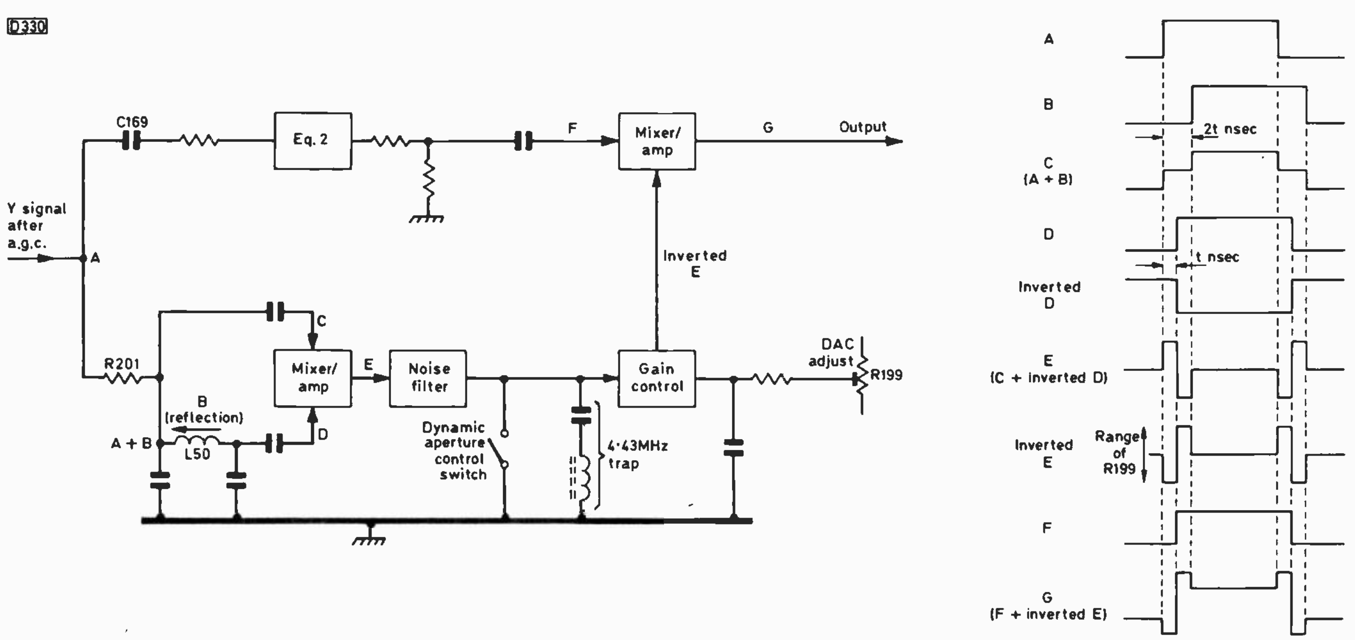


Fig. 4: Dynamic aperture correction.

TV Fault Finding

Reports from Les Grogan, Alan Shaw, J.R. Armagh, Philip Blundell Eng. Tech., Mick Dutton and Roger Burchett

Hitachi NP81CQ Chassis

The most common fault on this chassis is intermittent field collapse due to problems with the field output module. Another fault we've had several times recently is severe top cramping: in each case this was cured by replacing C608 (22μF, 160V) which smooths the supply to the field output module. **L.G.**

Philips CTX-S Chassis

The complaint with this colour portable was normal sound, no vision. A careful check on the voltages around the TDA3560 colour decoder chip revealed that pin 7 was at −0·5V instead of 1·7-3V (varies with the setting of the contrast control). Beam limiting is carried out at this pin, which is connected to the earthy side of the e.h.t. system via D6238 and R3239. A line pulse was found to be present at D6238, due to C2565 (0·039μF) being open-circuit. As a result the beam limiter was operating at maximum, turning off the contrast. **L.G.**

Grundig CUC220 Chassis

The 5V regulator IC663 (MC78M05CT) that feeds the microcomputer chip should be replaced if intermittent faults such as the set going into standby and incorrect channel display arise.

Field collapse on one of these sets was – after wasting time replacing the field output chip twice – traced to R2779 (18kΩ) on the field timebase subpanel being open-circuit. This resistor should be removed for test as it reads 18kΩ in circuit. **L.G.**

Fidelity Audio-Visual Systems

One of the latest "in things" in home entertainment electronics is the audio-visual system. Fidelity have been making and selling such units for some time now. To date there have been three versions, the AVS1600 which has been superseded by the AVS1650, and the AVS2000. The first two models have 16in. c.r.t.s: the AVS2000 has a 20in. tube and a different layout of the tape/radio/record player sections. The TV chassis is basically the ZX3000 as used in many Fidelity 14in. portables.

The most common faults in the TV section are as follows. (1) No sound or vision with faint power supply tripping: h.t. rectifier diode D13 (RGP15J) short-circuit. (2) Power supply inoperative due to the BU508A chopper transistor TR3 being leaky. This could have damaged the TDA4600 chopper control chip. The chopper transistor's base coupling capacitor C93 (100μF) should also be checked. (3) Sound and raster but no picture. The main suspect is the TDA3562A colour decoder chip IC7 but if a video signal can be fed into pin 20 of the scart socket with the TV/video switch in the TV position the TEA1014 switching i.c. (IC5) is suspect.

The real nightmare starts when you are faced with no sound on any system and the TV channel LED stuck on ch. 8 which can be tuned in. The 2A audio fuse F2, mounted on a small panel attached to the side of the TV chassis, will probably be found open-circuit due to one of the TDA1908A audio amplifier/output i.c.s (IC4 and IC5 on the main audio PCB) being short-circuit. That's the easy bit. In the case of the AVS1600 remove no less than 18 back screws. Then to gain access to the panel remove five screws in the record storage compartment, one screw at the rear of the record player base assembly and two Allen screws on the cabinet side panels. Disconnect the green earth wire near the mains input socket, then remove the two-pin mains supply to the audio assembly. The entire audio unit, with record and tape decks, can then be slid out of the front of the cabinet – after removing three small plugs from the a.f. panel. The audio chassis can be serviced on the bench after reconnecting the two-pin mains socket.

Measure the resistance between pin 1 of either TDA1908A chip and chassis. A low reading indicates that one of them is short-circuit. Since both i.c.s are connected across the 28V rail it will be necessary to open-circuit pin 1 of one of them to establish which one is at fault.

After carrying out the repair reassemble the unit in the reverse order to that given above. But be warned. When you return the AVS unit to the customer's home, measure the resistance across the loudspeakers before connecting it to the mains supply. The reading should be about 4Ω. If very low and you haven't checked this you will be back to square one. The point is that some people extend loudspeaker leads with odd pieces of wire, the joints insulated with Elastoplast or Sellotape, then tuck the wires under the carpet where the joints can short together.

Other faults we've had to date are: (1) Severe sound distortion on both channels due to the TDA3810 pseudo-stereo generator chip IC7 (audio board) being faulty. (2) No TV channel change with the remote control inoperative and the receive LED dot permanently lit. This was caused by a leaky stereo balance switch. **A.S.**

Some Quickies

Rank T24 chassis: Loss of colour can be caused by R229 (3·6kΩ) on main board T144A going high in value. This resistor feeds line pulses to the chroma module.

Pye 713 series chassis: No e.h.t. If disconnecting the e.h.t. tray results in plenty of r.f. from the line output transformer, giving the impression that the doubler is faulty, check C695 (0·001μF, 1·6kV) for leakage. This capacitor decouples pin 2 of the doubler.

Grundig CUC series chassis: For repeated failure of the BU208A transistor and TDA4600 chip in the chopper circuit replace the metal film resistor R646 (270kΩ) with a carbon film type. The original tends to go open-circuit, very often intermittently. **A.S.**

Hitachi NP82CQ Chassis

Tuning drift with these sets is often due to one or more of the 1N4148 blocking diodes D1503-8/D1511-2 being leaky. It's best to replace the lot. If the drift has persisted for some time before being reported it may well be that the first four or six tuning potentiometers are worn/noisy. Check them carefully and replace any that are doubtful. In one case after checking all the above the tuner turned out to be the cause.

Inability to tune above a certain frequency occurs when one of the zener diodes ZD1508-1514 is leaky. Note that the leakage may not measure on an Avo. **J.R.A.**

Mitsubishi CT2101TX

A fault I've had on a number of occasions is no sound and vision and no channel display, with a blank raster on the screen. Each time this has been the result of no 12V supply to the i.f. strip and display, due either to R178 being open-circuit or a crack in the print between R178 and the regulator Q241. **P.B.**

GEC 3135

The picture produced by this portable was dark and a check on the c.r.t. base voltages suggested that something was amiss in the video output stage. R361 (470kΩ) which links the tube's cathode to chassis had gone open-circuit. **M.D.**

ITT CVC45 Chassis

Intermittent loss of raster was the complaint. We eventually found that the tube's heaters went out in the fault condition, due to a dry-joint at pin 1 of the line output transformer. **M.D.**

Sanyo CTP6102

As this set warmed up the screen gradually blanked from the bottom until only the top two inches were visible. A can of freezer was used to check the transistors in the field timebase. One of the transistors in the Darlington driver stage, Q422, was going leaky when warm. **M.D.**

Sharp C1891

These sets seem to have only one fault – no colour. A lot have been sold in our area and they come in for repair after a couple of years. In every case we've had the loss of colour has been due to either I801 (RH-IX0109) or Q407. **M.D.**

More Quickies

Rank T26 chassis: The problem was no luminance. An easy one – the luminance delay line was open-circuit.

Ferguson TX9 chassis: The set concerned was a 14in. portable with no focus. The focus spark gap had gone dead short due to corrosion. It was impossible to clean it and a new c.r.t. base panel had to be fitted.

ITT Model CT3315: The fault was a dark picture. A 270kΩ resistor in the tube's first anode supply had increased in value to over 2MΩ.

Mitsubishi CT2101: We took delivery of a batch of these sets and rigged one up for display in the shop. An hour later the line output transformer went faulty, filling the shop with thick, evil-smelling smoke. **M.D.**

Philips KT3 Chassis

The problem was no picture, just a blank white raster, with normal sound. The 155V rail was low and the −20V rail absent. The two rectifier diodes that provide these supplies are fed by pin 15 on the line output transformer via the surge limiter. resistor R1583 (2·2Ω) which had never been soldered to the panel.

The remote control light on a remote control version of this chassis was permanently on and none of the control functions worked. This was caused by transistor T768 (BF422) on panel U752 being short-circuit – we've had this problem before.

No teletext was the complaint with a teletext version of the chassis. We proved that the problem was in the text decoder panel by exchanging it with one from another set. Luckily the i.c.s are all pluggable: replacing IC7040 put matters right. Pin 16 of the faulty chip had gone rusty and we wondered whether there had been liquid spillage at some time. **M.D.**

GEC C2110 Series

The complaint with one of these sets was intermittent loss of colour. There was colour when I called of course, and tapping around the decoder produced an unstable picture with line pairing, tearing and field bounce for good measure. It looked like an a.g.c. fault and closer examination revealed that one leg of the a.g.c. reservoir capacitor C117 on the i.f. panel had corroded right through. Its value is 47μF or 150μF depending on panel. Incidentally a Calor gas heater was working nearby: I hope it's not causing corrosion.

Intermittent loss of colour on these sets is usually due to dirt on the set-a.c.c. control P252.

