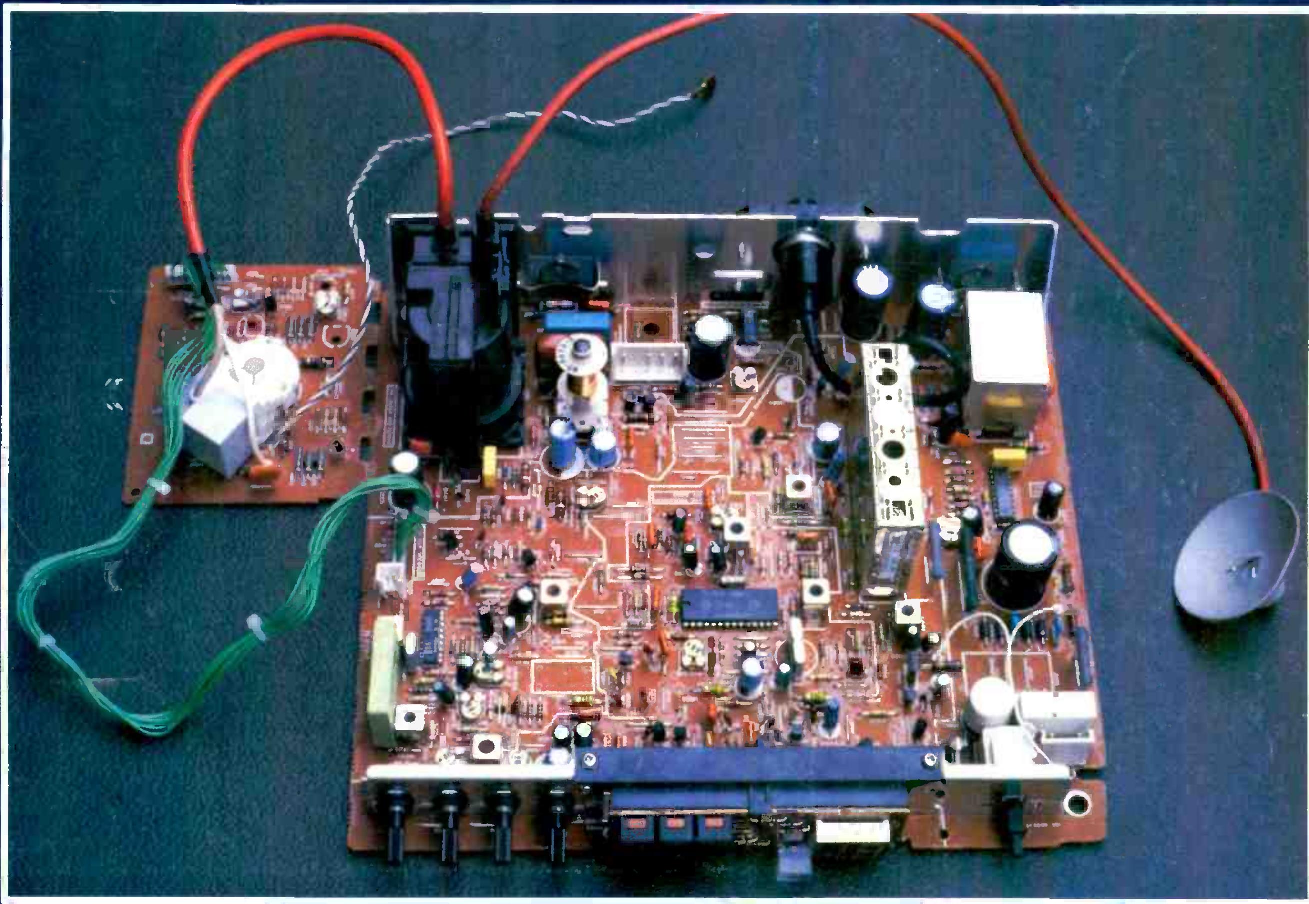
JANUARY 1986

Australia $2, New Zealand $2·50, Malaysia $5·75 £1·10

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



Decca-Tatung Chassis Up-date
The N. American TV Scene
Servicing Sets with Teletext
SMATV Systems • Vintage TV
TV Fault Finding • DX-TV
VCR Clinic • Tuning Troubles

TELEVISION

January 1986

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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
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BINDERS AND INDEXES
Binders (£4·50) and Indexes (45p) can be supplied by the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF. Prices include postage and VAT. In the case of overseas orders, add 60p.

BACK NUMBERS
Some back issues are available from the Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF at £1·20p inclusive of postage and packing.

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 FEBRUARY WILL BE PUBLISHED ON JANUARY 15

P. V. TUBES

TEL: 0254 36521/32611

104 ABBEY STREET, ACCRINGTON

SUNDRY EQUIPMENT

Test Lead Set	4.20
Degaussing Coil Stick	17.00
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.	399
Dynascan 470 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 .75mm²	15.47
F032 3 Core Round .5mm²	15.75
F035 3 Core Round 1.25mm²	28.21
F041 Speaker 7/0 2mm	3.90
Coaxial 75R	13.50
F051 Multicore 8x7/0	9.75

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
VEKIT 14	SANYO	VTC5000
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	18.00
Remote Control Tester		29.94

DATA BOOKS (Zero VAT)

Pair of A-Z/2N2S TV180	8.50
LIN IC Books (data only not Equiv.)	7.00
LINI	5.95

IC equivalent booklet £3.25 and transistor equivalent booklet £3.25

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) 381/383/386/9100/9300/9500	2.48

VIDEO HEADS

3HSS UHS	32.50
4HS VHS	32.80
PS3B Beta/Sony	37.00
Philips V2000	57.00
Philips 1700	57.00
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 381/3/6/8 9100/9300/9500	56.00
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		15.10

NEW LABGEAR

* CM7271-MHA 15db	8.25 *
* CM7274 4 Way Dist.	21.45 *

SERVICE AIDS

SERVISOL Freeze-It	1.14
SUPER SERVISOL	98
SERVISOL Foam Cleanser	96
SERVISOL Plastics Seal	1.08
SERVISOL Silicone Grease	1.20
SERVISOL Tubes Silicone Grease	1.64
SERVISOL Aero Klene	90
SERVISOL Aero Duster	1.20
SERVISOL Excel Polish	92
SERVISOL Video Head Cleanser	86
Super 40	1.62
Fire Extinguisher 640G	2.86
Heat Sink Compound 25G	1.08
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	74

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
Mast Amp/Power Unit WB	18.00
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	11.24
CM7262 Reg. Power Unit 12V	12.25
CM7060 MHA 10db 12V W/B	9.86
CM7065 VHF/UHF MHA W/B 12V	14.34
CM7066	13.38
CM7067 UHF 12V MHA (Specify A-B or C/D)	10.72
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	15.95
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	15.27
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	22.17
CM7108 VHF/UHF 8+1 Dist. Amp.	43.26
CM9700 27mhz CB Suppress.	4.05
CM6011 Outdoor Splitter (2 way) W/B	7.83
CM9003 Flush Single Outlet	1.47
CM9010 Flush Twin Outlet	1.95
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD)	7.69
CM6006 6 Way Passive Splitter	10.97
CM7042 TV Games Combin.	2.95
CM9009 Flush TV/FM Outlet	3.05
CM7091 Col. Bar Gen.	121.80
CM9006 VHF/UHF Diplexer	3.60
Televerta up converta	37.20

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

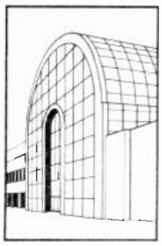
Heat gun	15.95
Heat gun tips (pair)	57
3/16" Iron tips 25W (MT5)	57

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				



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G.G.L.COMPONENTS

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PHONE (0228) 20358/39693

BUY WITH

INTEGRATED CIRCUITS

TYPE	PRICE (£)
AN214	1.95
AN301	3.45
AN303	3.45
AN305	3.50
AN7110	1.93
AN7114E	2.33
AN7115	2.37
AN7116	2.35
AN7145	3.25
BA312	1.25
BA511A	1.95
BA521	1.85
BA532	1.95
BA536	2.55
HA1166	2.65
HA1322	2.10
HA1338	2.78
HA1339	2.40
HA1342A	2.20
HA1366 W/WR	1.95
HA1370	2.75
HA1374	2.45
HA1377	3.80
HA1388	4.20
HA1397	3.90
LA1201	1.75
LA1230	2.30
LA1365	2.45
LA3350	1.65
LA4031	2.45
LA4032	2.30
LA4101	1.50
LA4102	1.95
LA4400	2.50
LA4430	2.45
LA4440	3.55
LA4460	2.95
LA4461	2.95
MB3712	2.30
MB3713	2.25
ML231B	2.35
ML232B	2.55
ML237B	2.50
SAA1124	3.45
SAA1125	4.70
SAA1250	3.85
SAA1251	4.95
SAA5010	5.10
SAA5012	5.70
SAF1032P	3.25
SAF1039P	4.55
SAS560S	1.95

TYPE	PRICE (£)
SAS570S	1.95
SAS580S	2.40
SAS590S	2.40
SL1430	1.95
SL1432	1.75
STK0039	6.45
STK0040	5.95
STK0050	7.50
STK077	7.25
STK078	7.45
STK082	9.75
STK415	9.66
STK430	7.75
STK433	6.50
STK435	6.75
STK437	7.25
STK439	7.55
STK441	8.50
STK459	7.35
STK461	7.95
STK463	9.30
STK465	9.95
TA7193P	4.30
TA7202	2.25
TA7203P	2.25
TA7204P	1.90
TA7205AP	1.40
TA7208P	1.95
TA7222AP	1.85
TA7223P	2.85
TA7227P	2.95
TA7310	1.55
TA7313	1.45
TAA550	.43
TBA120AS	.95
TBA120SB	.90
TBA120T	1.25
TBA120U	1.00
TBA520	1.30
TBA530Q	1.00
TBA540	1.37
TBA550	2.45
TBA560	1.60
TBA720A	2.65
TBA750	2.45
TBA800	.80
TBA810	1.35
TBA820	1.40
TBA890	2.95
TBA920	1.50
TBA950	2.65
TCA270	1.55
TCA800	5.45
TCA940	1.55

TYPE	PRICE (£)
TDA440	3.25
TDA1002	1.50
TDA1003	2.80
TDA1006A	2.95
TDA1035T	2.75
TDA1037	1.95
TDA1044	3.10
TDA1170	1.80
TDA1270	2.20
TDA1470	3.65
TDA2002	1.85
TDA2003	2.33
TDA2004	3.15
TDA2006	2.25
TDA2020	2.95
TDA2190M	4.95
TDA2522	1.80
TDA2523	2.25
TDA2530	2.10
TDA2532	2.20
TDA2540	1.95
TDA2560	1.80
TDA2578A	3.25
TDA2581	2.15
TDA2582	2.20
TDA2591	2.30
TDA2593	2.30
TDA2594	2.95
TDA2600	5.95
TDA2611A	1.50
TDA2640	2.40
TDA3560	5.10
TDA3561A	5.35
TDA3562A	5.50
TDA4500	5.85
TDA4600	2.85
TDA4600-16PIN	3.95
TDA9503	2.35
UPC555C	.70
UPC566C	2.10
UPC585C	1.40
UPC1031H	2.95
UPC1032H	.95
UPC1156H	2.45
UPC1181H	2.20
UPC1182H	2.20
UPC1185H	3.30
UPC1230H	3.95
UPC1238H	2.35
UPC1350C	4.50
UPC1353C	2.60
UPC1365C	5.05
UPC2002H	1.85

TRANSISTORS

TYPE	PRICE
BC107	14
BC108	14
BC109	14
BC141	26
BC142	23
BC143	25
BC147	09
BC148	09
BC157	10
BC158	11
BC159	11
BC237	11
BC327	11
BC328	12
BC337	11
BC338	10
BC547	10
BC548	10
BC557	10
BC558	10
BD124M	1.05
BD131	.33
BD132	.33
BD201	.80
BD202	.70
BD203	.70
BD204	.83
BD222	.50
BD225	.55
BD235	.32
BD236	.43
BD237	.40
BD238	.39
BD410	.50
BD434	.50
BD437	.70
BD438	.78

TYPE	PRICE
BD439	.70
BD707	1.05
BF337	.28
BF338	.30
BF458	.30
BF459	.36
BF757	.75
BFR90	1.60
BR100	.18
BR101	.32
BR103	.55
BR303	2.95
BT106	1.15
BT116	1.30
BT151/800R	1.10
BU126	1.78
BU205	1.42
BU208A	1.45
BU208D	1.85
BU326A	1.48
BU407	1.12
BU407D	1.45
BU500	1.80
BU508A	1.95
BU526	2.00
BU807	1.30
BU826A	3.20
R2010B	1.45
R2540	2.35
TIP31C	.46
TIP32C	.47
TIP33	.80
TIP34	.95
TIP41C	.48
TIP42C	.48
TIP47	.75
TIP2955	.70
TIP3055	.70

TYPE	PRICE
2N3055	.50
2N3773	3.45
15/80H	2.25
15/85R	2.25
2SA 771	2.35
2SA 835	1.55
2SB 618	2.45
2SC 867A	3.25
2SC 1034	4.85
2SC 1061	1.15
2SC 1114	4.75
2SC 1124	.97
2SC 1316	3.20
2SC 1413A	3.95
2SC 1739	2.45
2SC 1942	2.95
2SC 1962	1.65
2SC 1969	1.95
2SC 2078	1.55
2SC 2335 (Kit)	7.55
2SC 2369	3.25
2SC 257	2.45
2SD 588A	1.97
2SD 725	7.95
2SD B70	5.95

LINE O/P TR.

DECCA 80	7.95
DECCA 100	8.50
ITT CVC 20	7.75
ITT CVC 25/30/32	8.00
ITT CVC 45	8.45
PHILIPS G8	8.75
PHILIPS G11	13.50
PHILIPS KT3	9.95
PHILIPS K30	16.50
RBM T20A	11.50
THORN 1615	12.35
THORN 1690/1	9.65

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LARGE RANGE OF SPARES FOR ABOVE MAKES OF TV/VIDEOS INCLUDING INSTRUCTION AND SERVICE MANUALS. PHONE OR WRITE FOR NEW LISTS. WE CAN ALSO SOURCE & SUPPLY OVER THREE THOUSAND I/Cs & SEMI CONDUCTORS.