C411 (0·01μF) going short-circuit will stop the line oscillator. This can be intermittent and very confusing: freezer and a hairdryer will prove whether C411 is the culprit.

A dry-joint on the line driver transistor's feed resistor R411 (2·2kΩ) is sometimes the cause of line timebase failure in these sets. If the user has been in the habit of thumping the set to get it going this will finally kill the TBA920 line oscillator chip. **R.B.**

Alba CTV12

A "dead" set with a channel display is usually due to one or more dry-joints on the line driver transformer. The soldering in these sets is poor and a quick visual inspection pays dividends. The set is manufactured in Hong Kong. **R.B.**

Hitachi NP9A Chassis

Here's a tip I've not seen mentioned previously in *Television*. In the event of one of these sets going to standby at switch on, first check whether C919 on the power supply subpanel is 22μF. If it is, change it to 220μF. This will usually clear the trouble. **R.B.**

Rank T20 Chassis

When faced with excessive brightness and flyback lines check that the set black-level control 3RV13 is working. If it has no effect, 3R76 (1·2kΩ) which is in series with it is either high in value or open-circuit. This problem can be confusing if you start checking back to the TCA800 i.c. as I did: most of the voltages between the chip and the RGB output transistors will be slightly wrong.

Dry-joints on sockets continue to plague these sets. The latest to come my way was at pin 12 of connector 4Z2 on the timebase board. Result: intermittent field collapse. The same set was intermittently stopping due to dry-joints on the chopper transformer – this was in turn due to the power board bending under the weight of the transformer because of the lack of a stiffener at the front. **R.B.**

Servicing Teletext Receivers

Part 4

Mike Phelan

This month we'll look at the memory i.c.s used in the early Philips/Mullard teletext decoder and the operation of the SAA5050 TROM (teletext ROM, i.e. the character generator) chip.

Memory Chips

The memory chips used in early teletext decoders such as the one we've taken as our example were the very same types as those used at the time by the computer industry. This was fortunate, since taking advantage of these chips meant much more RAM capacity for a given cost. The decoder in the G11 chassis used type 2102 memory chips, with a 1K or 1,024 bit capacity – seven of these store 1Kbyte, this being equal to one screen of display with the help of the row and column address juggling we described last month.

Fig. 1 shows the essentials of the 2102. As you can see, the idea is very simple. The required address information is presented to the row and column address pins. This gives access to a unique location in the chip, known as a cell – it consists of nothing more than a bistable. If pin 3 is then held low the data signal at pin 11, either a one or a zero, is written into that cell. When pin 3 is taken high the data contained in the addressed cell appears at pin 12. As the seven bits of each data byte are stored at like addresses in the seven RAM chips (it would be rather silly not to do this!) all pins of the seven 2102 chips except the data input and output pins can be strapped together.

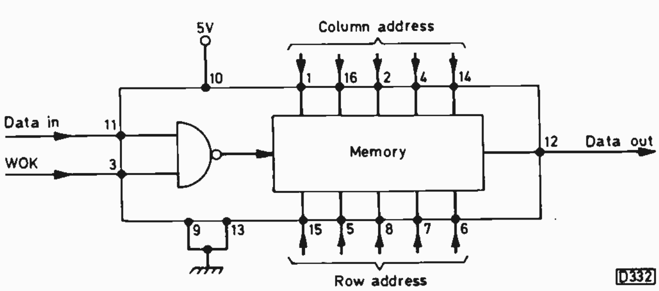


Fig. 1: Type 2102 RAM chip block diagram.

The TROM Chip

The TROM chip (see Fig. 2) carries out several functions, not the least important of which is conversion of the ASCII code for the required character to the correct pattern of dots for each scanning line of the display. If the code is a control code rather than a printable character this has to be interpreted and the necessary action taken so that the red, green, blue and luminance outputs are at the correct levels to give the colour required in accordance with the colour attribute. The information required to convert from ASCII code to a pattern of dots on ten successive scan lines is held in the ROM within the SAA5050.

During the display period (240 lines from 49 to 288 or 362 to 601) the RACK (read address clock) signal from the TIC chip makes the memory pass one Kbyte of information to the TROM chip, this operation being undertaken by the TTL counter/adder row/column decoder circuit discussed last month. As each character occupies part of ten successive scanning lines (unless in the double heigh mode), clearly each line of forty characters must be read ten times before we proceed to the next line of characters – hence the 1MHz clock signal. The divide-by-ten section of the TROM gives an output at the end of each line period to clock in the next row of characters.

Since only one dot or pixel can be displayed at a time it's necessary to convert the parallel output from the ROM within the SAA5050 chip to serial information. This is done by the output shift register. The 6MHz dot clock signal is used to read the pixel value from the ROM, a

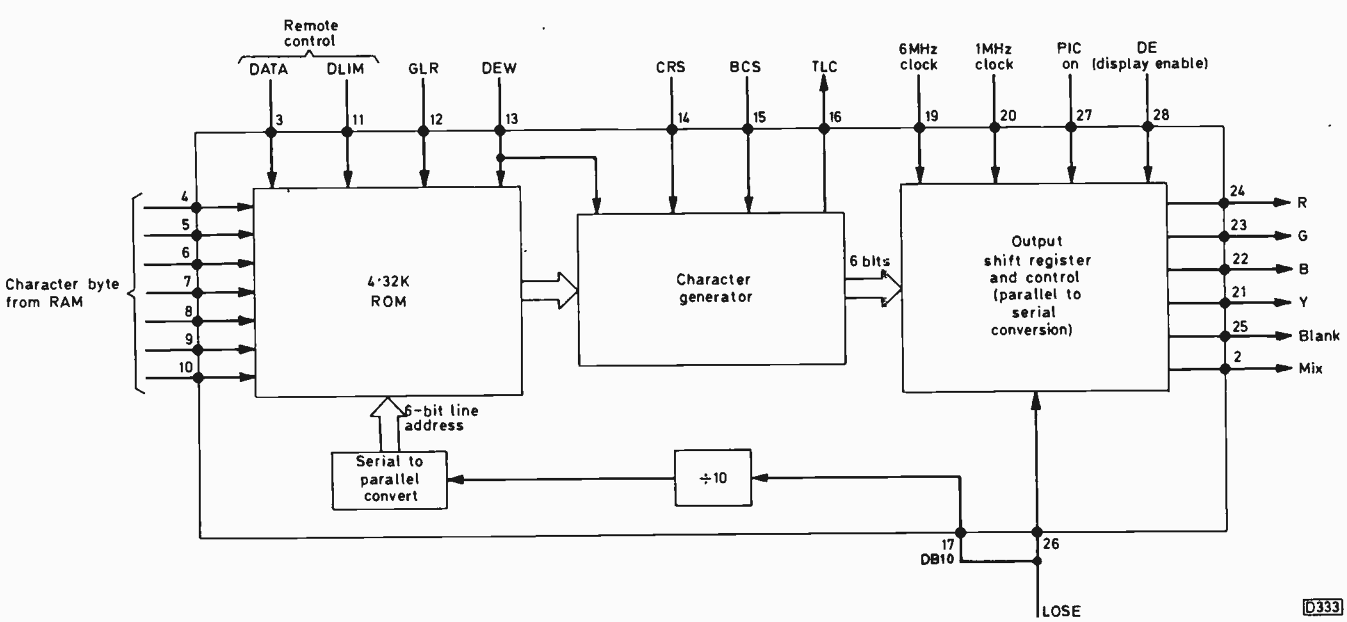


Fig. 2: Simplified block diagram of the SAA5050 TROM chip.

counter reset by GLR (general line reset) enabling the correct pattern of dots to be read for the current line of ten.

Most of the TROM's output connections were discussed in Part 1 (January), when we considered the buffer/level-shift stages that handle the output from the TROM. The different ways of double-height character operation were also discussed. This leaves only a few connections to this chip to be explained.

Pin 3 receives the data signal from the remote control receiver. This signal is used here only to select functions such as mix and reveal. As with the TAC chip described last month the DLIM signal is required to clock in the remote data signal: this enters at pin 11.

The DEW signal is fed to pin 13 to reset the row counter within the TROM at the start of each display period. It's also divided in the TROM for use when the "flash" attribute is transmitted. The flash effect is achieved by alternately displaying the character and a space (ASCII 32).

Pins 17 and 26 are strapped and receive line frequency information from the TIC chip during the display part of the field only. The DB10 input increments the line counter: it's this input that's divided by ten to provide a row counter. The LOSE (load output shift register enable) signal has two functions. First, it allows information to be displayed only during the part of each line that's used for teletext, i.e. the centre 40msec. Secondly, it cancels the attributes at the start of each display row.

In very early G11s the teletext decoder had chips with type numbers prefaced by M instead of SAA. The TROM chip was an M915. These panels can be instantly recognised by the fact that since the M915 requires a 6·25V supply there's a small subpanel with a voltage regulator on it. This panel takes its supply from the 12V feed to the decoder and plugs in vertically.

Character Rounding

A rather important function of the teletext decoder is character rounding. If we consider the fact that each character is displayed in a 10 × 6 matrix of dots the need for this may not be too clear. Most of the alphanumeric characters use only five pixels horizontally and seven vertically however: this is because we need spaces between the characters and rows. In addition, alternate fields have the displayed characters displaced vertically by the width of one line. If things were left like this the display would look rather ragged, particularly with graphics, i.e. weather maps etc.

To overcome this problem we need to do something to the pixels whenever a diagonal line forms part of a character, irrespective of whether the character is alphanumeric or graphic. Fig. 3(a) illustrates the problem. By a diagonal line we mean that the pixels on two successive lines are displaced one pixel to the left or right. The solution is to add smaller dots to fill in the corners – see Fig. 3(b). But, we hear you cry, this will require twice the video bandwidth and twice the dot frequency – 12MHz in fact! Not so.

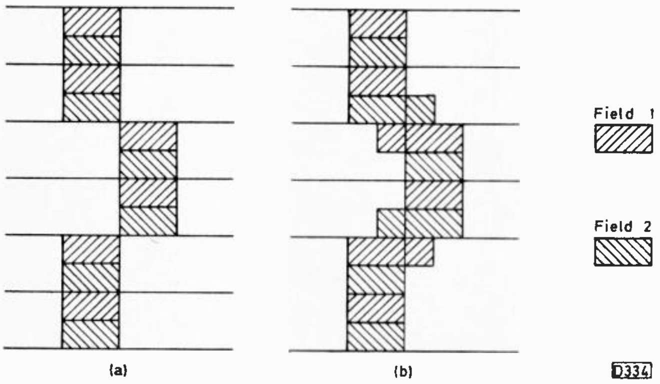


Fig. 3: Principle of character rounding.

As with so many good ideas the solution is elegant but simple. First, the vertical resolution must be doubled. This is easy: all we need to do to produce half-height dots is to display them on alternate sides of the pixels on odd and even fields. The CRS (character rounding select) signal from the TIC chip is high on even fields, low on odd ones. The dots are produced by extending the pixel width to one and a half times normal. This is achieved with no requirement for extra bandwidth.

The character rounding process we've described applies only to normal height characters. With double-height characters each dot is actually two pixels, one above the other. When a diagonal occurs in the character a half-height dot can be produced by displaying one pixel instead of two: this is done on both odd and even fields, so the CRS signal is not used. The single pixel dots must still be half width however, but are displayed in right and left mode on all fields.

Trailer

This completes our description of the circuitry used in this decoder. Next month we'll see how simple it is to service this part of the receiver.

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

16181	1.04
16182	1.04
16334	0.98
16335	0.94
16446	0.98
16600	1.38
16799	2.88
16801	0.54
16802	1.27
16803	5.30
16905	0.86
17074	9.30
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	0.06
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	0.41
2N3823	1.17
2N3904	0.62
2N3906	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	2.80
2SB618A	2.22
2SB681	3.96
2SB695	1.98
2SB75	1.04
2SB861	0.85
2SC1034	6.75
2SC1050	5.06
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	0.55
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	1.20
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	0.49
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	2.80
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
2SD898 TR	5.45
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	2.85
7812 TO-220	1.16
7815	0.64
7818	0.92
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	0.25
AC188-01	0.49
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	0.50
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	0.43
AF279	0.88
AL100	1.83
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	5.92
AN236	3.78
AN238	6.79
AN239	5.88
AN240P	1.52
AN241	1.71
AN245	4.49
AN247P	4.22
AN252	2.57
AN253	2.97
AN262	1.98
AN272	7.92
AN281	6.53
AN295	5.52
AN301	5.55
AN302	3.99
AN303	4.39
AN305	9.47
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	3.80
AN6320N	4.28
AN6326	3.98
AN6342	1.61
AN6344	5.87
AN6363	16.00
AN6551	1.35
AN6552	0.68
AN7115	2.52
AN7145	2.80
AN7146	9.90
AN7150	2.45
AN7151	2.26
AN7156	2.78
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 (IC)	2.92
BA521	2.02
BA524	8.94
BA526	7.98
BA532	2.67
BA536 (IC)	2.95
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	0.08
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	0.28
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	0.12
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	0.09
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	0.39
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	0.26
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	0.53
BD202	0.60
BD203	0.50
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	0.39
BD243	0.50
BD243A	0.37
BD244	0.51
BD244A	0.85
BD245C	0.99
BD246C	0.89
BD253	1.05
BD278A	0.80
BD317	2.60
BD318	2.59
BD375	0.42
BD377	0.26
BD379	0.76
BD380	0.76
BD410	0.52
BD412	6.27
BD418	0.87
BD433	0.47
BD434	0.49
BD435	0.49
BD436	0.60
BD437	0.49
BD438	0.40
BD441	1.42
BD442	0.66
BD507	0.60
BD509	1.42
BD510	1.07
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	2.31
BD899	2.48
BD901	0.79
BD902	0.84
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	0.57
BF245A	0.37
BF255	0.20
BF256	0.28
BF256LC	0.42
BF257	0.34
BF258	0.36
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	0.66
BF363	0.60
BF371	0.50
BF391	0.25
BF393	1.59
BF417	0.84
BF418	1.87
BF422	0.29
BF423	1.12
BF435	0.54
BF450	0.35
BF451	0.29
BF457	0.41
BF458	0.39
BF459	0.52
BF460	1.56
BF469	0.31
BF470	0.55
BF471	0.31
BF472	0.33
BF479	0.61
BF480	0.60
BF491	0.32
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	0.75
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	0.41
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
BSTBD140G	4.98
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	1.55
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	2.51
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	1.95
BU209	1.93
BU226	2.95
BU312	2.38
BU326	2.00
BU326A	2.20
BU326S	2.20
BU406	1.49
BU407	0.82
BU407D	1.00
BU412	5.29
BU426	1.90
BU426A	1.67
BU500	1.95
BU508A	1.89
BU526	2.02
BU608D	1.57
BU807	0.80
BU826A	1.76
BUV46	1.00
BUV84	1.24
BUW81A	3.06
BUW84	1.39
BUX84-TRAN	1.00
BY126	0.13
BY127	0.13
BY133	0.11
BY164	0.47
BY176	1.52
BY179	0.62
BY182	1.05
BY184	0.47
BY187	0.77
BY189	1.76
BY198	1.62
BY201/2	1.50
BY203/20	0.41
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
BYX71-800	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	2.38
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	0.46
CD4050	0.55
CD4052	0.75
CD4053	0.80
CD4069	0.29
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	9.16
CX109	7.86
CX121	11.83
CX130	8.76
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	2.65
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	2.87
HA1138	5.03
HA1141	5.65
HA11414	5.65
HA1144	7.87
HA1156	1.16
HA11580	9.00
HA1160	4.78
HA1166X	5.36
HA1166	1.55
HA1167	5.36
HA11711	20.16
HA11713	8.13
HA11714	7.76
HA11714	8.13
HA11715	8.13
HA1 1724	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	7.50
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

Horror Stories

Les Lawry-Johns

This lady brought in a Fidelity CTV14S colour portable. "It's hissing" she said, "it doesn't belong to me – it's my neighbour's."

I removed the rear cover and plugged the set in. The line output transformer started to hiss and sparks came from it. "Leave it with me" I said, "I'll dry it out and see whether that stops the problem. Call back later this afternoon."

The Arc Over

So I dried it out with a hairdryer and sprayed it with Plastic Seal. Switching on, I was quite pleased to hear that there was no hissing. I plugged in an aerial and a good picture appeared. A nasty arc over then suddenly occurred around the line output transformer and the field collapsed to a line across the screen. I assumed that the spark had damaged the field output chip and was surprised to find that this was a TDA3561 – it was the later version of the CTV14S. I looked through my chips and couldn't find one. No one I phoned seemed to have one either. So I phoned SEME and got one the next day. I fitted it in the portable and was most annoyed with myself when it didn't clear the problem. Oh yes, in the meantime I'd fitted a new line output transformer which I had in stock. I now had a hissless set but there was still no field scan.

I must confess that I didn't have the complete circuit for this fairly recent set, so I was in some doubt. I phoned Fidelity and received some good advice. "If the voltage at the scan coil plug is less than 13V, change the TDA2578A sync/timebase oscillator chip." Again I couldn't find one and again no one locally seemed to have such a thing. Feeling a bit sheepish I phoned SEME again and they didn't shout at me. I got the chip the next day and fitted it. Glory be, a nice blank raster.

I plugged in the aerial and the sound was loud and clear but the blank raster remained blank, with the brightness and contrast controls having no effect. In fact the only way to control the raster was by means of the first anode preset, which is part of the line output transformer. I started to panic. The brightness and contrast controls worked on the TDA3562A decoder i.c., which has twenty eight pins, so I checked everything else.

All this would have been avoided if I'd replaced the line output transformer in the first place instead of trying to rescue the old one. Mrs. Clearwater wasn't going to be too pleased with her bill. When the set had come in it had showed a good picture and I had told the lady who'd brought it in that I'd phone the set's owner when I'd got it sorted out. I'd better get permission to proceed. So I did this first. Now to proceed . . .

The signals went into the TDA3562A but didn't come out. The voltages were present but the output voltages were high. So I looked for a replacement chip which I knew I didn't have. Now don't get me wrong. We keep lots of chips in stock – all those I think we'll need. I just didn't think we would need these so soon and we wouldn't have done if I'd only fitted a replacement transformer in the first place instead of drying the old one.

I felt terrible when I phoned SEME again, but luckily this time a different girl took the order. All those girls must be nice – efficient too. In no time she told me that the chip was in stock, then proceeded to tell me where I lived. Something to do with the computer, Stan said. And I've always hated those things. Live and learn.

Anyway the next day the chip arrived and was fitted after a bit of a struggle. At last I was able to phone Mrs. Clearwater to tell her that the set was ready. "Funny" she said, "all it did here was to hiss, and you've had all that trouble". This may seem a trifle to you but it was a nightmare to me, feeling guilty all the time because I'd taken the wrong action in the first place. I'll know next time.

It Ticks

Eddie brought in his Thorn 9800. "There's not much wrong Les, it just ticks." I scowled at him. "When these sets tick you're in trouble, and so's the bloke who has to sort it out."

"Never mind Les, just have a look."

So when I had a chance I looked. It just stood there ticking. I brought my 25V power supply into action and fed 25V to the mauve lead on plug 4 on the decoder panel – these sets tick when the internal 25V supply is missing. Sound burst out but there was no sign of life in the line timebase – no e.h.t. I checked the line output transistor (VT851) and it said it was all right. I removed the screws and turned the line output panel up. The base-emitter readings didn't seem right, so I removed the plug from the right side panel and checked again. R858 (8·2Ω), which is in series with VT851's base, was open-circuit. I didn't have an 8·2Ω resistor so I put in two 4·7Ω resistors (KT3 type) in series. The set then worked beautifully, displaying a nice picture, but channel six was on instead of channel one. I touched selector one: the set hesitated then reverted to six. I touched all the other selectors and it still came back to six. I cleaned the front and this made no difference. So I removed the internal screws that hold the selector unit and pulled this out, away from the plug pins. I sprayed the front panel inside and the result, when the unit was refitted, was that position three was displayed and couldn't be shifted. I put the set to one side as I was fast losing patience.

I polished off a G11 and a Pye 725, then returned to the 9800. I pulled out the selector panel, leaving the front unit still secured to the front moulding by three screws. With these off it could be removed from the front and stripped down. The plastic strip needed a thorough clean and after doing this I refitted the unit to the cabinet, pushed the selector unit back on and put the screws back. It now came on with channel one displayed (fancy that): 3, 4 etc. could be selected but not channel 2.

My spirits were beginning to get low after all this. I replaced neon two and that didn't make any difference, so I checked the voltages and found that two differed quite a bit. My eyes strayed downwards and immediately caught sight of a red lead snipped off the panel that held the ML237 chip: the two ends were visible and were quickly soldered together. Channel two could now be selected and the job was done – except for an odd dry-jointy noise on the sound. Disconnecting the audio plug from the top of the signals panel stopped the noise so I concluded that the output stage, which is on the power supply panel, was in order. I spent some time replacing suspect items, including the MC1358PQ intercarrier sound chip and associated components. The noise had then gone, but came back after a while. I eventually had to admit that the trouble could be in the audio output stage so I replaced the output transistor, using an MJE340 turned round: the trouble stopped and the sound remained clear.

What an ordeal! I know it doesn't sound much, but it damages my confidence – which has always been sadly lacking – and I feel a bit let down when I'm tackling jobs that won't go right. When the thing is eventually done I feel a lot better, but I still have this feeling that it shouldn't have taken so long.

Eddie got a ticking off when he came to collect his 9800.

Vintage TV: US Sets of the 50s

Chas E. Miller

Since American design tends to reflect the "big is beautiful" school of thought (cars, buildings, etc.) one might think that their TV sets have all been on large and opulent lines. In fact the range of sets on offer around 1950 extended from some genuine monsters to sets that were much smaller than anything to be found in the UK at that time. But whatever the picture and cabinet size, there were certain design features common to all US sets – dictated by the different conditions in the States.

From the start American TV had been organised on commercial rather than public service lines. This meant that in large centres of population viewers could receive programmes from several different stations while in more remote, rural areas viewers required very sensitive receivers if they were to get acceptable pictures (the situation mirrored that of the early thirties, when powerful, selective radio sets were developed to provide reception of the proliferating number of radio stations on air).

Thus from the start all US sets had to be capable of receiving twelve channels (2 - 13, ch. A1 never being used for scheduled TV transmissions). This made the use of superhet tuning essential (in the UK the BBC's monopoly in the early days made it possible for many setmakers to opt for t.r.f. designs). To provide sufficient gain and selectivity, the tuner units and i.f. strips employed large numbers of valves compared to the designs with which UK servicemen were familiar.