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SG 613/6533	8.95
CX 143A	6.95
TDA 3652	4.35

Large range of Sony spares available

VALVES

PCF802	1.09
PCL82	.97
PCL85	1.03
PCL86	1.07
PL504	1.59
PL508	2.99
PL509/519	5.99
PY500A	2.25

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DECCA 80	7.20
DECCA 100	7.35
ITT CVC 20/30	6.85
PHILIPS G8-550	7.90
PHILIPS KT3	9.75
RBM T20/T22A	7.35
THORN 8500/8800	7.60
THORN 9000	8.70
Universal	5.95

DIODES

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

HITACHI I/Cs

STR 441	8.95
STR 451	8.95
STR 6020	7.90

SUNDRIES

G8 TRANSDUCTOR	2.25
G8 ON/OFF SW.	1.40
G11 E/W Coil	1.65
G11 Lin Coil	1.80
G11 Bridge Coil	1.35
G11 EHT Lead	2.25
PYE IF Gain MOD	7.85
ITT On/Off SW	1.10
THORN On/Off SW.	1.00
CUT OUT 2A	1.95
TX10 FOCUS UNIT	8.95
VCR Pilot Bulb	.70

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DECCA 80-80/100(400)350V (800)250V	3.99
PHILIPS G8(600)300V	2.65
PHILIPS G9(2200)63V	1.45
PHILIPS G11(470)250V	2.20
RBM A823(2500/2500)30V	1.65
RBM T20A(220)400V	2.35
THORN1690/1(4700)25V	.94
THORN3500(1000)70V	.99
THORN9000(400)400V	3.10

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DECCA/ITT 6 way	7.95
PHILIPS G8 S/L	14.90
PHILIPS G8 S/Q	12.00
PYE-G11 P/B	8.50
HITACHI 4 way	8.95
ITT CVC5 7 Button	10.40
ITT CVC8/9	12.80
1043/05	8.95
U321	8.35
U322	7.40

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A774 with stick rectifier	9.78
A816, T16, T18, Z712, Z715	10.35
T20, T22, T26, Z179, A823	11.50
Z718 Basic unit	13.50
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DECCA: 1210, 1211, 1511	11.50
1700, 2001, 2020, 2401, 2404	9.20
CS1730, 1733, 1830, 1835	9.20
30, 70, 80, 90, 100, 130 Series	9.20
FERGUSON, THORN: 1590, 1591	9.20
1690, 1691. built in rect.	9.78
1600, 1615, 1700 series	P.O.A.
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3000, 3500, 8000, 8500, 8800	P.O.A.
9000, 9200, 9300 series	12.00
9500, 9600, 9650 series	10.99
9800, TX9, TX10 series	P.O.A.
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FIDELITY: FTV12 mono	10.35
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DUAL & SINGLE hybrid col.	10.00
SINGLE STD solid state	12.00
SINGLE STD split diode	P.O.A.
INDESIT: 24EGB hybrid	9.50
12LGB, 12SGB mono portables	10.35

WINDINGS

TYNE: main winding	6.80
RBM: T20, T22, T26, Z179	6.33
WALTHAM: W125 eht winding	2.37
WALTHAM: W190, W191 eht coil	£6.00
KORTING: hybrid winding	6.90

ITT: VC200 to VC402	9.20
CVC1, CVC2 (FORGESTONE)	11.50
CVC5, CVC7, CVC8, CVC9 series	9.20
CVC20	10.35
CVC25, CVC30, CVC32, CVC45	9.20
CVC40, CVC1200, 1210, 1215	P.O.A.
FT110, FT111. P/no AT2063/02	11.50
PYE: 169, 173, 569, 368 series	9.20
CT200, CT200/1, CT213 series	10.35
725-731, 735, 737, 741 Series	9.78
PHILIPS: 170, 210, 300 series	9.20
320 series	9.78
TX, T8 mono	P.O.A.
G8 and G9 Series	9.20
KT2. KT3. series colour	9.20
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BINATONE: 9909, 9798, 9860	P.O.A.
DORIC Mk3	11.50
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GRUNDIG: most models in stock	
NORDMENDE: FC125, Z206, Z306	11.50
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SHARP: C1851H, C2051H	P.O.A.
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TANDBURG: 190, CTV2-2, CTV3-3	P.O.A.
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Type	Price (£)
DY802	0.95
DY86/87	0.66
ECC81	1.00
ECC82	0.92
ECC83	1.00
ECC84	0.80
ECC85	0.95
ECC88	1.25
ECF80	1.20
ECH81	1.40
ECH84	1.50
ECL82	1.10
ECL86	1.75
EF80	0.75
EF86	1.80
EF183	0.90
EF184	1.00
EH90	0.98
KT66(G.E.C.)	16.00
KT88(G.E.C.)	19.00
EL34	3.25
EL84	1.00
EL509	7.85
EM87	2.55
EY86/87	0.67
EY500A	2.50
PCC84	0.60
PCC85	1.75
PCC89	0.75
PCC189	0.85
PCF80	0.95
PCF86	1.25
PCF200	1.95
PCF801	1.05
PCF802	1.05
PCF806	1.20
PCL82	1.00
PCL83	2.50
PCL84	1.00
PCL86	0.90
PCL805/85	1.05
PD500	2.90
PFL200	1.85
PL33	1.50
PL36	1.75
PL81	0.85
PL82	0.75
PL83	1.20
PL84	0.75
PL95	2.00
PL504	1.40
PL508	2.70
PL509/519	5.25
PY88	1.80
PY500A	2.20
U26	1.90
UCH81	2.00
UCL82	1.80
30FL12	1.60

TRANSISTORS + DIODES

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	0.12
BA157	0.28
BB105B	0.30
BB105G	0.48
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
BC113	0.42
BC115	0.12
BC116	0.12

Type	Price (£)
BC117	0.22
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	0.16
A B or C	0.16
BC171	0.10
A or B	0.10
BC172	0.12
B or C	0.12
BC177	0.24
A B or C	0.24
BC182	0.10
A,B or C	0.10
BC182L	0.12
LA LD LC	0.10
BC183	0.10
A B or 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	0.10
A B or C	0.10
BC212L	0.09
LA LB	0.10
BC213	0.10
A B or C	0.10
BC213L	0.10
LA LB LC	0.10
BC237	0.11
BC238	0.12
BC251	0.14
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

Type	Price (£)
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
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	0.12
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	0.50
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

Type	Price (£)
BF117	0.50
BF119	0.82
BF120	0.38
BF125	0.42
BF127	0.41
BF154	0.14
BF157	0.46
BF158	0.30
BF160	0.23
BF167	0.32
BF177	0.42
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
BF200	0.30
BF222	0.38
BF224	0.16
BF224J	0.20
BF240	0.30
BF241	0.30
BF244	0.34
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
BF363	0.35
BF367	0.24
BF371	0.27
BF422	0.20
BF450	0.38
BF457	0.36
BF458	0.37
BF459	0.35
BFR51	0.35
BFR61	0.32
BFR90	0.86
BFT41	0.68
BFT43	0.86
BFW11	0.84
BFW44	0.88
BFX29	0.28
BFX48	0.78
BFX80	6.46
BFZ85	0.35
BFY50	0.22
BFY51	0.22

Type	Price (£)
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
BSX19	0.32
BSX20	0.30
BSX59	0.78
BSX76	0.65
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
BT108	1.25
BT109	1.15
BT116	1.20
BT119	3.30
BT120	3.50
BT121	2.99
BT138/600	1.30
BT151/560R	0.90
BTY79/400R	2.80
BU100A	2.30
BU104	1.80
BU105	1.20
BU105/02	1.55
BU108	1.80
BU124AE	0.98
BU126	1.40
BU133	1.90
BU204	1.30
BU205	1.30
BU206	1.50
BU208	1.40
BU208A	1.40
BU208/02	2.05
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

Type	Price (£)
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	0.44
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
BYZ12	0.78
C106D (400V)	0.48
C106F (5HV)	0.36
D40C1	1.08
D40N1	1.12
E1222	0.30
E5024	0.30
GET872	0.60
GET881	1.70
GET882	1.90
ITT2001	0.18
ITT2003	0.34
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	0.66
OA91	0.07
OA210	0.66
OC26	2.65
OC35	4.75
OC36	1.75
OC44	0.72
OC72	0.70
OC81	0.68
ORP12	0.85
R2008B	1.20
R2010B	1.20
R2540	2.71
TIC45	0.45
TIC47	0.70
TIC29	0.30
TIP30A	0.32
TIP31C	0.39
TIP32	0.35

Type	Price (£)
TIP33A	0.55
TIP34A	0.70
TIP41C	0.42
TIP42	0.44
TIP47	0.42
TIP121	0.63
TIP2955	0.70
TIP3055	0.58
TIS43	0.88
TIS88	0.50
TIS90	0.27
TIS20	2.45
Y728	0.14
Y969	2.80
ZE75	0.60
ZTX107	0.14
ZTX502	0.22
IN4001	0.04
IN4003	0.05
IN4004	0.05
IN4006	0.07
IN4007	0.07
IN4148	0.04
IN5400	0.12
IN5402	0.13
IN5405	0.16
IN5406	0.17
IN5408	0.19
IS44	0.06
IS920	0.07
2N1306	1.42
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
2N3904	0.20
2N3906	0.20
2N5294	0.80
2N6107	0.80
2SB337	1.80
2SC1098	0.84
2SC1172Y	1.70
2SC1173Y	0.88
2SC1279	0.50
2SC1306	0.92
2SC1307	1.50
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

Type	Price (£)
2SC2029	2.70
2SC2078	1.05
2SC2091	0.70
2SC2098	2.90
2SC122A	3.20
2SC2314	0.80
2SC2335	1.50
2SK135	3.80
3N211	3.52
3SK88	0.60
3SK88L	0.80
40636	1.65
40673	1.80

74LS

Type	Price (£)
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
74LS279	0.70
74LS283	0.80
74LS353	1.10
74LS365	0.50
74LS366	0.50
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4006	0.68	4099	0.75
4007	0.24	4161	0.96
4008	0.59	4162	0.96
4009	0.44	4163	0.96
4010	0.39	4174	0.96
4011	0.23	4175	1.00
4012	0.24	4195	0.99
4013	0.35	4501	0.38
4014	0.58	4502	0.58
4015	0.58	4503	0.38
4016	0.38	4507	0.45
4017	0.54	4508	1.28
4018	0.59	4510	0.54
4019	0.59	4511	0.54
4020	0.78	4512	0.54
4021	0.58	4514	1.10
4022	0.68	4515	1.20
4023	0.30	4516	0.60
4024	0.49	4517	2.70
4025	0.24	4518	0.48
4026	0.89	4520	0.05
4027	0.44	4521	1.10
4028	0.44	4522	1.20
4029	0.73	4526	0.58
4030	0.33	4527	0.64
4031	1.28	4528	0.68
4033	1.25	4531	1.20
4034	1.40	4532	0.64
4035	0.68	4536	2.50
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		
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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 137.

PRICE INCREASE

The price of *Television* will be £1·20 from the next issue dated February. We regret the need to make this price adjustment to cover the increased costs we have to meet. We hope you've noticed the additional pages in recent issues: our aim is to offer readers better value.

COVER PHOTO

This months cover photo shows the latest Decca-Tatung CTV chassis, the 165. Our thanks to Tatung (UK) Ltd. for their help with this.

CORRECTIONS

Two editorial slips occurred in the i.c. field timebase article last month. First, under the heading Direct Yoke Drive, the time-constant calculated should have been given as 1·6ms, not 1·2ms. Secondly, under the heading Picture Shift, it's the field *flyback* current that's exponential, not the field *scan* current.

The wrong transistor type was given for Tr9 in the video fader unit (May 1985, page 376). A BFX88 can be used in this position. Our thanks to Mark Lamb whose letter will appear next month.

The Great Satellite TV Gamble

The French certainly have the capacity to surprise. Who'd have thought that anyone would go to the trouble of putting a DBS satellite into orbit only to hand over one of the four channels to a foreign newspaper magnate (Robert Maxwell) and another to a consortium headed by a French industrialist and an Italian commercial TV entrepreneur? But then broadcasting in France has always been a rather curious business. It has a reputation for being leaden and has remained so despite successive attempts by governments over the years to improve the services offered by reorganising the broadcasting arrangements. It seemed strange on the face of it that a Socialist government should early in its period of office announce its intention to introduce commercial TV – strange certainly to those of us who recall the almighty fuss that accompanied the Conservative government's establishment of commercial broadcasting in the UK in the early fifties. They certainly do things differently in France. It seems that the decision to hand the new, fifth French TV channel to the Seydoux/Berlusconi group was largely President Mitterrand's. No lengthy consultations, Royal Commissions or anything like that, just a sudden fiat. But then he seems to have felt that an urgent decision was necessary while he still had parliamentary backing, and that the alternative of handing most of the new channels over to CLT (the traditional Radio Luxembourg commercial broadcasting operation), now linked for TV purposes with Rupert Murdoch's News Corporation group, was not acceptable. Then of course there was the urgent need, when it comes to satellite channels rather than the new terrestrial network, to ensure that something would be beamed down by TDF-1 once it gets up there. In this day and age it's no great feat to shove a satellite into orbit: to fill all those hours of channel time with material able to attract an audience is another matter again.

As for Robert Maxwell and his "Maxwell channel" (his words), he certainly seems to have pulled off a major coup. His TDF-1 channel is likely to be receivable on a modest sized dish over a substantial swathe of Northern Europe. Those who subscribe to the conspiracy theory of history will note Maxwell's long interest in broadcasting and his manoeuvres in the satellite TV field – he already has the MirrorVision channel, via Intelsat VA F11. Those of us more inclined to accept the accident theory of history will note the trials and tribulations that have attended efforts to get satellite TV services started in Europe and feel that Robert Maxwell was in the happy position of being able to respond to a golden opportunity that came out of the blue – literally!

The interesting thing next will be what the Mirror group will be able to do with its new Maxwell channel once it comes into operation. The rent for the channel, reputed to be around £5·3m a year, looks a snip but is still quite a lot of cash to have to find year after year. Then of course there will be the cost of providing the programme material. The idea is to finance the channel through advertising. But this brings us to a classic chicken and egg situation. Advertisers will be reluctant to advertise until the viewers are ready and waiting to see the programmes. Viewers on the other hand will be reluctant to buy/rent the equipment required until they are assured of a worthwhile service. There are precedents here. In the USA for example early efforts to get u.h.f. TV services started mostly failed because manufacturers wouldn't produce sets with u.h.f. tuners when there were no customers, and advertisers wouldn't support programmes when there were no viewers. In the UK things went rather better after the start of the second service. Following a relatively short period when losses were made, the era of the "licence to print money" came into being.

Has Robert Maxwell stumbled upon another such "licence"? He will have to persuade viewers to acquire satellite TV receiving equipment for a start. This shouldn't be too much of a problem since the cost of the equipment is likely to fall substantially once the market opens up. Then there's the sheer size of the prospective audience/market – some 280 million people are expected to be within TDF-1's service area. This is a far greater audience than any previous TV channel has ever had, and in consequence advertisers may well be ready to fall over themselves to book advertising time. But then again those 280m viewers will be spread over several countries and speak several languages. How many will be glued to Robert Maxwell's English language channel? That, one supposes, will depend to some extent on what he will be able to offer. In addition the wide bandwidths will make it possible to transmit multi-language sound.

For prospective UK viewers there are also the problems that if they want to receive UK DBS transmissions as well (if and when these start) a steerable dish will be required. In addition no transmission standard has so far been agreed for European satellite TV broadcasting. The French have a very great advantage here: by putting up the first European DBS satellite they can choose whatever standard they like without worrying too much about anyone else.

Rupert Murdoch, who shares satellite TV broadcasting ambitions with Robert Maxwell, has not been left out in the cold over all this. His joint venture with CTL is likely to guarantee him an interest in DBS TV before long. It's extraordinary that these newspaper tycoons have been able to get a major stake in the new TV systems at the outset.

Long-distance Television

Roger Bunney

October 1985 was a very active month for DX-TV reception. There were extensive and prolonged tropospheric openings and Sporadic E propagation was fairly frequent. With lots to report, we'll go straight to the collated UK SpE reception log:

7/10/85 TVE (Spain) ch. E4.
8/10/85 CST (Czechoslovakia) R1; RAI (Italy) IA; SR (Sweden) E3; TVE E3; TVP (Poland) R1.
10/10/85 TVE E3; CST R1.
12/10/85 RAI IA.
14/10/85 ARD (W. Germany) E3, 4.
15/10/85 A long, extensive opening: TVP R1, 2; TSS (USSR) R1-4; RAI IA; JRT (Yugoslavia) E3; ORF (Austria) E2a, 4; +PTT (Switzerland) E2; CST R1; ARD E2; TVP R1, 2.
18/10/85 TSS R1; TVP R1.
20/10/85 RAI IA; TVE E2, 3.
22/10/85 +PTT E3; TVE E3; CST R1.
25/10/85 TVE E3; CST R1; TVP R1.
27/10/85 TSS R1; MTV (Hungary) R2; TVE E2-4; TVE-2 E2.
2/11/85 TVE E2; RAI IA.
3/11/85 NRK (Norway) E2.