The sets had to work from mains voltages between 110V and 120V – no problem with an a.c. supply since a mains transformer could be used, but liable to cause problems if the designer opted for the a.c./d.c. type of power supply. Those unfortunates who had d.c. supplies were likely to remain only would-be viewers since most sets eschewing a mains transformer tended to use a voltage-doubling circuit that would not, of course, work on anything other than an a.c. supply.

Pilot Table TV

We'll take a look at a couple of sets that illustrate opposite extremes of US TV receiver design of the period. First a small-screen set. The Pilot Model TV37 was a small table model fitted with a tiny three-inch c.r.t. with electrostatic deflection. It used a total of twenty valves, many of them double-triodes, and was suitable for use with 105-125V, 60Hz supplies.

The tuner unit employed three 12AT7 double triodes. Three triodes were used for low-band (55·25-87MHz) operation and the other three for high-band (175·25-215·75MHz) operation. Tuning across the bands was continuous, by means of ganged capacitors, the front band selection and tuning knobs being concentric. Each r.f. amplifier triode was used in the earthed-grid mode, with the input to its cathode via broadband transformer coupling. Similarly the other two double-triodes were split between the two bands, as local oscillators and mixers. This arrangement enabled a commendably simple band switching system to be used: only the aerial input circuit and the h.t. supplies to the two local oscillators were switched.

The tuner was followed by a four-valve i.f. amplifier using 6AU6 r.f. pentodes. These were similar to but not as sensitive as the EF91 found in many contemporary UK sets. The vision detector used the only solid-state device in the set, a 1N34 diode. The following video amplifier stage employed a 6BA6 pentode, a valve more commonly employed as an i.f. amplifier in radio sets – it had a vari-mu characteristic. Its output was a.c. coupled to the tube's cathode, with the brightness control setting the d.c. level here. Intercarrier sound was a feature of many US sets from the start. In this one the intercarrier sound signal was tapped from the video amplifier's anode and fed to a single 6AU6 i.f. pentode. This was followed by a 6AL5 in a ratio detector circuit and a 35B5 as the output beam tetrode. Negative feedback was provided by returning the output valve's cathode to chassis via the secondary winding on the output transformer. The video output valve also provided the input signal for the sync separator pentode, a 6AU6 which was operated under unusual conditions – upside down in effect!

The technique used in this set to get round the low mains voltage was to obtain both negative and positive h.t. rails from the mains supply. The sync separator valve was operated from the negative rail: its anode load resistor and screen grid were taken to chassis while its cathode bias network was connected to the negative h.t. line.

The two timebases were basically similar, each using two 12SN7GT double triodes. Both oscillators consisted of cathode-coupled multivibrators, but while the field oscillator was operated from the positive h.t. rail, with the cathodes returned to chassis, the line oscillator was operated in the upside down mode, like the sync separator, its anode load resistors being returned to chassis. The two output 12SN7GTs were used as push-pull amplifiers to drive the deflection plates, and to get an adequate voltage swing both stages were connected between the negative (−120V) and positive (112V) lines. Even this wasn't quite enough for the field output stage, where the anode load resistor of one of the triodes was connected to a potential divider network across the e.h.t. supply. Fig. 1 shows the line output stage – the likes of which we've not seen before in this long-running series! A d.c. supply was connected across the deflection plates to provide centring (the same technique was used with the field deflection plates).

The negative supply was useful for several other reasons. It provided the supply for the contrast control,

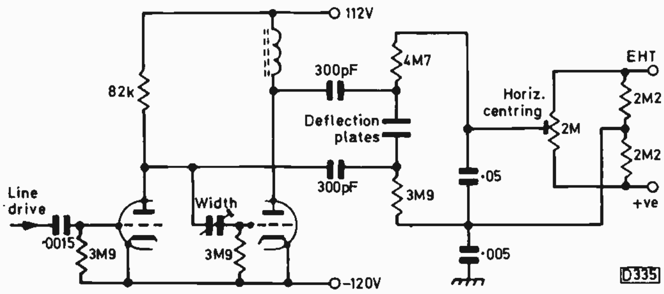


Fig. 1: Line deflection circuit, Pilot Model TV37. The c.r.t. used in this set employed electrostatic deflection.

which set the bias at the control grids of the first three i.f. amplifier valves, and also for the volume control which likewise provided a variable bias for the audio output valve's control grid. These were both front-mounted controls, as was the brightness potentiometer which was part of a resistive network connected across the negative and positive h.t. lines. The negative rail also provided the bias voltage for the control grid of the video output valve where, in the absence of cathode bias, it was most helpful in preserving the response and gain in harmony.

A 25Z6GT with its anodes and cathodes strapped together was used to provide the positive h.t. line: the speaker's field coil was employed as the h.t. smoothing choke. A 35W4 rectifier provided the negative h.t. rail, this time with resistive smoothing. The valve heaters were arranged in an intricate series/parallel configuration that would undoubtedly have excited the admiration of that arch-exponent of the method in the UK, the gentleman who designed Ekco TV receivers. His opposite number at Philips would probably have liked the cord-drive used for the TV37's tuning system!

A 25L6GT beam tetrode and a 1B3GT rectifier were used to provide the 2.5kV e.h.t. Fig. 2 shows the circuit. The 25L6GT was employed as an r.f. oscillator and, like the sync separator, was operated from the negative h.t. supply. Note than the feedback to the 25L6GT's control grid was obtained from the glass of the 1B3GT, where pulses were picked up. The variable capacitor in the tuned circuit was used to set the e.h.t.

The Dumont Bradford

The TV37 used quite a lot of electronics to produce its three inch picture. It was nevertheless cheap and cheerful – no vision a.g.c. for example and no flywheel sync, features that were common in the USA long before they came to be adopted in the UK. At the opposite end of the scale was the mighty Dumont RA108A Bradford – odd how that fair city seems to inspire TV setmakers, even those 3,000 miles away! Dumont also used names like Mansfield and Sussex. The Bradford was a 19in. set in a huge console cabinet of colonial style. Its 36-valve chassis had just about every feature including those just mentioned. The cabinet also housed an a.m.-f.m. radio and a record player.

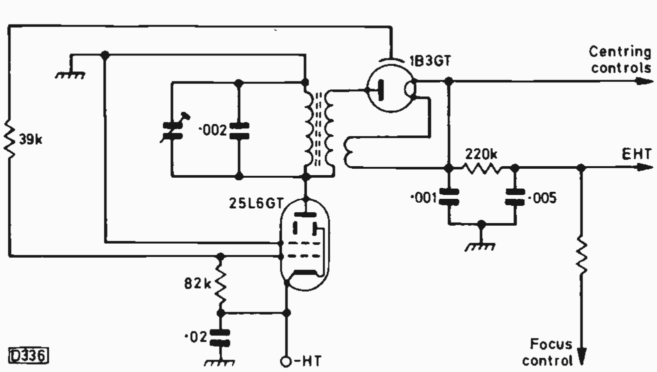


Fig. 2: The e.h.t. generator stage used in the Pilot TV37 was operated from the negative h.t. line.

The tuner unit was common to TV and radio – it covered 44-216MHz continuously by means of ganged variable inductors. It employed three valves, a 6J6 double triode with the two sections strapped, again used in the earthed grid mode; a 6AK5 pentode as mixer; and a 6AB4 triode as the local oscillator. Three vision i.f. amplifier stages using 6AG5 valves were followed by a 6AL5 as the vision detector (only one half of this double diode was used). Not quite as many i.f. amplifier stages as in the little Pilot set – but the i.f. strip was followed by a string of three video amplifier stages: first a 6AB6 pentode; then half a 12AU7 double triode as a cathode follower, with the contrast control as its cathode load; and finally a 6AG7 pentode. The latter was a metal octal valve that operated with the low anode load resistance of 2·35kΩ: one shudders to think how many service engineers seared their fingers on this hot little number! The video output was a.c. coupled to the grid of the picture tube, with the other half of the video 12AU7 strapped as a d.c. restorer diode. The brightness control set the voltage at the c.r.t.'s cathode.

This upmarket set didn't use the intercarrier sound technique. The sound i.f. was tapped from the coupling between the first and second vision i.f. stages and fed to a two-stage sound i.f. amplifier using two 6AU6 valves. This was followed by a further 6AU6 as a limiter then a 6AL5 in a Foster-Seeley f.m. discriminator circuit. The audio section consisted of a 6AT6 triode amplifier and 6V6 output stage. A special type of "magic-eye" tuning indicator (6AL7GT) was used to ensure accurate tuning of the f.m. radio stations.

The a.g.c. and flywheel sync arrangements were quite different from anything seen in UK sets and elaborate indeed. The starting point in this area is a 6AU6 in a tuned amplifier stage fed from the final vision i.f. amplifier stage. It was referred to as the sync amplifier and was used to optimise the sync output. Its tuned circuit fed a couple of rectifier diodes (a 6AL5). One provided the a.g.c. voltage, which was used to control the first and second vision i.f. stages (remember that negative-going vision was a feature of the US TV transmission system from the start, so a sync tip rectifier could be used for a.g.c. purposes). The second diode fed a conventional 6AG5 sync separator. This was followed by a buffer stage (half a 6SN7GT double triode) which provided the sync pulse outputs to the line and field timebases via differentiator and integrator circuits.

The field timebase at any rate was fairly conventional. The second half of the 6SN7GT just mentioned was

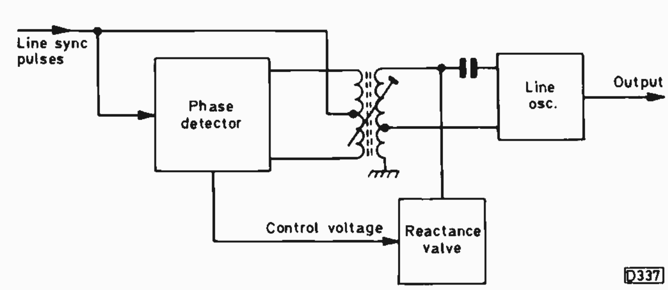


Fig. 3: The Dumont Bradford used a sinewave line oscillator that was phase locked to the off-air sync pulses.

employed as a blocking oscillator. The sync input was to a tertiary winding on the blocking oscillator transformer. A further 6SN7GT was used as the field output valve, with the two sections strapped together in parallel. Transformer coupling was used to the scan coils, with a d.c. component added for centring.

If the field timebase was conventional the line timebase was anything but. It was wondrous to behold! A sinewave line oscillator (6K6GT power pentode) was employed. This was controlled by a 6AC7 reactance valve in the tuned circuit, the latter being controlled by a 6AL5 phase detector which compared the phasing of the oscillator with the incoming sync pulses – no feedback from the output stage, so the feedback loop was much shorter than what we're used to (until chips with double loops came along). Assuming that it worked correctly this must have been a very stable system. Fig. 3 shows the basic idea in block diagram form.

The oscillator was followed by a triode (half a 12AU7) which acted as a discharge valve, providing a sawtooth drive for the 6BG6G line output valve. A secondary winding on the line output transformer drove the line scan coils, a d.c. component being added for centring. The e.h.t., a comparatively measly 10kV, was provided by a voltage doubling circuit (two 1B3GT rectifiers) driven by the line output stage.

A conventional boost diode was used, except that it consisted of a 5V4G double diode. Since this valve lacked the highly insulated cathode of say the PY81 its heaters had to be fed from a separate small mains transformer (which also provided the heater supplies for the other valves in the line output stage). The boost obtained in this way was only 140V, from the 400V h.t. rail to 540V, which wasn't considered sufficient. Two 6X4 double diodes with their anodes strapped were used to produce a negative bias voltage for the line output and discharge valves, raising the effective voltage across the line output stage to some 730V.

A 6AS7G double triode with the two sections paralleled was connected across the line output transformer's secondary winding as a damper: its grids were fed by an *RC* phase shift network which included a line linearity control (there was also a conventional inductive linearity control). This seemed an odd sort of valve to use for such a job so I looked it up in the RCA handbook of 1949. Lo and behold, the 6AS7G is described as being suitable for regulation work in power supplies, as a booster valve in TV scanning circuits, and as a push-pull output stage in hi-fi amplifiers. A versatile device!

This highly complex line timebase must have presented problems when anything went wrong. I dread to think what it must have been like trying to service one of these sets after an exhausting day at the bench.

In case you're wondering what the other half of the 12AU7 was used for, the circuit describes it as the "time delay rectifier". It took its supply from the negative bias provided by the 6X4s and was used to actuate a relay in the main h.t. line. The idea was to prevent the valves coming into operation until they had fully warmed up.

The main power transformer supplied 460-0-460 to a pair of 5U4G double-diode rectifiers connected in parallel. It was tapped at 190-0-190 to feed the previously mentioned 6X4 rectifiers. The valve heaters were all supplied in parallel from one or other of the two power transformers, which provided mains isolation.

The tube was a 19AP4, a kind of transatlantic cousin of the Mullard MW41-1, with metal-cone construction. The 16in. Mullard type, operated at 12kV, provided a reasonably bright picture. One wonders what the 19in. 19AP4 was like at 10kV. Still, even that potential was dodgy with a metal envelope that had to be insulated from everything else in sight.

The Pilot TV37 and Dumont RA108A provide quite a contrast in TV technology. It seems that US TV engineers of the period were likely to encounter a very considerable diversity of circuit techniques. In conclusion, my thanks to Anthony Bullock for his invaluable assistance in providing data on these sets.

IR Remote Control Handset Tester

George Bagley

Infra-red remote control is now being used with an increasing amount of equipment of different types. Inevitably, faults occur. It's not always practical to have the equipment brought into the workshop when the problem concerns just the handset. I found that a remote control handset tester that would work with a wide range of remote control transmitter units was required so I decided to make my own. Its design was kept as simple as possible, with adjustable sensitivity to match the output of any unit under test.

The circuit is shown in Fig. 1. To simplify construction a ready-made IR receiver unit was adopted – the Philips IR receiver part no. 4822 218 20293, though it's possible that other units will work just as well. The output from the receiver unit goes directly to the base of transistor Tr1 which drives a meter giving deflection over a wide range of handset outputs. Control VR1 sets the meter's range. The meter used in the prototype is a battery-level type but any small meter should do – adjust the value of R2 to suit (in the prototype the value is 10kΩ). D2 is included to suppress any back-e.m.f. produced by the meter.

The LED D1 provides visual indication when testing handsets for range: a clear LED is used since it's easier to see at up to thirty feet. The test socket enables an oscilloscope to be connected to monitor the receiver's output.

The tester has proved to be a very useful and valuable addition to my test gear.

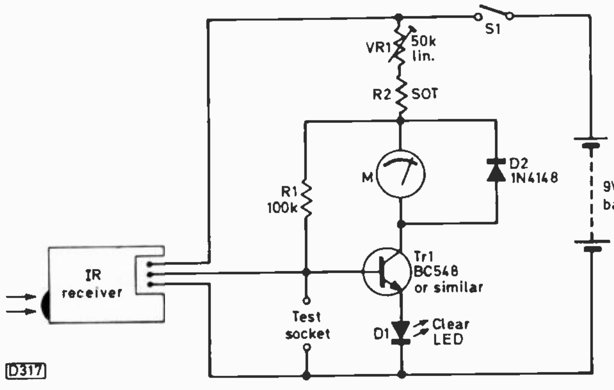


Fig. 1: Circuit diagram of the handset tester.

VCR Clinic

Reports from Steve Beeching, T. Eng., Derek Snelling, Steve Illidge and Philip Blundell, Eng. Tech.

Mitsubishi HS318 and HS306

Just before Christmas we took delivery of some Mitsubishi HS318 VCRs. This model replaces the HS306. It has similar features though with infra-red instead of wired remote control. Construction inside is similar, with most of the components on the main board across the top of the machine and the clock/timer/counter on a small subpanel at the front. Access to the heads and fuses is no easier – slightly fewer screws but it's necessary to unclip three small subpanels, one with the tracking control, one with the operate switch and light, and the other with the function buttons. Locating the main panel in the upright position is a bit easier however. A couple of these machines had no sound in playback or E-E. In both cases the cause was a crack in the print near a screw hole at the rear left of the main board.

A problem that's beginning to show up on the HS306 is failure of the wired remote control system. This can usually be cured by replacing the lead and plug. Some 2·5mm plugs are slightly shorter than the ones originally fitted however, and you may find that they don't work. The solution is to file the front of the socket down slightly. **D.S.**

Mitsubishi HS304

The problem with an HS304 was instability on the lower channels. The machine would appear to drift off tune on these stations, but when an attempt at retuning was made the machine refused to lock on the station, preferring to be just above or below the correct tuning point. A replacement tuner cured the problem. **D.S.**

Toshiba V31

We're finding that these machines are beginning to come in with worn heads as they approach twelve months old. **D.S.**

Hitachi VT8000 series and Ferguson 3V35/6

For those of you who like to codge the odd repair, here are a couple of tips. The first concerns the Hitachi VT8000 series, which tends to have a dry-joint on the i.f. can (see Fig. 1). To fix, burr the joint on top by hitting with a screwdriver, then solder with a high-wattage iron. This dodge should last at least six months and saves removing the i.f. can from the machine.

The second codge concerns the Ferguson 3V35/3V36. If you get one where the front loading doors keep going out of sequence, rather than replace the mechanism or the doors try burring the door hinges as shown (Fig. 2). This will force the doors over slightly to the right and stop them going out of mesh with the operating gears. **D.S.**

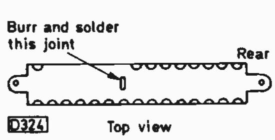
Finlux/Philips VR6462

We've recently had two Finlux machines with the same fault, failure to eject the cassette. The model concerned is the equivalent to the Philips VR6462, so presumably the fault could occur on these machines as well. The cause of the fault is mechanical: a small pin comes out of one of the operating levers. The lever in question is located under the main cam (see Fig. 3). To repair, remove the three circlips, then arm assembly A and cam B. Find the pin and refit it into the hole in the end of arm C. Use pliers to ensure a tight fit. Next find the small hair spring and refit it to the pin. Now for the tricky bit, reassembly. Push lever D as far towards the centre spindle as it will go. Fit the small metal block on to the pin and then hold arm C in such a position that as the cam is refitted the metal block locates in the slot beneath the cam, directly under hole E. The cam should push home fully with slight movement of lever F. If not, recheck the position of lever D. Refit the circlip to the cam and then refit arm A, ensuring that the pin locates in the metal block in the slot on top of the cam, then refit the remaining two circlips. Switch on and check for correct operation of the front loading and unloading mechanism. **D.S.**

Mitsubishi HS304 and HS7000

We had an interesting fault recently with a Mitsubishi HS304. The complaint was that it took a long time to return to normal speed after visual search, particularly in the forward direction. In fact it took up to ten seconds instead of one-two seconds for the capstan to return to the normal playback speed after search. IC4A0 contains a braking circuit amongst other things, but checks around this were rather inconclusive without another machine for comparison. We found however that pin 24, the reverse output, was permanently high, varying only slightly between forward and reverse search. The pin remained high when disconnected, so the chip was suspected. I should have realised when I found we'd got one in stock that fitting it wouldn't cure the fault, and it didn't.

Further investigation around the i.c. showed that the two Hall element inputs from the capstan motor were different. One was pulsing (as it should). The other was high and steady. A quick check showed that we didn't have a motor in stock so this was bound to be the cause of the trouble. When a replacement was obtained it cured the fault.



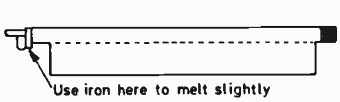


Fig. 1 (left): Dry-joint problem with the i.f. can in Hitachi VT8000 series machines.
Fig. 2 (right): A way of dealing with the front loading door problem on Ferguson 3V35/36 VCRs.

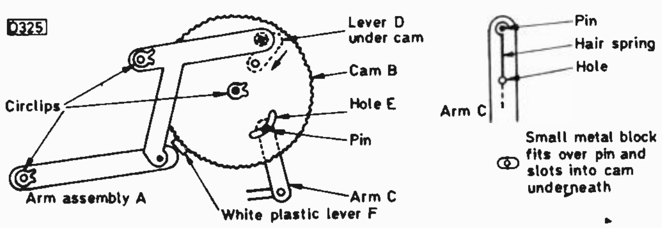


Fig. 3: Finlux/Philips eject failure problem – the small pin comes out of arm C.

Since then a colleague has had an HS700 with a similar fault. In this case the trouble occurred only in reverse search, which was slow when selected but speeded up when released before returning slowly to the play speed after about twenty seconds. Again the inputs to the i.c. (IC4A0) from the Hall elements were very different and a replacement motor cured the problem. **D.S.**

Ferguson 3V35

The problem was no functions. After removing the top the machine was tilted over in order to remove the bottom cover. A 2p piece then slid out from the component side of the mechacon PCB. Panic stations! How many dead bits will there be? The main microcomputer chip was working but didn't respond other than to power on, i.e. there was no output to the cassette motor although "cass in" was present. Now one would normally have a check round to ascertain the status of other inputs, but as the 2p piece could have damaged the chip this had to be eliminated from the search first. Naturally fitting a new one made no difference, so a check around the pins was called for. The housing up and housing down inputs were both high which is not at all correct: in fact the cassette housing had overshot its stop position in the eject mode. It had to be wound back and then repowered to reset the microcomputer chip, after which correct operation was restored. Of course that may have been the original problem, in which case the housing switches are suspect, or the presence of the 2p piece could have held pin 37 high. We shall never know! **S.B.**

Toshiba V65

This machine is equivalent to the JVC HRD140, but without remote control. The problem was no functions. Although new stock, the machine had a short history of peculiar problems. It had intermittently failed to respond to "power up", then subsequently to play, fast forward, rewind etc., though the "instant record" function always worked. It eventually failed completely while out on rental (clapped out as dealer Pete put it).

This time there was no power up, though the capstan motor ran for a long time before stopping. Operation code data reached pin 21 of IC601, the mechacon control i.c. The output at pin 1 didn't go fully to 0V, but when it was earthed the capstan motor didn't run. After replacing the i.c. all was expected to be well. Pin 1 went to zero, the capstan remained still but the power light stayed off. Over on the power supply the regulator wasn't switching on for a number of reasons: zener diode D3 was leaky, Q10 was also leaky from collector to base while circuit protectors CP1 and CP4 were open-circuit. Q10 must switch off to allow the supply regulator Q7/8 to come on. The junction of R12/D3 is earthed via 2·2kΩ by the microcomputer chip so the voltage here is about 1·9V: this reverse biases the zener diode and Q10 switches off.