Small auroral manifestations were observed on nine days in N. Scotland: both TSS and NRK were identified in Band I by Iain Menzies.

A relatively static high-pressure system was centred over the UK and W. Europe throughout much of October, giving considerable lift to tropospheric propagation in Bands I and III and at u.h.f. Although conditions improved here in central southern England, giving reception of TV signals from W. Germany, France, Scandinavia and the Benelux countries, they weren't dramatic. Enthusiasts in the east/NE fared much better, with reception from Scandinavia and as far as the Eastern bloc. For many the tropospheric lift extended throughout the whole month, from late September. In general there were two prolonged lifts, from the 11th to the 18th with peaks on the 13/14th and 18th, and a perhaps more intense lift from the 20th to the 30th with peaks on the 24th, 26th and 27th.

The first period gave widespread reception in the UK of signals from W. Germany, France (TDF and Canal Plus), Ireland and the Benelux countries in Band III and at u.h.f., while Norwegian Band III signals were present in profusion in NE Scotland. Band III/u.h.f. signals from Spain were received in the west country – Reg Roper (Torpoint) noted the local programme from TV de Galicia ch. E37 with its distinctive test pattern. Roger Pates' (Nottingham) log included signals from E. Germany, Denmark and many W. German Band III/u.h.f. stations. Simon Hamer (Powys) received Swiss signals on chs. E6 and 7 on the 13th, a very good catch.

The second period produced similar reception but with certain highlights. Roger Pates logged Gdansk ch. R10 and Wroclaw ch. R12 on the 24-27th along with a mass of Band III signals from Norway and Denmark and Band III/u.h.f. signals from Sweden. Iain Menzies received the Norwegian ch. E29 Viker relay (80W) on the 27th, using the "Gulen" identified test pattern – I suspect that this is the first reception in the UK of NRK at u.h.f. Many other main NRK/SR/DFF transmitters were received by Iain. Danish signals on chs. E5, 6, 7, 8 and 10 were well received throughout the UK – there was evidence of trop ducting on certain days.

There was a certain amount of ATV activity here in the south, but not much. A highlight of the month was the reception of high-quality stereo TV sound from ZDF, the W. German second chain, by Keith Chaplin and Tim Anderson. Keith was using a Luxor set and Tim a Finlux receiver.

In all a good month. My thanks to the following for sending in their reception reports: Reg Roper (Torpoint), Cyril Willis (nr. Cambridge), Tony Privett (Basingstoke), Tim Anderson (St. Leonards), Derek Juniper (Angus), Iain Menzies (Aberdeen), Bill Cotterill (Tipton), Roger Pates (Nottingham), Simon Hamer (Powys) and Keith Chaplin (Barrow-on-Soar, Leicestershire).

Following some quiet weeks solar activity is now on the increase, indicating the start of the new Solar Cycle. Hopefully this cycle will again see m.u.f.s reaching into the low v.h.f. spectrum.

Keep a look out for "Telecine", the new ch. E69 service from La Dole, Switzerland, which has been transmitting unscrambled programmes with the PM5544 test pattern filling the gaps. The intention is to introduce Discret-1 coding.

A list of channel allocations for the new French private stations has just arrived. Those listed as being available from the end of 1985 are Paris chs. E33 and E36 (provisional), Lillie ch. E47, Cherbourg ch. E35, Dijon chs. E46 and E51 and the Lens-Bethune-Douai-Arras region ch. E51. Le Havre ch. 4 is listed for early 1986 – the only other prospective Band I allocation is Saint-Etienne. Further details next month.

News Items

Poland: Starting with Katowice later this year the eight main regional TV studio centres are to begin producing their own programmes – at present the regional centres opt out of the network for half an hour daily.
Mozambique: The experimental TV service has proved successful with weekend programming; mid-week TV is to start shortly.
W. Germany: NDR-1 splits into three areas for regional news from 1920-1958 local time. These are Hamburg, Schleswig-Holstein and Niedersachsen. Variations in the NDR FUBK test pattern have been noted for regional identification: Lingen ch. E41 carries "LFHS-NDS" (Lietfunk Haupt-Stelle-Niedersachsen), Hamburg "Lf-HH" while other variations indicate the originating studio, e.g. Hanover. WDR-3 now provides a regional programme from 1945-2000 local time.
France: Winter has brought an increase in subscribers to Canal Plus. The TV licence has been increased to 541Fr (colour) or 356Fr (monochrome): in addition VCR owners are supposed to pay a 659Fr fee to compensate broadcasters for loss of copyright.
High-band u.h.f. TV: In addition to the new ch. E69 Telecine service from La Dole the BDXC report other u.h.f. high-band stations. Soesterberg (Holland) with AFRTS output uses ch. A80 (above E70 at 867·25MHz vision). TMC (Monte Carlo) is transmitted in Italy on even higher channels – from Monte Giarolo ch. E72 (879·25MHz, 50kW) and relays using chs. E74 (895·25MHz), E79 (935·25MHz), E80 (943·25MHz) and E81 (951·25MHz).

Satellite TV: The Europa transnational service via transponder 3 on Eutelsat I-F1 started on October 5th with predominantly English language programming.

NASA recently launched two multipurpose satellites to provide Australia with communications and TV services. The latter will consist of low-power transmissions in the 12·5-12·7GHz band for reception on 1·5m dishes, using B-MAC coding – the service is called the "Homestead and Community Broadcasting Satellite Service".

North East Satellite Systems of Cropton, Pickering, N. Yorkshire YO18 8HL and "Connexions Satellite Systems" of Barnet, North London are together offering a complete TVRO system covering the 10·9-11·7GHz band for £995 inclusive of VAT, with 1·25m dish. For £1,790 you get a full polar mount (motor drive) and dish controller with other electronics. Further proposed developments include a polorotor (for remote, indoor adjustment of polarisation), a stereo sound demodulator and an infra-red remote controlled receiver. Much of the equipment is being produced in Taiwan. Trade terms are available.

In brief: Syrian TV uses the PM5534 test pattern with the identification "ORSOS-DAMAS" and Arabic script. The SBS-TV network (Australia) will close down all its ch. 0 transmitters on January 5th.

Publications

Edition 30 of the "List of European Television Stations", published by the EBU, Technical Centre, Avenue Albert Lancaster 32, B-1180 Bruxelles, Belgium will be available shortly. This very thick volume, listing the situation as at September 1st 1985, together with the six bimonthly updating supplements that come with it through the following year, is an essential guide to everything from relays of a few milliwatts to megawatt powerhouses. The area covered includes N. Africa and the eastern Mediterranean countries. Cost is 750 Belgian francs, payable to the European Broadcasting Union via foreign draft from your nearest main or foreign branch bank.

"The United Kingdom Table of Frequency Allocations" covers both broadcast and non-broadcast transmissions, various band subdivisions and tables of both international and UK allocations. This useful guide, with some 310 pages, is published by the Department of Trade and Industry and is available from HMSO at £12 (ISBN 0115138196).

Subscriptions for the British Amateur Television Club fall due on January 1st each year. Membership costs only £5 per annum (UK) and is highly recommended if you have an interest in ATV or video/transmitting techniques. There's an excellent magazine (CQ-TV) that's sent free and is available only to members. Write to BATC Membership, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD for further details/application form with a stamped, self-addressed foolscap envelope.

Fringe Electronics Ltd., Fringe House, 50 Mansfield Road, Clipstone, Mansfield, Notts NG21 9EQ have just published a "Pocket Application Guide" that covers various diplexing, splitting and filtering arrangements for u.h.f./v.h.f. applications, based on their own range of mast/indoor units. Copies are available to aerial riggers on receipt of a stamped, self-addressed foolscap envelope. Several diplexing units are of particular interest, e.g. for diplexing group K with C/D or group A with E. Fringe is one of the few manufacturers that still offer Band I and Band III masthead amplifiers!

Publication of the new edition of my book "Long Distance Television Reception (TV-DX) for the Enthusiast" (Babani Publishing) has been put forward to Spring 1986 – copies were originally expected to be available in Autumn 1985.

The Teutoburger Collapse

The collapse of the Westdeutscher Rundfunk (WDR) Teutoburger Wald transmitting mast on January 15th, 1985 and the steps taken to restore services were recorded in this column at the time. The mast was 300m high and was erected in 1970. An investigation of the causes of the collapse has recently been completed by the WDR and reported in the "EBU Review – Technical". We are grateful to these organisations for permission to report the following conclusions.

Temperatures had been as low as −20°C during the week before the collapse and hadn't risen above −15°C. The result was a high degree of snow/ice loading, though this was not the main cause of the collapse. Instead, blame is placed on "wind-stimulated vibrations and fatigue cracks in welded seams at highly stressed parts of the steel structure". During the day before the collapse the top of the mast had been subjected to a sustained warm air flow, produced by a temperature inversion. This affected the top section only. A meteorological phenomenon referred to as a "hydraulic jump" then occurred, the result of high energy air turbulance. This set up self-resonant mechanical vibrations within the mast structure. After some 15 hours of sustained stress the top stay anchoring point, which was already fatigue cracked, fractured. The mast folded at this point and then cracked at 160m producing collapse of the 70-160m section. This cut the stay wires on the rest of the lower structure leading to complete collapse

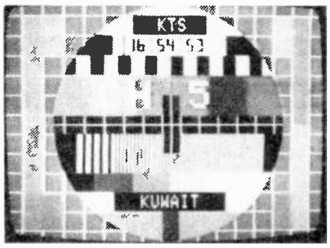
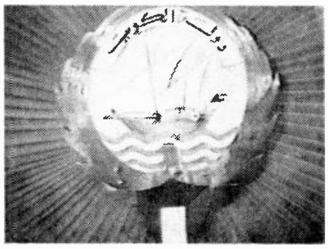


Fig. 1.



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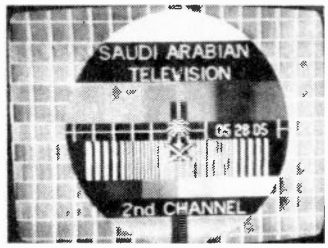

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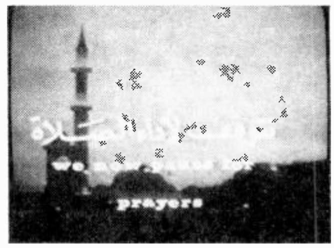

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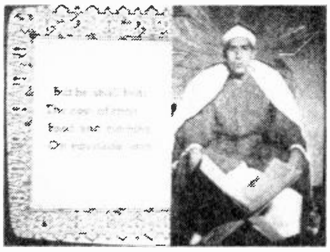

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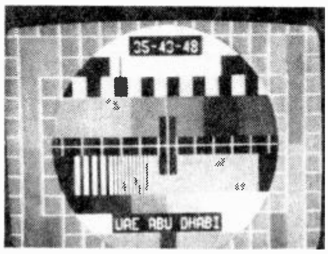


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 9.

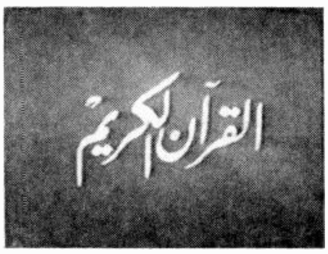


Fig. 10.

Fig. 11.

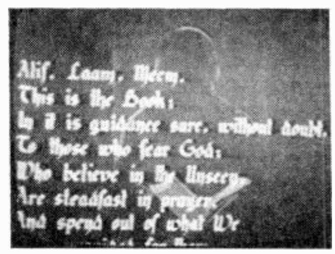


Fig. 12.

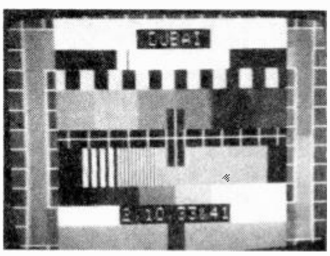


Fig. 13.

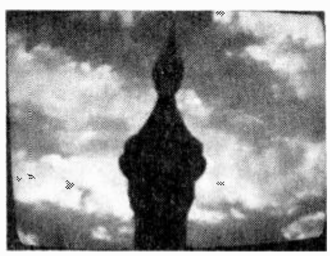


Fig. 14.

Fig. 15.

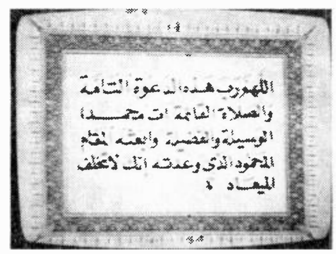


Fig. 16.

– interesting that apart from the upper fibre-glass aerial section the mast fell within the area bounded by the stay anchoring blocks.

Gulf Test Patterns etc.

Fred Pilkington (Newmarket) has lent us a VHS tape, recorded in the Gulf area, showing local test patterns and the opening sequences of the various TV stations. Some of these are shown in Figs. 1-16.

The Kuwait Television (KTS) first programme PM5544 test pattern (Fig. 1) features a flashing "CH 5" identification, with Western background music. Station opening is followed by the Kuwaiti anthem and a series of shots including the national emblem (Fig. 2), a live eagle, the national flag, shots of army equipment, a march past, the royal family thence to the Koran. The Kuwaiti-2 service also uses the PM5544 pattern with its own identification.

Saudi Arabian Television has a distinctive pattern (Fig. 3). This is followed by the call to prayer caption (Fig. 4) and a gentleman seated with the Koran (Fig. 5) – interesting to note the English subtitle.

The United Arab Emirates Television Service (UAE) from Abu Dhabi again uses the PM5544 pattern (Fig. 6) which is followed by a rather dramatic slide (Fig. 7). The test pattern is accompanied by Western background music.

Bahrain Television has both Arabic and English channels, the latter on ch. E55 (Fig. 8). This is followed by an announcer (Fig. 9) advising "it's time for the Holy Koran" quickly followed by Arabic (Fig. 10) and English Koran captions thence to the actual reading (Fig. 11). There's a slow zoom to a close-up, the lights dim and English captions then appear (Fig. 12).

The shots so far are unlikely to be seen in the UK (Bahrain also operates on ch. E4 but this is not featured on the tape). Dubai, also in the UAE, is received fairly regularly however on ch. E2 via SpE during the summer months. Its distinctive test pattern is shown in Fig. 13. An outline tower follows (Fig. 14), then a caption with several towers and the call to prayer script (Fig. 15). The Koran reading then takes place, accompanied by a series of film inserts of views, mountains, flowers and streams with Arabic script subtitling. The sequence ends with script on delicately bordered captions (Fig. 16).

Our thanks to Fred. The shots were taken at 1/15th second, f4 using 100ASA standard colour film and a Zorky Russian camera at 5ft from the 22in. TV set's screen.

Tuning Troubles

– an historical survey

Jeff Herbert, G4JJH

One of the first things I learnt when I started TV servicing as an apprentice thirteen years ago was how to deal with flashing or intermittent turret tuners with poor switch contacts. This was in the days of 405-line monochrome TV sets of course. Numerous sets would come in with the complaint "it cuts off, then comes back on when the channel switch is tapped". Depending on the model, cleaning the contacts was either quick and simple or time consuming and extremely difficult.