I don't know why so many components in this part of the circuit were damaged. Stop press: Pete has just phoned to say that it keeps doing silly things like suddenly coming on or ejecting cassettes. . . **S.B.**

Grundig VS200/VS220

A short note that may save a few headaches.

If the customer reports the display of "7" in rewind, sometimes accompanied by tape damage, the take-up motor is suffering from tight bearings when hot. It tends to occur with motors date coded before 06/84, but later motors have been known to fail. When replacing the motor, remove the plastic cover from the brake solenoid rear mounted switch. It's not fitted on all machines: dust gets trapped here and can lock up the control micro.

If the customer uses high-grade tapes the cassette exit guide (the one on the front left corner) can unscrew due to static build up in rewind. Check the setting so that there's no tape edge curling and that the tape path is compatible, then seal it with "lock tight" or nail varnish (Passion Red is best. . .). **S.B.**

Panasonic NV2000

The timer couldn't be programmed. The cause was that the clock i.c. failed when hot. Fixed up a can of freezer with a hole through the front panel so the customer could operate the machine – or did I change the chip on that one? **S.B.**

Sharp VC381

The unusual problem with this machine was picture rolling on E-E and record. If it had been a VC7300 I'd have homed in on the i.f. packaged circuits. The signal at the output from the i.f. section was fine however. We followed it through IC201 but found that the field sync pulses were missing by the time the signal reached IC402. Coupling capacitor C438 (47μF) was low in value. **P.B.**

Philips VR6660

The customer complained that the machine didn't pull the tape back into the cassette every time. It worked fine until I tried to eject the tape after running in rewind search. Then the jockey wheel jammed half way and tape spilled everywhere. A new jockey wheel was needed. **P.B.**

Toshiba V8600

This machine came in for no E-E operation. The audio and video signals were both present at the input to the r.f. modulator, but there was no r.f. output. The supply to the modulator was found to be low because the modulator supply switching transistor Q661 was leaky. Fitting a replacement cured the fault.

A quick way of checking the signal from the r.f. modulator to the r.f. converter is to connect an "isolated" lead from the r.f. modulator's output to the aerial socket of a TV set. This normally gives some indication as to whether the modulator is working. **S.I.**

Hitachi VT14

The problem with this machine was intermittent loss of sound in the E-E mode. The sound would disappear for several seconds a day, which was most irritating. Armed with a signal tracer – and a lot of patience! – we checked whenever possible the audio to and from audio board PG405 and chroma board PG751. We were eventually able to eliminate these boards. This brought us to the tuner/i.f. board, where checks on the voltages around IC881 suggested that the audio defeat circuit was operating when the fault was present. We eventually arrived at the programme PCB where we found that the programme chip IC721 was faulty, intermittently operating the audio defeat circuitry. **S.I.**

Long-distance Television

Roger Bunney

The first month of 1986 was unfortunately yet another quiet one for DX-TV reception. Even the January Quadrantids meteor shower produced little. A few minor Sporadic E signals confirmed that the E layer still existed, but the few reception reports indicate how bleak the period has been. The SpE log is as follows:

5/1/86 ORF (Austria) ch. E2a.
9/1/86 ARD (W. Germany) E2.
11/1/86 SR-1 (Sweden) E3; MTV-1 (Hungary) R1.
12/1/86 TVE-1 (Spain) E2.
21/1/86 NRK (Norway) E2; TSS (USSR) R1.
22/1/86 RAI-1 (Italy) IA.
26/1/86 RAI-1 IB.
29/1/86 TSS R1.

Ian Menzies (Aberdeen) noted an interesting aurora on January 6th. It apparently had three phases (they usually have two). This evening event produced mainly NRK/TSS signals between 2020-2030, 2130-2140 and 2300-2320 (all times GMT). A "mainly Scottish" aurora was also logged during the evening of January 21st. Intensive auroral activity occurred during the evening of February 8th. It was visible in the southern UK and produced Radio Kent (104·2MHz) and French/Dutch Band II f.m. signals in Scotland.

Ray Davies (Norwich) reports an intense SpE opening during "mid-January", with JRT (Yugoslavia), RAI and ORF amongst others – but he forgot to log the date! My thanks also to Simon Hamer (Powys), Iain Menzies and Tim Anderson (St. Leonards) for reporting on their reception – or rather lack of it – during January. Incidentally Tim (2 Burry Road, Silverhill, St. Leonards, Sussex) would like to get in touch with other *local* DX-TV enthusiasts with a view to establishing an informal club/early warning reception network – write to him directly. He mentions that the local 23cm ATV repeater GB3SX should be on-air at Easter, accepting either a.m./f.m. video in with a.m. video out on RMT1: ATV, both 70 and 23cm, is expanding in his area.

Alan Reekie (Brussels) reports that the first test transmissions of the new French fifth TV network started in early February: at present transmissions are from 0900-1700 CET daily, but should increase later. The PM5544 test pattern is used with identification "MV5". The fifteen transmitters reported to be on-air include Paris ch. E30, Lyons ch. E28, Marseilles ch. E32, Lille (town) ch. E65 and Lille (Bouvigny) ch. E51.

A new RTE TV transmitter listing is available from RTE, Reception Investigation, Dublin 4, Eire (dated January 1986).

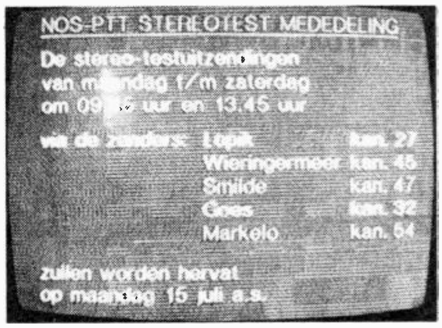
If all is gloom in W. Europe those in Australia are having a ball. With the closure of the ch. 0 SBS-TV transmitters the opportunities for DXing have increased, particularly in conjested areas such as Sydney and Melbourne. Robert Copeman (Victoria) has sent us several letters reporting the wide open conditions across Australia to the north and west, also to New Zealand. He has received many DX f.m. radio signals in Band II (Band II f.m. radio is relatively new in Australia): one good catch was Alice Springs 8KIN-FM (100·5MHz) on January 2nd.

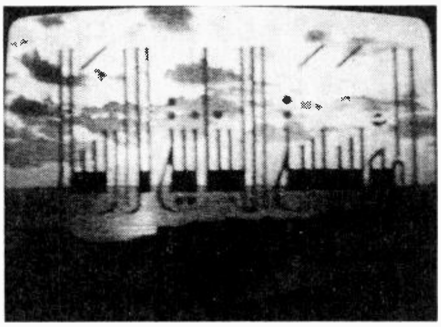
Anthony Mann (near Perth, Western Australia – home after a period in the USA) reports reception of multi-hop SpE signals from the north. On December 29th he received China ch. R1 and Malaysia chs. E2/3/4 at upwards of 4,000 miles, along with Eastern Australian and New Zealand transmitters – the opening lasted for some three hours. Intense openings to the east occurred on the following day (30th), reaching as far as American Samoa (ch. A2) at 4,700 miles for about an hour and a quarter at mid-day Perth time. The Samoan signals are at plus five hours – both vision and sound were received. There were many short-skip openings during the period end December/early January. Let's hope that this is a foretaste of the 1986 European SpE season!

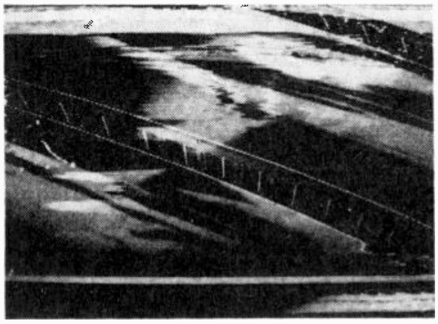
There have been no undue problems to date with ch. E2/R1 reception following allocation of the 50-50·5MHz band to Amateur Radio, though it's early days yet. For the record the maximum e.r.p.s allowed are 25W (14dBW) for f.m./c.w./a.m. and 100W (20dBW) for s.s.b. (peak envelope power). We would welcome any reports from readers on problems experienced with DX-TV reception in this band and any remedial measures (if any) taken.

Ryn Muntjewerff (Holland) was featured in a Nederland-1 programme transmitted by Veronica TV from 1530-1600 CET on February 1st. Typically, appalling weather prevented even those in East Anglia resolving the programme.

Planning regulations have been relaxed to allow dish aerials with diameters up to 1m to be mounted at the fronts of houses – apart from in conservation areas.







Left: Caption for stereo sound test on NOS-2 (Holland). Note the locked, floating PM5544 test pattern from TDF (France), with inverted transmission standard (L). Photo from Tim Anderson. Centre: RTT (Tunisia) station identification slide received by Marios Colocassides in Cyprus. Right: An example of the scrambling system now used by HBO and Cinemax in the USA – the VideoCipher II system manufactured by M/A-Com.

Previously dishes could be erected only at the rear of premises.

News Briefs

The Swiss "Telecineromandie" pay-TV channel (E69) is now in operation. The descrambler costs 150 Swiss francs and the monthly subscription is 20 Swiss francs, giving access to mainly film material. There are plans for a relay network . . . More NOS-2 (Holland) transmitters are being equipped with the two-carrier sound system, for either dual-language or stereo broadcasting . . . There's a suggestion that a new Italian transmitter in the South Tyrol region may be used to transmit UK material – the Music Box pop programme – to Bavaria . . . The Dutch Army is installing relay transmitters in W. Germany for the NOS output – Luneburger-Heide is thought to be using ch. E41 (an NOS transmission has been received in Holland from the direction of Bremen).

Satellite TV Terms

With the increasing number of TVRO systems in use in the UK for reception of satellite TV transmissions in the 10·9-11·7GHz band, the following short glossary of common terms may be helpful to readers.

Aperture. The "square area" or size of a parabolic dish.
Az/el mount. Dish support system that allows for separate adjustment of azimuth and elevation.
Azimuth. Horizontal rotation of a dish, expressed as a compass bearing relative to true north and measured in a clockwise direction.
Beamwidth. Dish aerial polar response, indicating the narrowness of the forward pickup lobe. Beamwidth decreases with increased gain and frequency. Dish aerial gain is usually expressed in dBi (dB isotropic): a given dish size will give higher gain with increase in frequency.
Boresight. The part of the Earth's surface at which a satellite's transmitting aerial is aimed and where the strongest field strength (dBW) will be found.
C Band. 3·7-4·2GHz. Widely used for satellite TV transmissions in N. America.
Cassegrain aerial. Aerial system with a hyperbolic subreflector mounted at the focal point of the dish to direct the signal to the centre of the dish where the feedhorn connection is made.
Dish efficiency. Dish performance figure with respect to gain. Usually in the region 60-65 per cent.
Dish illumination. Part of the dish "seen" by the feedhorn. The feedhorn has to be arranged so that when positioned at the focal point of a given F/D dish it doesn't see too much over the edge of the dish or enough of the dish surface.
Downlink. Signal transmitted from a satellite to the Earth's surface.
EIRP. Effective isotropic radiated power. A measure of the signal strength transmitted towards the Earth.
Elevation. Vertical movement of a receiving dish, expressed in degrees above the horizon.
F/D ratio. Indication of dish depth. Calculated by dividing the focal length by the diameter. A higher ratio means a shallower dish.
Focal length. Distance from the focal point to the centre of the dish.
Footprint. Area of the Earth's surface covered by a satellite's transmitting aerial. Shown as a contour map expressed in dBW. A good guide to the size of receiving dish required at any location within the contours.

Ku Band. 11·7-12·7GHz.
Offset angle. Tilt (in degrees) of a polar mount aerial from its polar axis to ensure correct tracking (horizon-to-horizon) of satellites in geostationary orbit. The angle increases the farther north the receiving location is from the Equator. Also known as **declination angle**.
Offset-fed aerial. Reflector system in which the focal point is offset or stood to one side of the dish so that the feedhorn and its support do not block the signal path, giving increased efficiency.
Parabolic dish. Dish with specific (logarithmic) curved surface to reflect all incident signals to a common, small focal point along the axis.
Polar mount. Dish support system that provides simultaneous adjustment of elevation and azimuth.
Polarisation. Signal sense, either vertical, horizontal or circular (left- or right-hand).
Prime-focus feed. Dish aerial system with the feedhorn/LNA assembly mounted at the focal point.
Transponder. Satellite receiver/amplifier/transmitter receiving from and transmitting back to the Earth.

Satellite TV

Confusion in W. Germany! The "3 SAT" service to parts of E. Europe via the Eutelsat I-F1 satellite's east spot beam has been declared unconstitutional by the federal government. The service uses ZDF/ORF/SRG material and has been run by ZDF-Mainz. The government claims that it alone has the authority to organise/transmit programmes outside W. German borders. It seems that a lawsuit to terminate the service is pending. There has also been argument about the SAT-1 service via

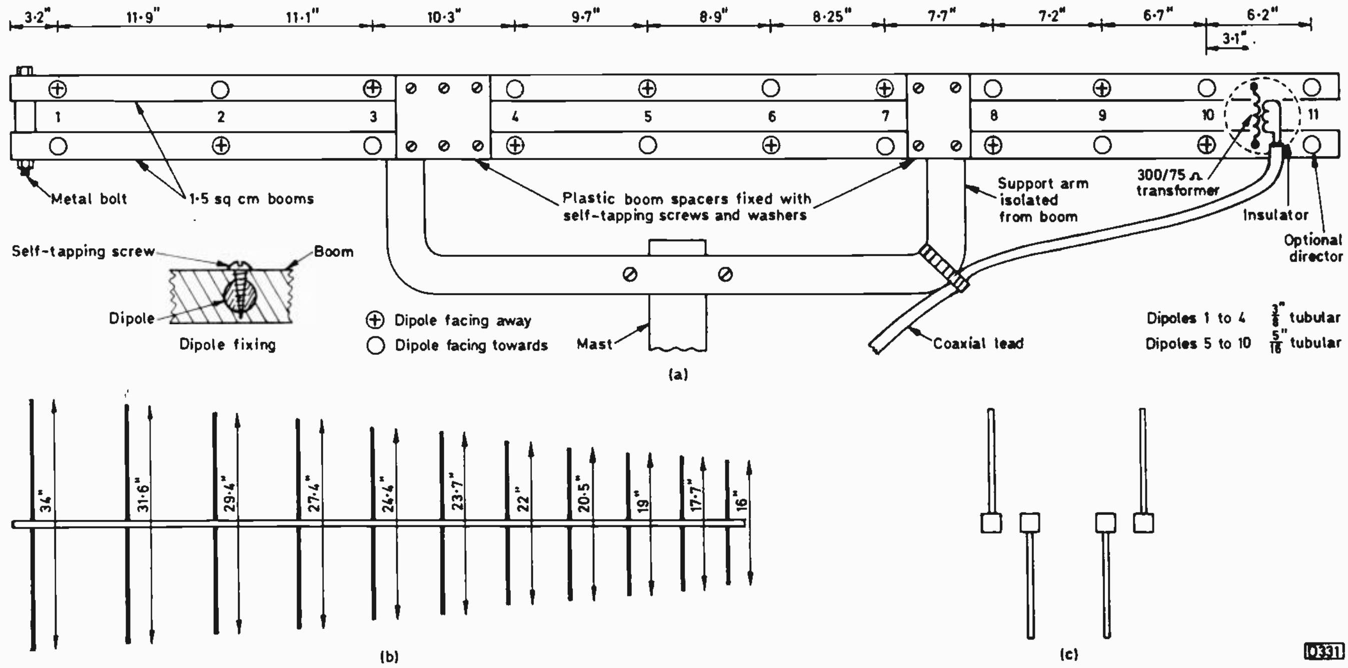


Fig. 1: Band III log-periodic aerial designed by Roger Pates. (a) Constructional details; (b) element dimensions; (c) arrangement of alternate dipoles on the boom.

the Eutelsat I-F1's west spot beam.

In the USA CBS, HBO and Cinemax have all started to use scrambling for their satellite distributed programmes. The HBO and Cinemax programmes, intended for cable operators, have been viewed by users of some 1·2 million TVRO systems.

The 50MHz Band

The information that was published in support of the 50MHz Amateur Radio allocation suggested that possible interference to TV would be limited to eight ch. E2 transmitters in mainland Europe. No mention was made of ch. R1 nor of the re-engineered French ch. L2, both of which spread through the allocation. In total, allowing for two projected French stations, some 73 transmitters in Europe and the Western USSR could experience interference via SpE. Letters outlining the situation have been sent to the DTI and the RSGB but to date no response has been forthcoming.

There's been a report of 50MHz interference from a digital telephone exchange, consisting of wideband digital hash and pulse modulation. The hash runs up to 20dB above threshold and the pulse interference to 40dB, depending on exchange loading. If anyone knows of a cure or would like to comment, please write in.

Band III Log-periodic Aerial

Log-periodic aerials are quite widely used in the UK for u.h.f. reception. Their advantages lie in a clean polar response and substantially flat gain across the intended bandwidth (a standard wideband Yagi array has a rising gain over the bandwidth). Since there's been little need for wideband Band III arrays in the UK few log-periodic aerials for use in this band have been manufactured here.

Roger Pates (Nottingham) has designed a wideband Band III log-periodic aerial that's given most encouraging results. By way of confirmation Tony Mancini (Derby) is using one of these aerials, made for him by Roger, and reports a noticeable improvement in comparison with the eight-element wideband Band III Yagi he'd previously been using, particularly at the lower end of the band.

Details of the array are shown in Fig. 1. It was constructed from salvaged u.h.f. aerials, using 1·5 sq cm booms and plastic spacers cut from a 1/8in. thick polythene bucket, so the cost is minimal. Drill 3/8in. holes through the booms for dipoles 1-4 and 5/16in. holes for dipoles 5-10, securing the dipole elements from the top by means of self-tapping screws – use plated or aluminium screws to minimise corrosion. A standard 300/75Ω matching transformer is used to connect the coaxial feeder to the output – such transformers are available from hi-fi shops for use with imported f.m. tuners etc. Alternatively a suitable transformer can be wound on a toroid. An additional director some 6·2in. ahead of the first dipole (at the transformer end) will enhance the performance at the h.f. end of the bandwidth (ch. E12). The dipole spacings given are element centre to centre: the lengths are overall measurements which must be halved for each element fixing point. It's essential to avoid any metal mast passing through the dipole chain (use a fibreglass mast if it has to pass through the array). Roger uses a Fringe Electronics Band III amplifier at the masthead.

If the array is well constructed the gain sould be 8·5-9dBd across the 175-220MHz bandwidth. The beamwidth will be around 60° at the −3dB points and the front-back ratio some 20dB maximum.

From our Correspondents . . .

A reader in Rastanura, Saudi Arabia writes that he constructed his own four-bay bowtie aerial, which he installed at 40ft. A surprise reception was an AFRTS (American Forces service) programme on ch. E27, carrying the identification "SEB Italy". This identification ("Southern European Broadcasting") is used with transmissions sent via Intelsat V at 1°W. Can anyone suggest the Arabian source of this signal?

An excellent tropospheric opening in the Eastern Mediterranean during November 12/13th gave Marios Colocassides in Nicosia, Cyprus an impressive sunset logo identification from Tunisian TV ch. E33 Zaghouan (1·4kW e.r.p., location south of Tunis) – see photo.

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.

HITACHI NP9A CHASSIS

The line output transistor Q702 keeps blowing. The original one was very leaky: the set would try to work, but the resistor module CP702 that supplies the line driver and output transistor burnt up. After replacing the module and the line output transistor the set worked all right for several weeks, then Q702 blew at switch on. A BU208A was tried for test purposes and the set again worked – CP702 o.k. this time. It worked for a while then Q702 once more failed.

It's advisable to use the correct type of line output transistor in this chassis. We would suggest that you replace the bunch of 0·039μF flyback tuning capacitors C715/C716/C732/C749 after carefully checking the entire line output stage for dry-joints, especially around the transformers T701 and T703 – it's worth retinning and resoldering each pin even if the joints look all right. We have heard of Q702 failing as a result of the HM9105 thick-film module CP901 in the power supply producing jitter.

TANDBERG CTV1 CHASSIS

The problem with this set is weak video. The set is unusual in using RGB drive to the tube's grids – a check reveals that these are highly negative. Any idea of the cause?

The signal coupling to the grids is capacitive, with diode clamps. If there's excessive ripple on the h.t. line the clamp diodes will rectify this to produce the negative voltages you mention. Try replacing the large electrolytic cans C405 and C406 (200 + 200μF each).

FERGUSON 3V22

This machine intermittently records in monochrome. Could you suggest likely checks for this?

The usual cause of this fault is incorrect adjustment of the record colour killer control on the Y/C board. Turn it to the end of its travel at which colour is recorded – the other way will give permanent monchrome recordings. Less likely causes are the following, in this order: IC202 (AN305); the 4·433169MHz crystal; the 4·435571MHz crystal; misadjustment of the colour a.f.c. and a.p.c. loops – a frequency counter and scope are required to set these up.

SONY KV2000 Mk II

The problem with this set is no results – no sound and the tube's heaters out. There's a 1Hz thumping sound from the speaker and a coincident squeak from the chopper transformer. No shorts can be found. Disconnecting the output plugs from the power supply remove the thump but the 1Hz squeak from the chopper transformer continues. There's 320V across the mains bridge rectifier's reservoir capacitors.

The power supply doesn't seem to work unloaded and the thump suggests that the audio side is o.k. The fault is almost certainly in the line output stage. If there's no leakage in the SID30-15 efficiency diode D806 it's safe safe to assume that the line output GCS has failed. These symptoms can arise when its gate is open-circuit.

SHARP VC9300

After half an hour or so on playback the machine stops. When play is pressed the machine starts up again but stops intermittently after different lengths of time.

There can be several possibilities for this type of fault – even pinholes in the tape oxide. If the fault occurs in play and record but not fast wind the usual culprit is the drum pickup head mounted near the drum motor flywheel – it's probably going open-circuit intermittently or positioned too far from the flywheel.

SANYO CTP6112

This set has touch tuning but the channels keep changing of their own accord. We checked for h.t. and e.h.t. discharges and cleaned all relevant areas and have changed the chips on the preset tuning board but the problem remains.

This sort of thing is very often due to conduction on the touch tune assembly itself. Prove this by disconnecting the touch pads from the chip inputs. If this clears the problem and thorough cleaning of the touch surfaces doesn't help, fit a new sensor panel.

SONY C5

Pressing the record button also activates the pause function: pressing the pause button then cancels pause and initiates record. The fault doesn't occur with a timed recording. All other functions operate normally.