Many tuners consisted of a rotating shaft that held tuning biscuits with round contacts on one side and coils and capacitors on the other. This type could usually be easily removed and the contacts cleaned with RS switch cleaner and a cloth. The fixed contacts in the unit itself were then wiped and their tension checked. A smear of silicone grease and the job was done. Care had to be taken to ensure that the biscuits were refitted in the correct order otherwise they wouldn't coincide with the knob numbers. After this treatment good contact would last for probably two years or so before the exercise had to be repeated. Poor tuner contacts were so commonplace that customers would often put up with the trouble and were quite happy to give the channel switch a good thump when the picture cut off.

Dual-standard Operation

The advent of 625-line operation brought dual-standard sets fitted with large slider switches that were often almost the length of the chassis or panel. These were necessary to carry out switching in the i.f. strip and the line timebase. They caused all manner of faults from no sound, low sound, no picture, ghosting picture and weak contrast to loss of line lock. It was amazing how many troubles disappeared when the system switch was given a tap or push. Cleaning these was usually a job for contact cleaning aerosols, and many cans were expelled in order to get to all the many contacts. This was often only a temporary cure, since if the plating had worn off it would not be long before poor contacts were back. Due to the expense and difficulty in replacing these switches many were permanently wired in the 625-line position towards the end of the 405/625 change over era.

Rotary UHF Tuners

With the change to u.h.f. tuners switches went, replaced by a variable capacitor. I recall a colleague saying "well, that's the end of all the switch contact problems". He was right in a way but adoption of the variable capacitor brought along a new problem. Not switch contacts, since it didn't have any, but the earthing fingers that earthed the shaft of the moving vanes. Both the shaft and the fingers would tarnish. To remove, clean and retension the fingers was a job calling for expertise. If the moving vanes were bent during removal the result would be at best low gain or at worst no signals at all. Many a unit must have been ruined by unskilled hands. These early rotary u.h.f. tuners were difficult for customers to use, being without the click stops they were used to with v.h.f. tuners. Older people with shaky hands in particular couldn't master the fine tuning – and it had to be fine to get the sound and picture tuned correctly.

The pushbutton selector was the next step forward, but most mechanisms had poor reset due to the mechanics. A twist of the button was often required to restore colour and sound after changing station and the earthing fingers were still a problem.

Varicap Tuning

I thought that the advent of the varicap tuner would bring an end to the troubles described above. After all there were no switch contacts and no moving variable capacitor. It soon became obvious however that tuning problems were not at an end. The tuners themselves are pretty reliable – only a few failures in comparison with earlier mechanical types. The stumbling block with this arrangement is the tuner control unit. The varicap tuner requires a d.c. tuning supply to bias the diodes, between approximately 1·5-33V to tune over the band. The usual arrangement is to have a group of preset potentiometers with switches to connect the slider of the selected potentiometer to the tuner. Back to the old switch contact problem again. Tarnish build up and plating that flakes introduces resistance, with the result of drift and flashing of the picture. Unlike the early days, the increasing use of plastic mouldings makes it impossible to remove the contacts for cleaning. Aerosol contact cleaner can help but is only a temporary cure. For a lasting repair the only solution is to replace the channel selector unit complete. These units are often expensive, but the more common makes are available from HRS, SEME, etc. This type of unit is still used on basic models. We find that on most sets there are signs of contact problems after about two-three years. The tuning voltage stabiliser device, generally a TAA550 or ZTK33, also commonly causes tuning drift: a check on the tuning voltage supply should show whether or not this is the cause of the trouble though leakage in the tuner can also affect the tuning voltage.

Touch-button channel selection has been around for some years. This gets over the switch contact problems and, apart from dirty touch buttons, leaves only the presets themselves to cause trouble. These can suffer from noisy sliders and loose rivets.

Current Sets

The varicap tuner is still current and has a good reliability record. Control voltage switching is now often performed by various i.c.s. Remote control implies electronic channel selection and the only switches are for initial tuning and storing in a memory. Due to the infrequent use of these buttons they should, and to date have, given no trouble. The source of problems now lies not with the set but with the buttons on the remote control unit!

With basic, i.e. non-remote controlled, sets noisy switches are still very much a problem and you could say that manufacturers have not learnt their lessons. But I suppose the cost of the unit is the foremost consideration and the reason why we still don't see better designed units. I wonder if tuning troubles will still be around thirteen years hence?

Decca-Tatung Chassis Up-date

Part 1

Ray Wilkinson

The Decca 120 series chassis was the very latest thing back in 1981 when we described its design in these pages. Time and technology haven't stood still however (I sometimes wonder which is the faster!) and the Tatung design laboratory at Bradford has not been idle in the intervening years. The present articles bring the story up to date by describing the 140, 150 and 160 series chassis all of which are in current production. It's also by way of being a swan-song for the Bradford laboratory since Tatung's design department has now been moved to the Telford manufacturing complex.

Design Requirements

The design principles mentioned in the previous articles apply today as they did four years ago. It's still necessary to reduce manufacturing costs while maintaining or bettering the product's performance and reliability. With the 140 series we wanted to design a version that was a true single-panel chassis, i.e. with the customer controls also on the chassis. To help the stylists we wanted to make provision for alternative plug-in control units as well as having remote and non-remote control versions. The usual export requirements had to be catered for, for example tuning over the v.h.f. as well as the u.h.f. bands, and there would be a need for mains-isolated versions as well as live chassis. A version (the 150 chassis) to drive 110° tubes was also envisaged from the start.

The number of permutations was thus considerable. These objectives were all achieved however and the full range of versions is or has been part of the production programme. If you deal with these sets you may be interested in the chart (see Table 1) which lists the many versions of the 140/145 series chassis, i.e. different tubes, vertically or horizontally mounted chassis, and integral/separate/monitor-style controls. Mains-isolated versions with an extra interface panel for audio and video inputs/outputs were introduced during 1985. These chassis have the suffix X. In addition all current monitor-style models have a remote-on facility (i.e. standby): these have the suffix S. Only UK versions are shown in the chart: including export models there have to date been 44 versions of the chassis.

Construction

From the photograph you can see that the positions of some of the circuit sections have been changed around when compared to the arrangement used in the 120 series. The switch-mode power supply is at the top right, above the line timebase, and the i.f. section is at the far left (looking from the rear). One reason for this was to keep all the high-power stuff well away from the small-signal circuits.

The top section varies depending on whether the chassis has mechanical push-button channel change (types 140-144) or voltage-synthesis tuning with remote control (types 145-149). The rest of the PCB is the same for all models except for a few component value changes to cope with different screen sizes. On models where the control panel is mounted on the board it's soldered edgewise at the front. The panel can be mounted vertically at the side of the c.r.t. or horizontally under the tube. The latest monitor-style models also have a moulding on the front of the chassis to hold the mains switch, the programme number digital display and the infra-red preamplifier in its screening can.

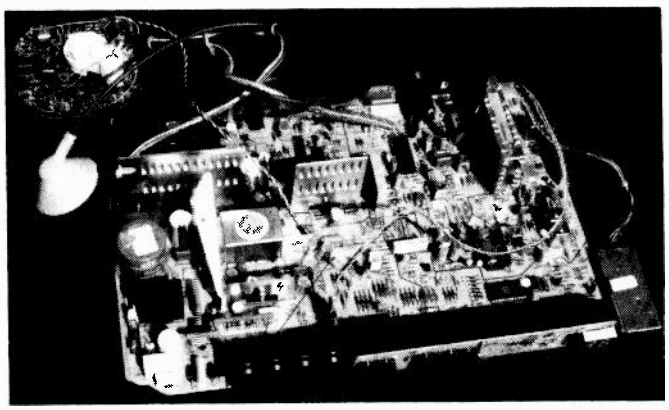
Main Changes

Fig. 1 shows the 140 series chassis in block diagram form. The two main areas of change are the timebases and the colour decoder. The tuning and remote control systems are also new – we'll come to these later.

In the 120 series chassis a TDA1170 field timebase i.c. was used, with a TDA2576A sync/line generator i.c. (sync processor). The sync processor in the 140 series chassis is the TDA2578A, its companion field output device being the TDA3651. This combination produced some cost saving and also gave us some extra features. The partitioning of the circuitry within these i.c.s is such that most of the field timebase functions are in the TDA2578A, the TDA3651 acting as a power output stage and flyback generator. The main feedback from the output goes right back to the sawtooth generator in the TDA2578A. Great care had to be taken with the board layout to avoid pickup problems.

It's not all that clear from the 140 circuit diagram how this part of the set works. Fig. 2 shows the principle in simplified form. A sawtooth waveform, synchronised to the video input to the i.c., is generated at pin 3 of the TDA2578A. A voltage sample of the scan current is applied to pin 2. These signals are mixed and then applied to the power output stage via the driver stage in the TDA2578A. R303/4 provide d.c. feedback, the linearity control being connected to their junction. The height control sets the amount of sawtooth sample fed back. There's some degree of interaction between the field frequency and height controls: to minimise this the setting up method recommended in the manual (hands up those who read service manuals!) should be followed if the frequency control needs to be tweaked, e.g. after changing the i.c.

Some of the improvements provided by the



View of the 145 series chassis, from the front.

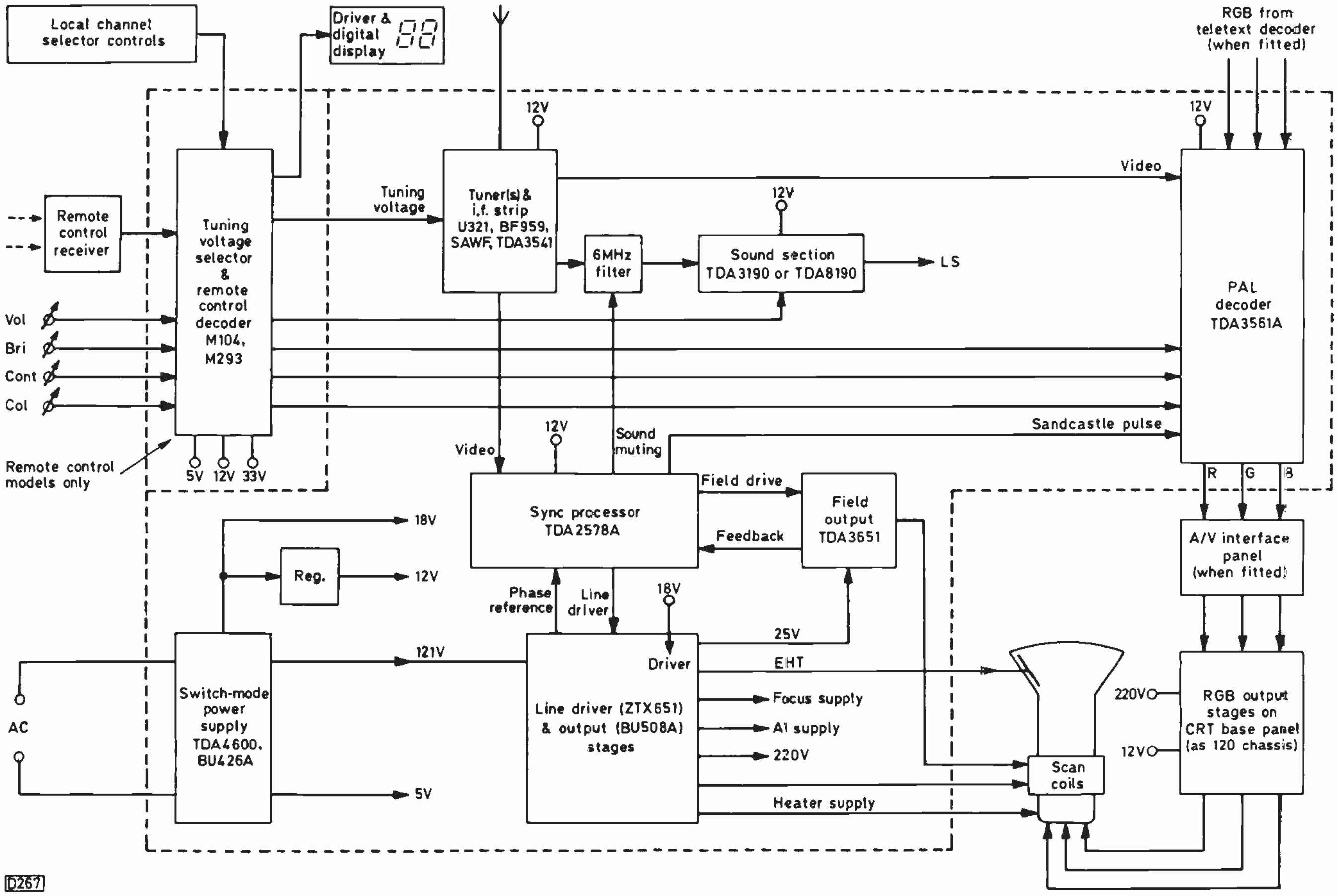


Fig. 1: Simplified block diagram of the 140 series chassis. A TDA8190 intercarrier sound/audio output chip is used in versions of the chassis suffixed X. Chassis types 140-144 have mechanical switches and tuning potentiometers in place of the tuning voltage selector and remote control decoder section.

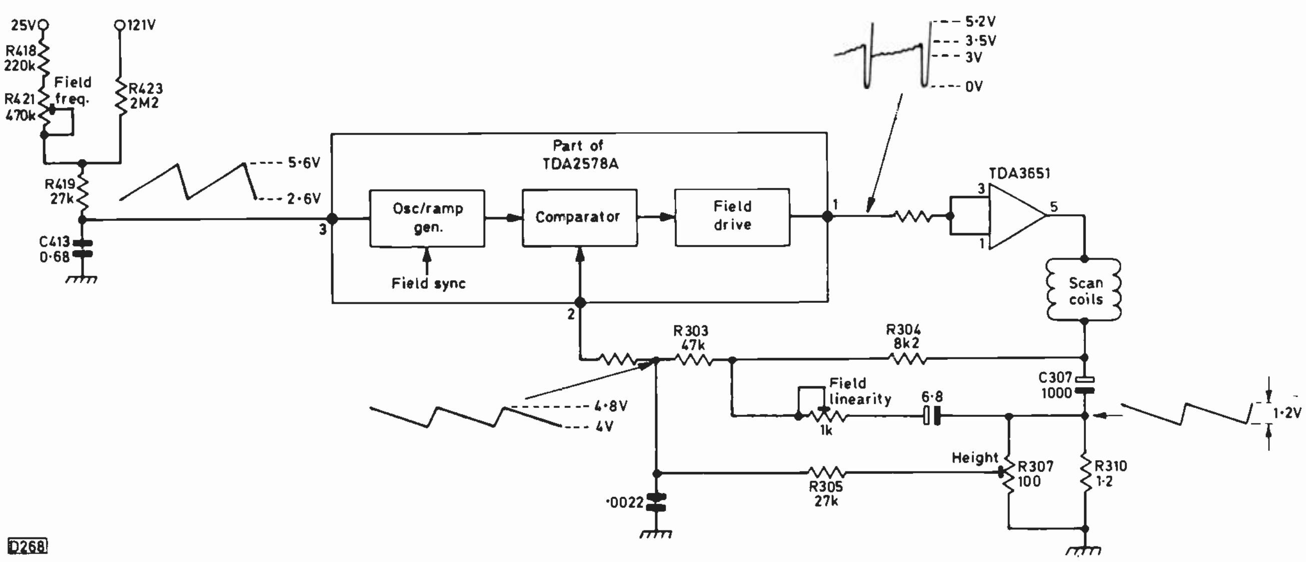


Fig. 2: Arrangement of the field timebase.

TDA2578A/3651 combination may not be immediately apparent. They include: (1) Provision of a sound muting signal when the set is tuned to noise or when the line scan is not in sync. (2) More sophisticated circuitry for controlling the time-constant of the line oscillator control loop under various signal input conditions (strong or weak signals, VCR, channel change, etc.). (3) Better control of the line drive output mark-space ratio under start-up and fault conditions (e.g. if the flyback pulse disappears). This gives better line output transistor protection. (4) Thermal and short-circuit protection in the field output stage. (5) Video blanking if the scan coils are removed.

In the 150 chassis a TDA3654 with a larger heatsink is used to provide the higher scan current required for the 110° Toshiba c.r.t.

The other major change in the timebase area is the use of a diode-split line output transformer. We were one of the last manufacturers to retain the traditional transformer/tripler combination and were unhappy to go over to the use of a diode-split transformer until we were fully

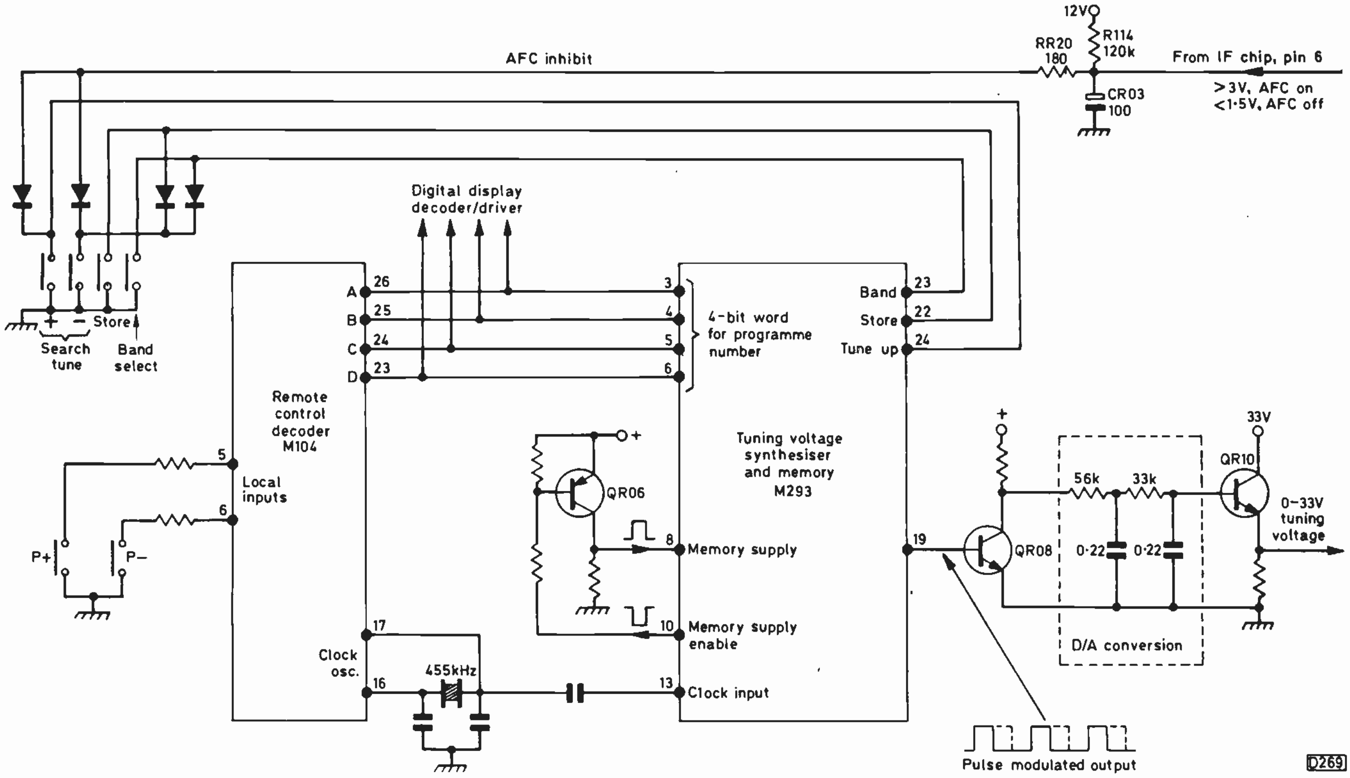


Fig. 3: The voltage-synthesis tuning system.

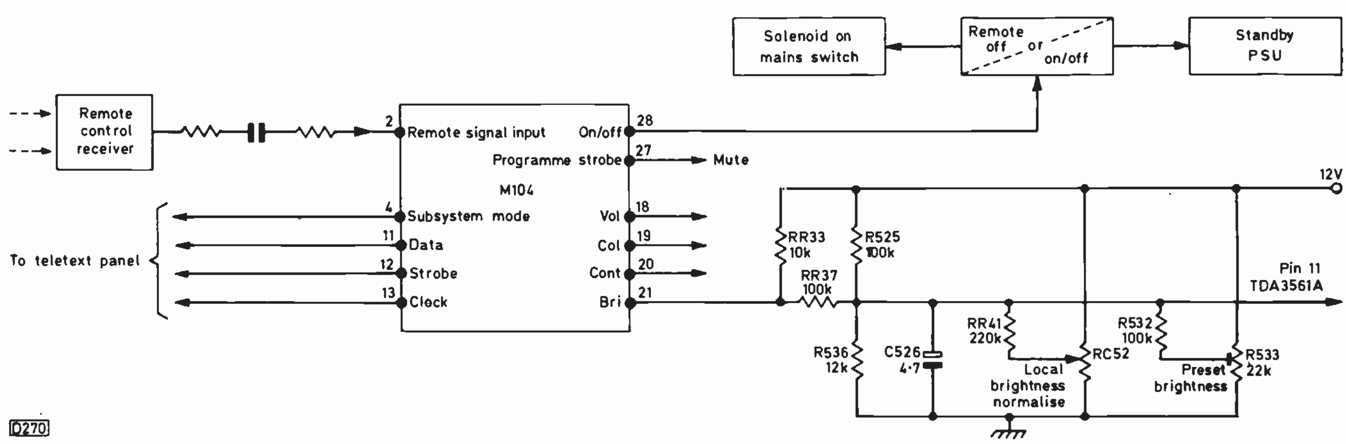


Fig. 4: Remote control command processing.

confident of its performance and reliability.

Removal of the transformer, tripler and focus module has helped us to reduce the size of the chassis and simplify its assembly.

The PAL decoder i.c. chosen for use in the 140 chassis is the TDA3561A (a number that's easy to confuse with the field output i.c.). This was adopted in preference to the μPC1365C used in the 120 chassis partly because of supply difficulties with the latter and partly due to the TDA3561A's compatibility with the new teletext decoder

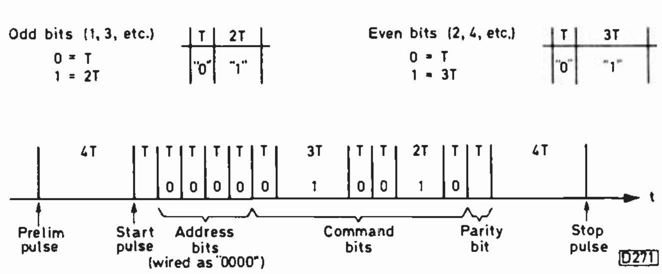


Fig. 5: Remote control pulse code – typical word.

chip set. There are also a few less peripheral components.

The improvements we found with the new decoder chip were mainly in the way in which the external circuitry could be designed. For example, the sandcastle pulse is separated into its three components (burst gate and black-level clamp pulse; line flyback blanking pulse; field flyback blanking) within the TDA3561A, so that no extra external network is needed. Then the use of an 8·8MHz subcarrier crystal means that there's no need for a 90° phase adjustment. Also the chroma delay line driver transistor is within the i.c. – the μPC1365C required an extra transistor for this purpose.

Tuning Arrangements

Chassis types 140-144 have push-button mechanical channel selection with multi-turn potentiometers for tuning. Whilst many of these sets are still around they have now been superseded by the 160 chassis which we'll discuss next month.

Chassis types 145-149 and all the 150 series have

Table 1: Chassis variations.

140 series: mechanical channel change			
Tube (in.)	Vertical chassis, integral controls	Horizontal chassis	
		Integral controls	Separate controls
14	—	—	140
20	141	141AH	143
22	142	142AH	144

145 series: remote control with voltage synthesis tuning				
Tube (in.)	Vertical chassis, integral controls	Horizontal chassis		
		Separate controls	Integral controls	Monitor controls
14/16	—	145(A)*	—	145AB
20	146(A)*	148(A)*	146AH	146AB
22	147(A)*	149(A)*	147AH	147AB

* When the 150 series chassis was introduced the 145 board layout was modified slightly to produce a common basic panel – hence the (A).

voltage-synthesis tuning with remote control of channel selection and all other customer control functions. The remote control system is known as System 40: the hand units are numbered RC40, RC41 etc. depending on style and so on. The system also decodes the teletext control codes received from the hand unit.

The i.c.s in this section are of SGS manufacture. They are used by several setmakers so some details of the system's operation may be of interest.

Fig. 3 shows the basic elements of the tuning system. It's been drawn in a similar way to the full System 40 circuit diagram to make it easier to relate the two. To illustrate the principle of operation we'll go through the sequence for tuning in and storing a channel.

Pressing "tune +" or "tune −" (or "P+", "P−") starts the tuning voltage obtained from pin 19 of the M293 tuning voltage synthesiser i.c. moving up or down. The actual output at pin 19 is an increasing (or decreasing) number of pulses up to 256 per cycle: after this the number of pulses remains the same but they become wider. These pulses are integrated (digital-analogue conversion), the emitter-follower QR10 supplying the tuner with the resultant tuning voltage. While either tune button is pressed the a.f.c. is inhibited (via RR20): when the button is released the time-constant network CR03/R114 delays reinstatement of the a.f.c. for a few seconds to make fine tuning easier. The search starts slowly and gradually quickens while either button is pressed.

When a signal has been tuned in to your satisfaction you press the store button. On release of this button the memory supply (pin 8) is switched on for a few milliseconds and the tuning voltage is recorded, as a pulse code, in the non-volatile memory for that particular programme number. If you want to transfer it to another programme number (there are sixteen to choose from) press the store button again and without letting go select the required programme number. Then release the store button.

The M293 i.c. decodes the programme number, for its own internal reference, from the four-digit code on lines A, B, C, D. This code is generated by the M104 remote-control decoder i.c. from the information it receives either from the "P+" or "P−" buttons or over the remote control link. The local buttons index just one programme at a time but the remote control hand unit has direct programme access. Lines A, B, C, D are also decoded by an LM1017 i.c. to drive a seven-segment, 1½-digit display for programme number indication.

Remote Control

Fig. 4 shows the main bits around the M104 i.c. which decodes the remote control signals. The coded infra-red signal is received, amplified and limited in the remote control receiver which is housed in its own screening can and feeds an output of about 2V peak-to-peak to pin 2 of the M104. Notice the resistor at the receiver's output and at pin 2 of the M104: these resistors are included and split in this way to give some protection to the i.c.s against large transients, e.g. due to tube flashovers. Most of the pins of these MOS i.c.s have resistors as close as possible to them. The M104 checks the signal in several ways to make sure it's a valid command and not noise or some interfering signal. Only when all the checks are correct does it decode the pulses and issue the appropriate command output.

Channel selection commands produce corresponding codes on lines A, B, C and D as mentioned above. Other control commands, i.e. brightness etc., result in a variation of the 7·8kHz squarewave present at the appropriate analogue output – the brightness control circuit is shown in Fig. 4 and is typical of the others. The squarewave output's duty cycle can be varied in 63 steps: the output is integrated by RR37/C526 and matrixed with the local control and a preset potentiometer before being applied to the PAL decoder i.c.

The on/off command can be used either to operate the solenoid on the mains switch (for remote off only models) or the standby power supply (for remote on/off models). The programme strobe output at pin 27 is used to mute the sound during channel change. The signals appearing at pins 4, 11, 12 and 13 are used for the teletext decoder.

Finally this month a brief note on the way in which the commands are sent over the infra-red link. The system used is pulse-code modulation. Each binary command word consists of twelve bits, the state of each bit depending on the time interval between pulses (see Fig. 5). Having different codes for odd and even bits helps to protect against unwanted or interfering signals.

The example of a complete word shows that before an actual command is transmitted a preliminary pulse is sent to warn the receiving end that something is about to happen. This is followed by a start pulse then four address bits are sent. Up to sixteen different addresses are possible but in the System 40 this code is permanently wired as 0000. The six command bits are followed by a parity bit to help the checking procedure further and the word finishes with a stop pulse.

In order to synchronise the transmitter and receiver, the receiver measures the time interval between the start pulse and the first data pulse and uses this as a reference for time T.

While a button is pressed the relevant twelve-bit word is repeatedly transmitted by the hand unit at intervals of 112ms. About 18ms after the button has been released a code representing "end of transmission" is sent and the transmitter returns to the standby mode.

TV Fault Finding

Reports from Chris Avis, Brian Renforth, Philip Blundell, Eng. Tech., Keith Hamer, Garry Smith, Hugh MacMullen, Hugh Allison and Steve Leatherbarrow

Tube Reactivation

The complaint with a Panasonic TC2207 was intermittent red, but the picture displayed revealed a very tired Mullard A56-540X tube – after all of four years' use. After "cleaning and balancing" (a very mild reactivation) on the B and K Dynascan 467 analyser excellent emission was restored to all the guns and the picture was perfect – until the red disappeared. Fortunately resoldering the red output transistor's collector connection was all that was required.

I originally bought the 467 instrument after reading Eugene Trundle's review of it in this magazine (April 1984). Despite the high cost (over £400) it has proved to be an excellent investment, even for my modest one-man business. Incidentally I find it useful to code the tubes I've processed by marking the neck with a permanent felt pen. "984" for example means complete reactivation in September 1984, "RGCB1085" means red and green guns cleaned and balanced in October 1985, etc. **C.A.**

Binatone 01/9771 Visioncorder

This combined radio/cassette/TV had no sound and on investigation a 10Ω, 1W resistor (RB40) embedded inside the case was found to have been overheating. It feeds the UPC2002 audio output i.c., which had gone short-circuit. Not having this type of i.c. in stock I fitted a TDA2003, which is listed as an equivalent, replaced the scorched 10Ω resistor and switched on. The sound had been restored and after a while on test the unit was returned to the customer.