Remove the front panel to gain access to switch board SY14. Check carefully for signs of corrosion or moisture ingress on the board and in the function switches, also for print faults or damage. Check D4 for leakage. If it's o.k. there's probably a fault on the syscon panel (SY15). Items to check here are D30, IC1 and the microcomputer chip IC7 (μPD547C-049).

GRUNDIG 6010TD

The problem is that the volume will not stay low. When the control is set for low sound the level gradually rises on its own.

The problem is becoming increasingly common on this set. It's generally due to leakage in the paddle-switch

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TELEVISION APRIL 1986

assembly which adjusts the volume level. A less common cause is the "memory cell" for the sound level (SB29.40741-1101) – this becomes leaky. Spares are now hard to obtain in view of the set's age.

TEST CASE

280

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

By way of a change, this month a monochrome set. In practice there's little difference between colour and monochrome sets these days unless one's considering the decoder or RGB drive circuits – the power required for scanning and the e.h.t. differ of course. Our subject this time is at the lower end of the power-consumption league, a small-screen portable Pye Rambler, fitted with the Philips TX chassis.

The shop assistant had written "frame collaspe" on the job card, an expressive misspelling conveying perhaps the last dying breath of the field timebase . . . ? There was certainly no field scan, also an imminent danger of burning the screen phosphors since the single horizontal line across the screen was very bright indeed, even at the lowest setting of the brightness control. The simplest way of overcoming this problem was to remove the tube's base socket and dress it clear of mischief. This was done and attention was turned to the field timebase, a d.c.-coupled seven-transistor circuit with a complementary-symmetry class B output stage.

The field oscillator and output stages are supplied by the 26V boost line which is derived from the line output stage in the traditional manner. These supplies were found to be present and correct. Since the output stage midpoint voltage was found to be about 7V low at 2·7V instead of just over 10V it was decided, to save time, to disconnect two of the legs of each of the field amplifier, driver and output transistors (TS520, TS523 and TS521/2 respectively) and cold check them with an ohmmeter. This technique will often expedite fault finding: not this time however! The transistors all measured correctly, as did the three diodes in the output stage, D508-510. An oscilloscope hooked to the midpoint of the output stage – the emitter of TS521 – showed that there was virtually no activity here, eliminating the possibility of open-circuit scan coils or connections. Time to move a step back, to the driver stage.

The voltage at the collector of the driver transistor and the base of the lower output transistor was also found to be very low, 2·5V instead of around 9·5V, so the operation of the field oscillator was investigated. This appeared to be running at full bore – there was a 9·5V peak-to-peak sawtooth at the collector of TS515 and the voltages in this area were all correct. The oscillator's output is coupled to the base of the amplifier transistor TS520 via two high-value resistors and the height control. The two fixed resistors were unhooked in order to make resistance checks but both were found to be within tolerance. The height control also seemed to be o.k., but TS520's base voltage was only around 0·3V and the waveform here, a most unhealthy clipped sawtooth, was a mere 0·22V peak-to-peak, far short of its normal 1·3V peak-to-peak value sitting on 2·4V d.c.

The amplifier transistor's emitter voltage is taken from the output stage's midpoint – this is the usual d.c. stabilising feedback loop. It was realised that the correct operation of TS520 was crucial to the operation of the amplifier/driver/output stages so a new BC559 was fitted in this position. It made no difference at all. The other transistors and the associated resistors were then checked, all to no avail – replacement of the tube's base revealed that the bright line was still obstinately present.

Having run out of ideas the young man with the AVO and soldering iron consulted one of his senior colleagues. This worthy studied the screen symptom, then the circuit diagram. He then chastised the young man for not taking into account all the displayed symptoms. What had been overlooked? See next month.

ANSWER TO TEST CASE 279
– page 326 last month –

The Expert-branded GEC/Hitachi set (NP8CQ chassis) last month produced no sound or raster – not with the normal mains voltage applied anyway. If you recall, supplying it via a variac produced results of sorts at low mains input voltages. What was found to be happening was that the chopper circuit was running virtually out of control, trying to establish an h.t. voltage way in excess of the normal 108V. As the h.t. built up at switch on the set would momentarily come to life, only to trip out when the h.t. rose to around 120V, due to the action of the over-voltage crowbar trip. This accounted for the lack of h.t. voltage, the "purr" from the chopper transformer and the burst of life again at switch off as the voltages fell. Why was the power supply failing to regulate?

The chopper transistor Q901 is connected in a blocking oscillator circuit. There are two other transistors, the error detector/amplifier Q902 and Q903 which controls the chopper transistor's base drive conditions. You'll remember the sudden increase in Q902's collector voltage as the h.t. line rose above its correct 108V. This should increase Q903's base current. Q903 acts as a variable impedance in the chopper transistor's base circuit: reducing this impedance reduces the self-oscillating chopper's duty cycle. The cause of the trouble was that the 2SC2060 transistor in the Q903 position had low gain. We've found that "equivalents" don't work well in this critical position – you have to fit the real McCoy.

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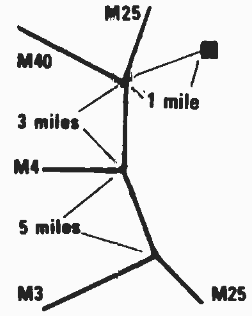

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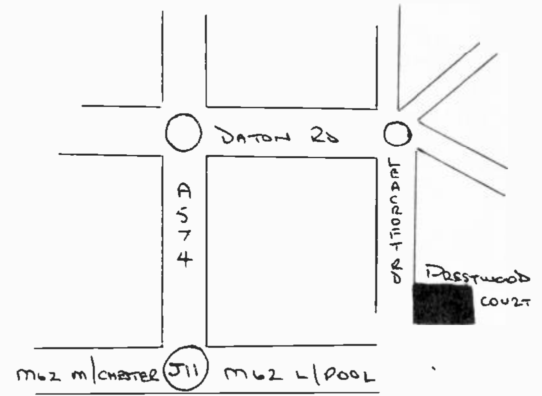

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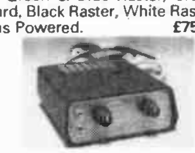

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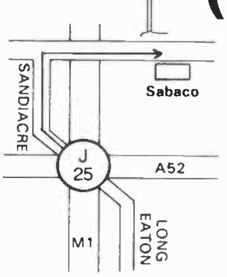

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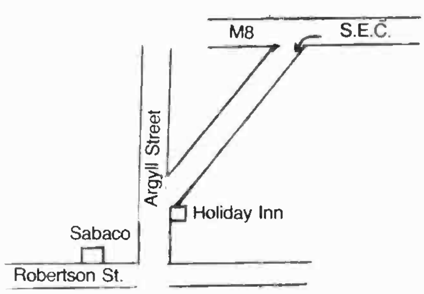

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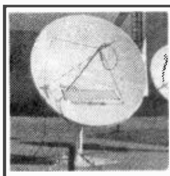

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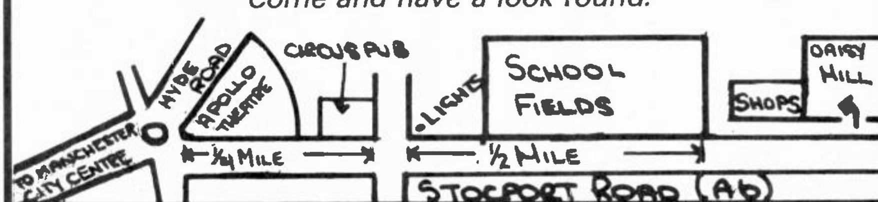

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SONY 1400KV Tuner unit £3.50
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G11 touch button red 6 for £1
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AC131	15p
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BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	16p
BF244	40p
BF245b	20p
BF257	20p
BF258	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF337	50p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF422	15p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF494	30p
BF594	10p
BF597	10p
BF858	30p

BF694	10p
BF758	30p
BF760	30p
BFT34	15p
BFT43	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
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BFY52	20p
BFY90	25p
BLY49	25p
BPW41	25p
BRC116	25p
BRX43	15p
BRX48X	10p
BRY56	30p
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BSY79	10p
BSY95a	10p
BTY80	20p
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BSX20	17p
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BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	10p
BC171	25p
BC172	10p
BC173	10p
BC174	10p
BC183	10p
BC184	10p
BC204	10p
BC207	10p
BC212	10p
BC213	10p
BC214	10p
BC237	10p
BC238	8p
BC239	10p
BC250	8p
BC251	10p
BC252	10p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	15p
BC349b	10p
BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p

BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BCX31	25p
BCX32/36 Pair	75p
BCX32	25p
BD116	25p
BD124	30p
BD124 (metal)	30p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD140	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	60p
BD204	60p
BD207	60p
BD221	20p
BD222	30p
BD228	30p
BD226	30p
BD233	30p
BD235	30p
BD238	30p
BD239	15p
BD240	50p
BD243c	30p
BD244	30p
BD250a	50p
BD252	20p
BD253B	50p
BD331	20p
BD373b	25p
BD416	25p
BD433	25p
BD437	25p
BD439	50p
BD678	30p
BD681	30p
BD682	30p
BF761	30p
BF819A	30p
BF858	30p
BF871	30p
BFR39	15p
BFR52	7p
BFR79	15p
BFR81	15p
BFR87	10p
BFS60	10p
BFT42	20p
BFT57	20p
MR1366	20p
BRC-M-200	40p
BRC-M-300	50p
BRC 1330	75p
BRC 3064	£1.00
BTT822	£1.00
BTT6016	£1.20
BTT6018/	
ML237B	£1.50
BTT6218	£1.50
BTT8124	£1.00

Thyristors

BT151/800R	80p
BT106 Plastic	30p
BT106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
GI1 Thyristor	60p
Decca 80 100	60p
2N4444	£1.00
MCR72-6	25p
OT112	£1.00
TF320M	£1.00
HC8441	£2.00
17052	£2.00
17088H	£2.00
17089R	£2.00
17053R	£2.00
5P2M	50p
MCR72/6	50p

Thermistors

G8 Degausing	35p
Philip type VA1104	70p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34	20p
Degausing Thermistor (fits most sets)	20p
GEC Double Thermistor	25p

Filters

5-5MHz	15p
6MHz	30p

I.C. Heat Sink	20 for £1
20×TO5 Heat Sink	£1.00
CVC 9 power supply board	£1.50
CVC 20/2 mains panel	£2.00
ITT Mains Filter .1/250v/ CVC 20 to 45 chassis	50p
Pots 10 k with Switch	25p
Mullard Surface Wave Filter RW 153P Colour TV Filter	40p
Mullard Surface Wave Filter RW 154 Colour TV Filter	40p

TV Crystals

4MHz	
4.433-619	
6MHz	
8.867238	
11.059.000	30p
Large or small	50p each
NEC 4730312	£3.00
Line Tran Tripler in Case	
Antistatic Isolators	
Disc Type Black	10p
RCA 1693	£1.00

I.C. Holders

DIL – DIL

40 Pin × 4	£1.00
42 Pin × 5	£1.00
28 Pin × 5	80p
16 Pin × 10	70p
24 Pin × 5	75p
14 Pin × 10	70p
18 Pin × 10	80p

DIL – QIL

16 Pin × 10	£1.00
18 Pin × 10	£1.00
28 Pin × 4	£1.00
AB Mains Switch u/v	30p