A week later it was back again with the symptom of intermittent low volume and distortion. To cut a long story short, an eventual scope check across the speaker revealed that a high-frequency oscillation (nearly 4MHz!) was present during the low volume periods while the audio chip then overheated. Any attempt to increase the level of negative feedback via RB112/CB113 made matters worse. By now you clever readers will have realised that the input/output phase relationship of the UPC2002 and the TDA 2003 is different, in fact 180° different. The result was that my "equivalent" i.c. effectively converted negative to positive feedback and produced an intermittent v.h.f. oscillator. Fitting the correct i.c. restored normal service – and taught me a lesson! **C.A.**

ITT VC300 Chassis

Some sets play the meanest of tricks. This ageing monochrome portable had severe top field foldover, caused by T12 (BC140) in the field output stage being leaky. A replacement BC140 was fitted and the result was – complete field collapse! After fruitless checks through the field timebase I turned the field hold control R76 to minimum resistance and obtained a full though unlocked picture. In the time taken to replace one transistor the field hold control had gone open-circuit at one end of its track. Must have been a frame up . . . **C.A.**

Ferguson TX90 Chassis

This dead set had blown the mains transformer secondary fuse FS102. Temporarily substituting my 20mm fuse shell wired to a 2A cutout produced a humming, chirruping noise from the set before the cutout tripped. My Diagnostically Immaculate Mind instantly deduced that there was a heavy current somewhere and incorrectly directed my attention to the 12V regulator chip IC105. The line output transistor TR112 was then checked in situ for shorts but appeared to be in order. Other semiconductor devices in the power supply/line timebase were similarly checked. After much wasted time TR112 (T9064V) was removed, and rechecked. This revealed a 2kΩ leak from the base to the collector. Moral: always remove before checking for shorts – in case of a leak. **C.A.**

Service Tips

A noisy control is sometimes difficult or impossible to reach with the applicator tube supplied with cleaning fluid aerosols. A spare tube with about 40mm of 2mm PVC sleeving pushed halfway on one end makes a useful extension which can be push-fitted on to an existing aerosol tube to reach otherwise inaccessible points.

It's difficult to find a suitable test point at which to measure the l.t. rail voltage on some obscure monochrome portables. I find that the tube heater pins 3/4 provide an easily located and reliable monitoring point (provided the tube has an 11V heater of course!). Since one pin is connected to chassis it takes a maximum of only two attempts to get a reading. **C.A.**

ITT CVC1202 Chassis

One of these sets had an odd fault on the CMC301 remote control module. When the set had been on for about half an hour the on-screen channel display stopped working: after a further half an hour there was no remote control operation. The cause of the trouble was traced to reduced output (15V) from the μA7818 18V regulator chip (IC1401). **P.B.**

ITT 80-90° Chassis

The ticket said dead but the set did have some life in it. The h.t. was very low (60V) and there was no sound or picture. The h.t. voltage remained the same with a dummy load connected instead of the line output stage, so battle with the power supply commenced. The known suspect components – R632 (820kΩ), R630 (1·5MΩ), R628 (thermistor) and D611 (1N4002) – all checked o.k. so the pulse-width modulator transistors T613/4 were replaced – to no avail. There was a working set with the same chassis in the workshop at the time, so the collectors of the chopper transistors in the two sets were disconnected and the d.c. voltages compared. The voltage at the collector of T616 was found to be low in the defective set – it's part of the trip circuit. R651 (100kΩ) had gone open-circuit. **P.B.**

Rank T114B Power Panel

The set came in with the complaint of fuse blowing after various periods of time. Having eliminated the main chassis we got to work on the T114B power supply panel. A 60W bulb was connected as a dummy load and the mains input was applied via a variac. For the first few days the power supply would work quite happily for an hour or so with a reduced output of 115V, after which there would be violent fuse blowing (both fuses). Subsequently the fault became more destructive, killing BU326 chopper transistors. After several days just about every component in the power supply had been removed, checked, refitted or replaced – we all know how naughty solid-state components can be under operating conditions. We found it difficult to check the very low voltages around the switching thyristor 7THY1. To save fuses the over-voltage crowbar thyristor 7THY2 was removed. We then found that the BU326 chopper transistor just acted as a rectifier and d.c. resistance, i.e. it wasn't being switch on and off (at about 25kHz) as it should have been. The set would work quite happily with an input of 110V, but the e.h.t. regulation was poor. The panel was next examined in microscopic detail (two pairs of specs). Yes, there it was, a tiny hairline crack in the print between the gate of 7THY1 and the set-current limit potentiometer – it was invisible to the naked eye. The end of a long, frustrating search. **H.MacM.**

Philips K30/K35 Chassis

This fault was rather naughty: it appeared only when I wasn't looking or the set was in the customer's lounge. Every now and again the luminance disappeared, leaving only weak chrominance. We eventually found that when the fault was present the field flyback blanking transistor's collector voltage was rather high. Replacing this transistor (T1535 – BC558) cured the fault for good – we assume that the transistor was intermittently shorting internally. **H.MacM.**

Rank A823 Chassis

This early 22in. colour set had bowed vertical red and green lines, which couldn't be straightened by adjusting the R/G field tilt control, at the top and bottom of the raster. It turned out that 7C4 (400μF) was open-circuit, a replacement restoring satisfactory convergence after readjustment. **B.R.**

Dwek Classic TV130

Two of these sets were reported to have a line sync fault and on investigation we found that the picture jittered horizontally. The obvious suspect was the TBA950 sync separator/line generator chip (IC400) but replacing this made no difference. In both cases the culprit eventually turned out to be C403 (0·1μF) which is connected from pin 8 of IC400 to chassis. **K.H.-G.S.**

Sinclair Microvision MTV1A

In a moment of weakness I bought one of these sets for a tenner at a car boot sale. The seller demonstrated that it would run on an external supply by plugging it into his car's cigar lighter socket: it then produced a grotty picture with severe sound-on-vision. He said it didn't have the internal battery option.

When I opened it up I found that it had four rechargeable pencells in it, but the interlocking pins that interconnect the boards were misaligned, with the vital battery pin bent. Straightening the pins and reassembly cured the sound-on-vision and improved the picture – I presume the battery acts as the main smoothing capacitor. It then took five short hours of sheer frustration to coax the chassis back into the case. Incidentally, never ever operate the exposed chassis in the the palm of your hand: the Walton-Cockroft e.h.t. multiplier is on the bottom board and packs a punch – it caught me three times. Allison 0, Sinclair 3. **H.A.**

Fidelity CTV14

This colour portable was tripping. Disconnecting the line output stage stopped the tripping but replacing the secondary supply rectifiers, the output transistor and the transformer failed to cure the fault. The culprit was the focus control. **S.L.**

Ferguson TX10 Chassis

A common problem with these sets is that discharges in the focus control unit cause tripping or intermittent tripping. After replacing this you may find that with remote control (later versions) only even channels are selectable, e.g. press channel 7 and channel 8 appears. The SAA5012 is always the culprit. After replacing the above items in one of these sets the customer complained of intermittent mumbling and crackling on sound. Replacing the sound i.c. cured this.

Incidentally, if a new focus unit is not to hand and the discharge is fairly minor, removing one of the mounting screws and positioning so that the unit is clear will suffice until a new one can be obtained and fitted.

Whilst on these sets, note that the connections to the thermistor in the degaussing circuit tend to deteriorate, giving impurity and/or fuse blowing. **S.L.**

Philips TX Chassis

This chassis has few real vices and is thus a particular favourite. A fault that could easily set you off on a wild goose chase however is no line hold. A check on the l.t. rail voltage will usually show that this is high, due to a leaky or short-circuit regulator transistor (TS110, BD434). A glance at the tube heater tells all of course. **S.L.**

Philips G11 Chassis

If the Philips G11 on your bench has slowly decreasing width (as much as five inches on either side) which corrects itself if you even think of touching the set you'll not be surprised to find a dry-joint. On one occasion recently the dry-joint was at the line driver transformer's connections. **S.L.**

Ferguson TX9 Chassis

Dead sets always form a large proportion of an engineer's workload. A TX9 we had recently became a bit of a trial however – the fault was intermittent. After carrying out various tests in the power supply nothing wrong could be found – because the set had decided to work . . . It went off again two days later. The board was removed and various dry-joints under plugs were dealt with. Result: faultless behaviour. Until, that is, it was asked to work for the customer. After several days it stayed off long enough for us to prove that the on/off switch was faulty. It was of the white Lorlin variety. On reflection these have caused many a dead set with various different chassis – the Rank T20 and GEC C2110 series spring to mind. **S.L.**

The North American TV Scene

Keith Cummins

On a recent visit to Canada and the United States I was struck by the fact that the TV scene there is rather different from that in the UK. Cable and satellite TV are much more common and, upon reflection, one can see why.

My first stop was at Vancouver in British Columbia. One hardly sees any TV aerials of the conventional kind there: the whole city is wired for cable TV. Since nearly all N. American TV is commercially operated there's no licence fee. The annual cost of the basic cable connection, apart from scrambled pay-TV, is around 120 Canadian dollars (roughly £60 at the time of writing). For this you get over twenty channels from various sources – local studio programming, the Canadian Broadcasting Corporation, transmissions from the USA (e.g. Seattle and Bellingham) and satellite transmissions.

Utility Poles

In most cases the wiring of a city for cable TV is relatively easy because of that N. American facility the Utility Pole. These are everywhere: they carry the electricity supply, street lamps, telephone lines and cable TV. It's usually a simple matter to hang the cable TV system from existing poles. Furthermore most N. American towns and cities are laid out using the grid format, the parallel avenues intersecting the streets at right angles to divide the city into blocks, making the provision of services easier. I have to say that utility poles are unsightly. As one goes downtown their complexity and number increases.

Power Distribution System

While on the subject of services, it's worth mentioning the power distribution system. As most people know, the standard mains voltage in N. America is 117V (110V and 115V are commonly mentioned, but 117V is the standard). Quite how this voltage was arrived at is difficult to ascertain – the truth about this would be welcome if anyone knows! The mains frequency is 60Hz. I'd often wondered how one copes with heavy consumption appliances like cookers and tumble driers on 117V. The answer is to double the voltage.

People say that because they have three lines coming off the utility pole they employ three phases. This is incorrect. What they have is a biphase 117V supply, in other words the distribution transformer has an overall secondary voltage of 2 × 117V = 234V, which is centre-tapped. The centre tap is neutral and earthed. The lines pass through a two-phase kWH meter. Lights and the normal 117V distribution sockets (very small and neat, with flat blade plugs) are connected between one phase and neutral. Heavy consumption appliances are connected across the phases, either by hard wiring or via a hefty metal-clad plug and socket.

The utility poles carry the distribution transformers. In most suburban areas a single h.t. cable to feed the transformer primaries is strung along the very tops of the poles. The other end of the primary winding is returned to the system neutral referred to. This strikes me as being slightly dubious practice but it obviously works all right!

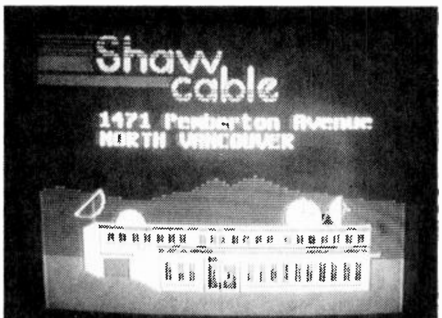
The 60Hz Field Rate

The TVs naturally run off 117V and with the NTSC system the field scan rate is 60Hz because in the old days the field scanning was locked to the mains supply frequency in the same way that ours used to be locked to 50Hz.

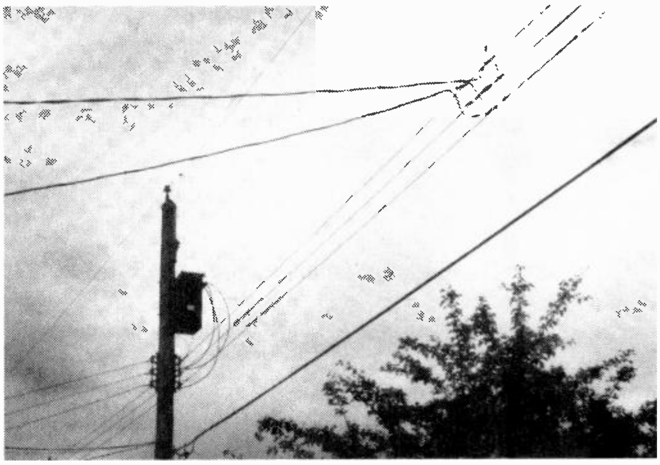
The use of 60Hz, i.e. 30 complete frames per second, is a mixed blessing. The increased scanning rate virtually eliminates picture flicker – I'm told that a five-fold increase in brightness can take place before the flicker becomes as obvious as it is at 50Hz. Certainly the pictures I saw were flicker free provided the programme source was to N. American standards. The problems arise with the scanning of film and with standards conversion of programmes using the 50Hz system (like the endless repeats of 1975-vintage Monty Python, Dave Allen and more recent Benny Hill shows).

Standards Conversion

The original method of coping with 24 frames per second film is first to run its average speed to provide 25 frames per second – we do this in Europe, which means that a one hour film runs for 57·6 minutes – then, to cope with the 30 frames rate, five frames of the film are scanned at 30 frames per second with the last one held



Off-screen shots of N. American cable TV. Left, caption for Shaw Cable which runs a network in N. Vancouver. Centre, logos of some of the channels available from Shaw Cable. Right, cable TV advert seen in a motel room at Kamloops.



A typical suburban utility pole hook-up. Photograph taken in N. Vancouver.

House in N. Vancouver, B.C., with roof-mounted dish aerial for satellite TV reception.

and scanned again so that six frames are transmitted for every five frames of film. This works quite well until fast panning shots are transmitted, when 5Hz edge flicker becomes obvious. More modern telecine equipments use field storage techniques, i.e. they use electronic standards conversion. These give rise to a blurred edge under fast motion conditions, which is less objectionable. Likewise, 50-60Hz conversion introduces a 10Hz edge flicker – the same as when we do it the other way. Our standards converters appear to be of better integrity than some N. American ones however.

When looking at a severely censored and edited Dave Allan show I kept noticing that the picture appeared to be over-scanned. Captions were lost at the top and bottom of the screen, and sometimes parts of heads were cut off at the top. It then occurred to me that a "poor man's converter" must be in action: what appeared to be happening was that the top and bottom fifty lines of our 625-line picture were being thrown away, thus producing a 525-line picture! Change the field rate and you don't need an elaborate line store. Ugh!

NTSC Colour

So far I've said nothing about NTSC colour. It's not that words fail me. In fact I did see some very good pictures in N. America. There weren't many, mind you, and it's true to say that the overall standard and consistency are not as good as in the UK. Modern receivers have a.f.c. which helps maintain consistent results. The reasons for this are not immediately clear until you think about the problem, as it applies only to NTSC. I should point out too that the turret tuner is only just being displaced by electronic tuners – many new sets at the cheaper end of the price range still use turret tuners.

So how does a.f.c. help an NTSC receiver? Remember that unlike the PAL system NTSC has no colour phase-error correction facility and is therefore very vulnerable to colour subcarrier phase errors. Phase errors with PAL result in colour desaturation (and have to be really bad to be noticeable) whereas small phase errors with NTSC produce noticeable hue errors. The user is provided with a subcarrier phase (hue) control on his NTSC receiver. Every such control I saw was labelled "tint". The user thus has two colour controls to manipulate, compared to one with a PAL set. Fine receiver tuning moves the vision carrier and colour subcarrier positions within the receiver's i.f. passband, and as I noticed whilst twiddling this can also produce visible colour phase errors – something that just doesn't happen with PAL. So the user in fact has three variables to contend with. Add to this the inconsistencies in broadcasting and you'll appreciate why some NTSC pictures look so awful! A.F.C. removes one variable. Very often it's tied to a "colour auto" button which also vastly reduces the range of adjustment provided by the colour and tint controls, setting them to a central nominal position. This seems to work quite well and one was able to flick around the channels without seeing one sea-sick green face.

I'm told that some more recent receivers take advantage of reference signals transmitted during the field blanking period, but no one I spoke to seemed to know whether this was so and if so what was involved.

While on the subject of the field flyback blanking interval, I managed to roll a few pictures and saw some kind of teletext like signals dancing about, though there's at present no agreed teletext standard in N. America.

Cable and Satellite TV

Most towns have cable TV systems. This applies particularly because small towns can be hundreds of miles apart and might otherwise have no TV at all. The use of a satellite TV receiving station, local studios and a cable network is an obvious solution to the problem. This situation does not arise in the UK, so I'm not altogether surprised that cable hasn't taken off here in the same way as in N. America.

Quite a lot of people in N. America live in the middle of nowhere – grain farmers in Idaho for example – and buy their own dishes and receiving equipment in preference to having no TV. I was told that there's talk of scrambling all satellite TV broadcasts and that this slowed sales of individual receiving systems in 1985. There's a strong lobby against scrambling however. As nearly all TV is paid for by advertising, it's felt that the advertisers will apply pressure against scrambling on the grounds that it would limit audiences and thus be against their interests. The situation is at present in the melting pot.

Most satellite transmissions are in the 4GHz band though some are shifting to 12GHz. This introduces further uncertainties with satellite systems.

Crosstalk

One disadvantage I noticed with several cable systems was crosstalk. On some channels the interfering signals were very obvious, floating around in the background of the main picture. This "ghost" was often negative. Severe ringing could also occur on some channels.

Dealers

I met several TV people in my travels. My thanks go first to Al DeHart of HiGrade TV in Penticton, B.C. who showed me a huge Electrohome back-projection TV set that sold for over 3,000 Canadian dollars. There were also the large, low cabinets in the N. American tradition, carrying various names including Zenith and Hitachi. We chatted for a while then Al gave me a photocopy of an article by a Mr. Paul Seelig in the July 1985 issue of *Marketnews*. The subject was future multi-standard video recorders and TV sets to enable the standards gulf between Europe and N. America to be bridged.

Seelig made some interesting statements in his article, which I'll quote with minimal comment. "In Britain for example one normally buys an electrical unit without a plug since the sockets are different from place to place, even from town to town." How long have we had the 13A plug? Thirty years? "Both v.h.f. and u.h.f. are in use in Europe, however the bandwidth is generally much smaller than in N. America. Channels are used or reserved for use by the governments, so television sets aren't supposed to be able to receive them . . . France decided to use u.h.f. channels 16 to 30 for aviation, England however decided to use channels 61 to 79 for this purpose and leave 16 to 30 open for commercial use." "In N. America we have settled on a 117V supply with a frequency of 60 cycles . . . with our plentiful supply of generating facilities this low-voltage, high-amperage system is ideal." We don't need centre-tapped double voltage supplies in Europe – even if we are more likely to get killed.

My thanks are also due to Gunther of Jan's TV in North Vancouver and Ed Knippelberg of Elgered TV Sales and Service in Priceton, B.C. for their time and trouble. Ed makes and sells his own satellite dishes.

Summing Up

It was interesting to see a different approach to TV and to be able to make my own assessment of NTSC. The satellite and cable situation in N. America is quite different from the UK. In all cases it's a matter of "horses for courses". Satellite and cable TV represent solutions to a N. American problem. In the UK cable TV is an answer looking for a question. The only question we have is how to get twenty channels instead of four, though most people I've spoken to don't want them. The British seem to have taken to the VCR instead of cable.

VCR sales and market penetration in N. America are much lower than in the UK. Profit margins on their sales are small and they are regarded as a maintenance liability by both servicemen and the public alike. Remember that if you live in a small town in the vast area of N. America you may need to take your equipment 100 miles to get it serviced!

Lastly a laugh I had while looking at an ancient monochrome Perry Mason film being broadcast by KVOS-TV of Bellingham, Washington State. After the end of one reel the next one started with the picture upside down while the sound and picture ran backwards. Who'd forgotten to rewind?!

Teletopics

SATELLITE TV LATEST

Robert Maxwell's plans to run one of the four TV channels to be transmitted via the first French DBS satellite TDF-1, due for launch this July, were mentioned in this column last October. Mr. Maxwell has now signed an exclusive eight-year contract to run the channel, with an option to renew the agreement. The fee for renting the channel, which will cover an area of W. Europe with some 280m viewers, is understood to be approximately £5·3m a year. The plan is to use the channel for a news and entertainment service (in English) financed by advertising. Since TDF-1 is a high-power satellite reception will be possible using an 0·9m dish – much of the UK will be within the service area. Mr. Maxwell is currently engaged in negotiations with television companies and independent producers on the supply of programmes. He is also considering making an offer for Thorn's cinema and film-making business, which is up for sale.

There has been a change in Mr. Maxwell's arrangements with the French authorities. He had originally agreed to take a stake in the company operating the satellite. The agreement to lease the satellite channel supersedes this earlier proposal.

TV services company Carlton Communications, whose recent proposal to take over Thames Television (which joint owners Thorn and BET want to sell) was blocked by the IBA, has bought Television International Operations (TVI) from Rank Video for £2·6m. TVI's customers include Rupert Murdoch's Sky Channel and Robert Maxwell's MirrorVision (broadcast via Eutelsat I-F1 and Intelstat VA F11 respectively): it supplies studio and production facilities and transmission uplinks.

A dozen organisations, including broadcasters and industrial concerns, responded to the IBA's request for ideas/proposals for a UK DBS service (see Teletopics, November). While the IBA has released no information on those providing proposals two organisations have made public statements, National Broadcasting Service and Britsat. NBS was set up recently by James Lee who was previously chief executive of Goldcrest Films and Television. It hopes to bid for a franchise to run three channels, two initially – an information channel and an entertainment channel for young people. Britsat's proposal is to provide a satellite system costing £170m over a fifteen year service span. A broadcasting profit approaching £300m is anticipated after ten years' operation. Britsat would use three RCA satellites, each providing five channels with beams covering most of Europe. A July 1988 launch date is proposed for the first satellite – provided approval is received by early 1986.

The sixteen ITV companies are planning to go ahead with a satellite-delivered SuperChannel which would supply European cable TV networks with a service using programme material from the existing four UK channels, with news from ITN and TV-am. The BBC is understood to have agreed to supply programmes for an initial payment plus a percentage of the profits, though it does not intend to become a member of the group. The channel would be financed by advertising and would compete with Rupert Murdoch's Sky Channel which is at present available to over four million European cable TV subscribers.

SES of Luxembourg (see last month) has now signed a contract with Arianespace for the launch of a 16-channel RCA TV satellite next year – April or May is the expected launch date. The satellite power will be 45W per channel (the high-power TDF-1 will operate at 250W per channel while the Eutelsat and Intelsat satellites operate at 10-20W per channel).

The options for those seeking satellite TV reception in the UK are steadily increasing. DER has launched a pilot satellite TV rental scheme through twenty of its outlets in the Home Counties. The firm will install a 1·8m dish of NEC manufacture and align it for reception from either Eutelsat I-F1 or Intelsat VA F11. The rental is £50 a month for the equipment plus a monthly charge of £12 for the right to receive the programmes. It's expected that the equipment charge would fall to £15 a month by the third year of the rental contract. DER will probably extend the rental scheme nation-wide if a total of a hundred or so rentals is achieved during the initial six-month trial period. Alternatively you could go to Harrods, which claims to have become the first major store in Europe to offer satellite TV receiving equipment. The main line is a 1·8m dish with or without motor drive: all equipment is being supplied by Megasat, who ran an intensive sales training course for eight members of Harrods' staff. The in-store display consists of a dish, the motor drive controller and a bank of TV screens which show the various channels available. A basic installation costs £1,150 plus VAT: with the more sophisticated motor drive arrangement the cost is £2,100 plus VAT. Megasat expects a modest initial sale of around twenty systems during December/January.

LEARNING VIA SATELLITE TV

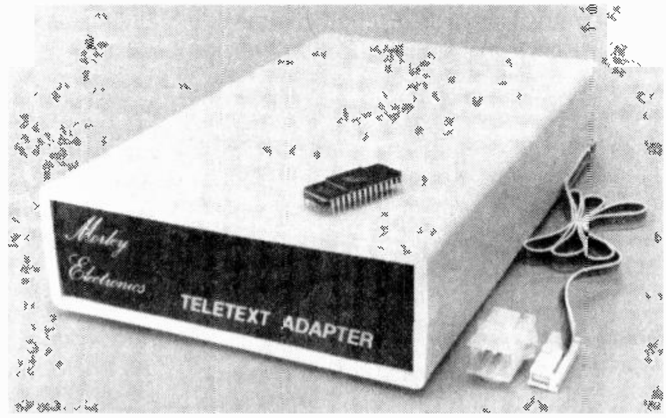
A system called ASTRID – short for Automatic Satellite Telemetry Receiver and Information Decoder – has been developed by Steve Webb to give easy access to educational signals from the Oscar 9 and Oscar 11 satellites. The equipment is available from M.M. Microwave Ltd., Kirkbymoorside, York YO6 6DW for £149 inclusive of VAT and packing. It includes a receiver-decoder, aerial, power supply and leads plus a test tape with display software and will operate with any computer that has a suitable serial interface. The system was originally developed for use with the BBC microcomputer because of the good quality educational software readily available for use with this machine: it has since been adapted for use with the Sinclair Spectrum and other computers.

PRESTEL'S YEAR

Prestel has reported a successful year with use of the service increased by 44 per cent – more than a million pages a day were being called up by users and over 100,000 electronic mail messages a week were sent. At the end of last October the number of Prestel installations was 62,000, the business/domestic ratio being 55/45 per cent respectively.

TELETEXT ADAPTOR FOR MICROS

Morley Electronics of 1 Morley Place, Earsdon Road, Shiremoor, Tyne and Wear (091 251 3883) has introduced a teletext adaptor for use with microcomputers. The adaptor takes aerial and mains inputs and is controlled by the microcomputer's keyboard. Models are available at prices ranging from £98 to about £150 for use with various computers including the BBC, Electron and Commodore 64/128. A u.h.f. modulator is available as an optional extra for the Electron version so that the output can be fed to a standard TV set.



The Morley Electronics microcomputer teletext adaptor.

The company has also introduced a one Mbyte RAM disc with battery backup: this is not a sideways RAM but a true silicon disc that connects with the 1MHz bus – up to 64 RAM discs can be connected to the BBC micro.

FIFTH FRENCH CHANNEL

The French government has decided that a new company headed by Jerome Seydoux, chairman of the Chargeurs industrial holding company, and the Italian TV entrepreneur Silvio Berlusconi will run the new, fifth national TV channel, which is to be financed by advertising. The new service is due to start before February 20th with about four hours of programmes a day during prime TV time, building up gradually to about eighteen hours of transmissions daily. In addition to a terrestrial network, which is expected to reach 28 million viewers by the end of the year, the service will be given one of the TDF-1 satellite channels. The decision to award the service to the new group caused a political storm with protests from all parties, particularly those on the right – the new channel will come on air just before national elections are due to be held this March. The Luxembourg group CTL, which had hoped to run the service, has threatened to take legal action to block the start of the transmissions.

SCOTCH VIDEO HEAD CLEANER

Scotch have introduced a video head cleaning cassette which is available in both VHS and Beta formats – the patented system uses the TV screen to show when the heads are clean. The tape is a dry cleaner requiring no detergents or liquids: the cassette is simply inserted and play selected. A recorded message – "when message is clear stop recorder!" – becomes clearer as the cleaning action takes effect. In addition a recorded audio message acts as a reminder to the user to stop the cleaning. Scotch comment that many of the rival cleaning tapes they've tested have completed the cleaning action in far less than the time specified for use, resulting in excessive head wear. Cleaning tapes are on average ten times more

The message on the Scotch video head cleaning tape.

abrasive than recording tapes, though the Scotch cleaning tape is said to be notably "gentle" on the heads.

CHANNEL 4 COVERAGE

Over 98 per cent of the total UK population can now receive Ch. 4 transmissions – only about one per cent less than the ITV coverage. Full parity with ITV coverage will be achieved by the end of 1987 and during 1986 a further 99 relay stations will be equipped with Ch. 4 transmitters.

CABLE SETBACKS

The difficulties in raising finance experienced by UK cable companies already awarded franchises by the Cable Authority has led the Authority to defer advertising the next batch of franchises. The original plan was to advertise groups of five franchises every four months: the second group was to have been advertised at the end of November, with the franchises awarded this month. Most of the original eleven companies awarded franchises in November 1983 have so far failed to start operations. Shaw Cable, which was to provide a service in the London borough of Wandsworth, has been put into receivership. The economics of Aberdeen Cable, which commenced operations last summer, have been put into question by the local council's decision to levy wayleave charges for laying cables on council owned property – just under fifty per cent of the property in Aberdeen is owned by the council.

GRUNDIG-BLAUPUNKT TV DEAL

In a move designed to reduce excess TV manufacturing capacity in Europe Grundig and Blaupunkt have reached an agreement whereby Blaupunkt will cease to manufacture TV sets at its Hildersham TV plant and instead take supplies of sets from Grundig. In return Grundig will be supplied with car radio/audio equipment by Blaupunkt. As part of the deal Blaupunkt will purchase a twenty per cent interest in Grundig, which is controlled by Philips. Blaupunkt's TV manufacturing operation has been running at a small loss: the company intends to review its W. German distribution network, reducing the number of dealers.

NEW MAPLIN CATALOGUE

The massive 1986 Maplin Buyers' Guide to Electronic Components is now available from Maplin stores for £1·45 or from Maplin Mail Order, PO Box 3, Rayleigh, Essex SS6 8LR for £1·85 including post and package. The prices of over 3,000 lines have been reduced and store/mail order prices brought into line.

POCKET INSPECTION MICROSCOPE

Cobonic Limited of 32 Ludlow Road, Guildford, Surrey GU2 5NW (0483 505 260) has introduced a self-illuminated pocket microscope roughly the size of a long, slim pack of cigars. A version giving a clear 30 times magnification is available at £18·90: a second version with 100 times magnification costs £27·90. Ideal for examining PCBs for print cracks and flaws.

DISC DEAL

Thomson of France and the Japanese company Nakamichi have signed an agreement to develop a new audio/video disc system. The audio equipment would be compatible with the current compact disc system while the video equipment would also provide a recording capability. Production is expected to start in Japan in 1988.

NEC INCREASES US TV OUTPUT

Japanese domination of the US TV market has been increased by NEC's latest moves. The company has opened a CTV plant in Georgia with a production capacity of 240,000 sets a year. A second plant to produce special TV sets/monitors at a rate of 48,000 a year is expected to start up by the end of 1986 while a third plant with the capacity to produce a further 240,000 colour sets a year is planned for 1987. NEC intends to increase its share of the US CTV market from one to five per cent, increasing the number of outlets from one to five thousand. NEC is also seeking three per cent of the US VCR market.

ADDRESSES

A couple of address changes worth noting. Toshiba's UK service department has moved to: Toshiba Technical Centre, Units 6 and 7, Admiralty Way, Southern Trading Centre, Blackwater, Surrey GU15 3DT (0276 36 222). Morphy Richards Consumer Electronics has moved to Swinton Works, Swinton, Mexborough, S. Yorks S64 8AJ (0709 582 402).

ANTISTATIC WIPES

A new series of anti-static wipes designed to keep equipment, c.r.t. screens, lenses, etc. clean and free of dust has been introduced by The Process Control Company, Griffin Lane, Aylesbury, Bucks HP19 3BD (0296 84 877). Called Procostat wipes, each cleaning wipe measures 6 × 4in. They come in packs of ten at £1·70 per pack. The wipe is impregnated with a static eliminating additive suspended in a solution containing ISP, giving an effective antistatic cleaning action without smearing.

TV SETS WITH TIMERS

NEC has introduced two 14in. TV sets that incorporate a timer to control the switch-on and switch-off times. The timer can be set from the control panel or the remote control handset. Model FS1401PI is fitted with an FST tube and sells for around £284·50: Model CT1416PI is fitted with a standard type tube and sells for around £235.

MULLARD ICs FOR STEREO TV SETS

Mullard has introduced a family of quasi-split sound (q.s.s.) i.c.s which give setmakers flexibility in designing the i.f. and sound demodulator stages of stereo TV sets and VCRs. In quasi-split sound systems the vision and sound signals are separated at the input to the i.f. strip. There are three levels of complexity with the new i.c.s: the TDA2556 gives dual-channel q.s.s. processing; the TDA2546A gives q.s.s. processing with single-channel sound demodulation; the TDA2545A/TDA2555 pair gives q.s.s. processing with dual-channel demodulation. The new i.c.s provide weighted signal-to-noise ratios in the audio channel of around 53dB. The quality of the video signal is also improved due to reduced sound-on-vision interference and a wider video bandwidth. The tuner's i.f. output is passed through parallel vision and sound i.f. filters, the signals then being processed separately. The i.c.s are suitable for all TV standards except standard L.

The TDA3803A stereo/dual-sound decoder i.c. has been designed to handle the W. German transmission standards.

More About RC5 Remote Control

Harold Peters

We've touched upon Philips remote control systems before (see November 1984 and February 1985). Since then a new range of models has appeared and the RC5 digital code has been established as a standard for Pye/Philips sets for some years to come. Moreover "basic" sets are on the decline and first line servicing is likely to involve more than plugging in a module: faults often need to be traced to component level. So, as servicing becomes more of a bench job, it's a good time to take a second look at RC5 and to sort out the proliferation of handsets. But first a recap for newcomers.

RC5 is a fifteen-bit digital code comprising two start bits, one control bit, five system bits and six command bits. The start bits provide synchronisation (like a burst), the control bit changes state every time a button is pressed, the system bits tell the set "TV" or "VCR" and the six command bits permit 64 different instructions per system. With few exceptions the same command code gives the same instruction on every system. The most significant exception is code ten, which is "tens/units" on VST and "single/double figures" on TRD4. Were it not for this and the fact that the VCR channel is 0 on current sets and 12 on KT3/K30s one handset could be made to work the lot. The pulses are 20msec long and are repeated every 114msec.

We should emphasise that RC5 is the *handset* code. The buttons on the set do not necessarily duplicate the bit streams for the same function. Note also that handsets having VCR commands on them give these out only while the side button is pressed at the same time – more on this later.

KT3/K30 Teletext Series

A brief note on this range first. These are not truly RC5 sets: they have a teletext and remote control system originally designed around the Southampton codes used in the G11s and others such as the Ferguson teletext range. To translate the RC5 Dutch code into English a panel incorporating a TMS1000 microcomputer chip is interposed between the remote control receiver and the decoder. The sets have twelve channels, with position twelve shortening the line sync time-constant for VCR operation. Since then, multichannel and cable requirements have made the VCR position 0 and the switching voltage can be made to select inputs as well as altering the time-constant.

The TMS1000 board can give rise to some odd faults. The situation was further complicated by a chip change half way through the production run. The 0096 and 0117 versions are not interchangeable, but Philips Service issue only the later (0096) type with fitting instructions for earlier models. At about the same time the l.t. supply connection was changed from a single pin to one pin of a multiconnector (W8.3) to suit the K30. It pays to keep the late version in the toolkit since it fits anything.

Other misleading symptoms on these models come from the power supply on the floor of the cabinet. The regulator i.c.s can give low outputs, and unless the supplies at the decoder are within 0·5V of 5V and 12V respectively decoding errors and unexpected trips to standby can occur. If the 500mA fuses on the power supply blow for no apparent reason, replace them with 650mA anti-surge types.

The VST System

The VST (voltage-synthesised tuning) system, which is used on medium-priced models, can be immediately identified by the yellow tuning line that traverses the screen from left to right during tuning. The heart of the system is an MSM5840H microcomputer i.c. which accepts commands from both the local keypad and the remote control system, generating data to control the analogue functions, channel change and where relevant teletext. For continental Europe there can also be bandswitching with on-screen indication by changing the colour of the tuning line. It will also select "first or second language" with European dual-channel TV sound systems.

Twenty tuning voltages, including VCR on 0, are memorised together with the "Granny" or personal preference settings of the analogue functions at switch on. The microcomputer chip has a volatile memory so a 2·4V ni-cad battery is float charged as the set is run, providing data retention in the memory for many months.

There are two more chips on the VST board. The LM339 quad operational amplifier chip handles the blanking and a.f.c. arrangements and an SAB3013 converts the data stream into voltage levels for the main chassis. System 4 sets have these two latter devices on small thick-film subassemblies.

You are likely to encounter six types of VST board, fitting the K35, CTX and System 4 chassis in either teletext or non-teletext versions. Stock control in workshops can be simplified by stocking only the teletext versions of each type – lift up the teletext mode control diode fitted between pins 16 and 28 of the microcomputer chip when fitting a board in a non-teletext set. This has to be done for the following obscure reason: if the remote control handset has to be returned to Philips Service for replacement an RC5352 flat, general-purpose type will be supplied and this provides teletext commands. If the user of a non-teletext set puts it into the teletext mode accidentally he'll not be able to change channel until he presses "reset" or "TV". The result is a nuisance service call.

The microcomputer chip, being pluggable, is not only easy to replace but is seldom the cause of trouble. Odd faults such as going to standby at random or reduced handset range of operation are generally due to either of the two 5·1V zener diodes going *low*. As the circuit references vary from model to model we must identify the diodes as the one across the eyeball receiver supply line and the one that regulates the 5V supply to the board.

A frequent user complaint is "poor teletext" after a new set has been in use for a while. This is usually due to the tuner having drifted to the end of the a.f.c. pull-in range. It can be seen when changing channel: the new programme will be snowy at first, then suddenly clear to normal as the a.f.c. works. The cure is to reprogramme the memory completely, not by using the fine tuner plus and minus buttons but by tracking the yellow line up to the station from the low-frequency end.

If you earth pin 16 of the microcomputer chip as shown in the manual the board goes into the service mode, offering a limited number of fault indications for use in conjunction with the published repair method. Unless a number of boards is being repaired on a flow-line basis it's probably better to adopt the conventional approach.

The yellow tuning line stops at every acceptable station and is halted by the state of the sound muting line which keeps down the hiss during tuning. This in turn depends on detection of the intercarrier sound signal, so if you get a set in which the yellow line won't stop at stations check the sound circuits as well as the VST board. Incidentally this feature is used by a colleague as a signal failure dector: should the local transmitter fail, the change of state on this line automatically switches the output from a pattern generator into the system instead.

The TRD4 System

TRD4 is the up-market remote control system. Why two systems you may ask, with some justification since the component count on the two boards is roughly the same. Moreover both systems use the RC5 code. What's the difference? Well TRD4 has a larger, non-volatile memory on a separate subpanel. This EAROM (electrically alterable read only memory) is capable of storing up to 90 cells of programme information (channel, band and system) together with the personal preference settings for the analogue controls without need for a back-up battery. Receivers for UK use employ only fifty memory cells for channel selection, leaving spare capacity for novelties such as Supertext, about which more later.

The microcomputer chip contains its own ROM which is programmed with data corresponding to the local oscillator frequencies required to tune in all the available TV channels (frequency-synthesis tuning). This data is compared with the actual local oscillator frequency via a conventional phase and frequency locked loop. The ROM is accurate to plus 500kHz of the nominal vision carrier (never minus). When selecting a channel, if the system fails to find a carrier to lock to it hops 1MHz up and tries again. It will repeat this up to eight times if need be (8MHz being the width of a channel) then go back and start all over again. This process is necessary in order to be able to tune to computers and VCRs whose outputs may not be spot on a particular channel frequency.

TRD4 sets can be tuned up in three different ways. (1) By changing to the Channel mode and dialling up the required channel on the handset. In this mode a full stop after the two digit numbers displayed on the set distinguishes Channel from Programme. (2) By pressing the plus and minus buttons. This will advance or retard the channel selected by one channel per push. (3) By pressing the search button. This starts the set tuning up the band, starting from the last channel in use. After any of these methods the chosen programme can be stored in any of the fifty available cells.

These sets can also suffer from tuner drift once the works have settled down. Unlike VST sets however the symptoms show up in a totally different and misleading way. Horizontal chunks of picture will flash brighter or go dark, symptomatic of a sync or video fault. What's happening is that the a.f.c. has got to the end of its catching range and the system has jumped up 1MHz to look for the carrier, as previously described. As before the cure is to reprogramme the whole bunch of channels, with the set fully warmed up, approaching each channel from the station lower down.

Thus to reprogramme ch. 62, press the open store button to open the memory, select the programme of ch. 59 (as an example), press C/P to select the channel mode, press the plus botton thrice, press C/P again, select the cell number in which you store ch. 62 (e.g. 3) and then press store. During the time that the memory is open the two-digit display will flash.

Not "user friendly"? You soon get used to it.

When it comes to fault finding the TRD4 board is a little more helpful than VST. As part of each initiation sequence it runs through a programme of tests before letting you have a picture. If there's a fault, an error indication is presented on the two-digit display as follows:

E0, parity error (faulty memory unit U15 or the microcomputer chip itself).

E1, missing supply voltage – check the 13V and −22V rails.

E2, faulty RC5 input. Check TS26 and the remote receiver unit.

If the message-received LED doesn't light when the handset buttons are pressed check the handset and the eyeball remote receiver. If the LED does light but nothing happens, suspect the microcomputer chip.

There's about a page full of different TRD4 boards likely to be encountered. Philips Service stock five types which between them cover the lot. Slight modifications are sometimes needed, and in this case fitting instructions come with the board.

Supertext

Some TRD4 sets use spare memory cells to store programme and page details for up to twenty most used teletext pages, using a five-figure code. The BBC-1 news headlines would be 01101 (programme 01, page 101). Entry into the memory is made with the store opened and the two-digit display flashing. The Supertext button is pressed at the end of each five-digit programme/page selection. At the end of the store process the store button is pressed: the set then reverts to normal use.

To display selected pages, call up the wanted channel (it won't change channel for you), go to teletext and press the Supertext button. The decoder will then hunt for and eventually display the first of your selections on that particular magazine. Press Supertext again and the decoder hunts for the next preselected page on that channel and so on. Note that Supertext doesn't store the whole page of your selection for instant display, only the access data. You still have to wait for the broadcast magazine to reach the wanted page.

A frequent Supertext complaint is that the set displays pages other than those you've chosen to note in the memory. The usual reason for this is that the factory test programme of selections is still in the memory and turns up when you press the appropriate buttons. To erase this involves entering a bogus programme/page number such as 50000 and pressing the Supertext button. Repeat this procedure as many times as it takes to clear the memory.

Computer-controlled Teletext

Assuming that you can stand being confused even further, the replacement for Supertext on current models is CCT (computer-controlled teletext). Sets with either VST or TRD4 can incorporate CCT and the teletext decoder does have a double memory so that you can hunt up a page while reading another. Two new handset types cover the extra command, RC5353 for VST and RC5373 for TRD4.

CCT sets have a double-page header, the usual one and above it another showing your next page selection – in green during search, turning to white when found. You could for example be reading news headlines on page 101 while the decoder searches for the weather on page 152 at the same time. Pressing the CCT button changes over memories and you then watch page 152 while the decoder hunts and stores the next selection. If you don't ask it to do anything it will automatically store the next available page, i.e. page 153 in our example.

It's rumoured that the CCT teletext decoders are pin-compatible with their single-memory counterparts. So if you're so inclined it should be possible to produce a set with both Supertext and CCT.

The FST System

At the start we said that RC5 is likely to be with us for a long time. If you inferred from this that VST and TRD4 will be with us for as long, not so. A third system FST (frequency-synthesised tuning) is on the near horizon. It has the direct channel selection facility of TRD4 but has such an economic component count that it's cheaper to fit to a basic chassis than a bank of tunable potentiometers. It's featured in the new single-chassis models to replace the K35 in the 22 and 26in. sizes.

FST is a three-chip system with an MAB8441 microcomputer chip on the keypad, an SAB3037 control chip for presenting analogue and tuning voltages to the main chassis and a PCD8571 RAM. The facilities are about the same as TRD4 but with fewer channels. There are basic, remote control and teletext versions, with every possibility that further handset types will be introduced to work the system.

VCR Control

RC5 can be used to control VCRs of both the 2000 and VHS types. A different set of command codes is used, so there's no interaction between the TV and VCR handsets – unless you press them both together, when nothing happens.

The later flat, metal-faced slim handsets issued with recent TV sets incorporate a number of VCR command buttons on the lower half. To control a VCR these buttons must be used simultaneously with the button on the side. In the same way some VCR handsets can be made to issue a limited number of commands to TV sets using RC5.

Problems

The "limitations" can get you into a knot when servicing or installing a "twosome", so keep on reading. The RC5 code can enter a VCR in either of two ways, directly via the infra-red eyeball fitted or added to the VCR or through the interconnecting SCART lead, where fitted. In the latter case the RC5 code is detected within the TV set and passed as data to the VCR via line 16 on the SCART connector.

Not all TV sets and VCRs with SCART connectors actually incorporate the line 16 facility, so you must check on the proposed combination before ordering it. It also means that the TV set must be on to be able to control the VCR. With VCRs that have their own infra-red eyeball the TV handset will permit control of play, record, forward and reverse search, channel change and standby, but not wind or rewind. Instead there's a go-to button with which rapid access to any tape counter position is possible – but only on 2000 system models at the time of writing. The handset that comes with the VR6920 VHS machine with hi-fi sound will perform volume, channel change and standby operations on any RC5 TV set with which it is linked once its TV mode button has been pressed. A word of warning here. The insertion of batteries in this handset for first time use leaves it in the TV mode, so unless you press the VCR mode button (which it doesn't tell you to do) it won't control the VCR and you'll think you've got a dud handset.

Table 1: RC5 handsets

Type	*Chassis*	*Details*
Wedge types		
RC5150	K30	Teletext. VCR on button 12.
RC5171	K35	VST, 20-way. Superseded by RC5300.
RC5172	K35	As RC5171 but with first and second language button.
RC5177	K35	VST, 20-way with teletext. Replaced by RC5350.
RC5267	K35	TRD4, teletext, stereo. Superseded by RC5370.
RC5275	K35	TRD4, teletext, stereo, VCR. Superseded by RC5370.
Flat types		
RC5300	–	General purpose, VST. Replaces RC5171. VCR buttons.
RC5350	–	General purpose, VST with teletext. Replaces RC5177. VCR buttons.
RC5352	–	Replacement type, VST. Like RC5350 plus first and second language button. Sent by Philips Service as replacement for RC5171/5172/5177/5300/5350.
RC5353	KT4/K40	VST. As RC5350 with CCT.
RC5356	–	Replacement type, VST. Issued to replace RC5353 (CCT plus stereo).
RC5370	K35/KT4/K40	TRD4, Supertext, stereo, tone controls, VCR.
RC5371	KT4/K40	As RC5370 but printed "Matchline".
RC5373	KT4/K40	As RC5370 plus CCT.
RC5375	KT4/K40	As RC5370 plus printer button. Issued as replacement for RC5267/5275/5370/5375.

Handset Types

In conclusion (for the time being!) Table 1 lists the handsets used with RC5 receivers. Note that the RC5352 replacement type can't be used in place of the RC5150 because of the VCR position, which is 0 on all VST/TRD4 sets and 12 on the RC5150. Wedge types suffer if damp or exposed to gin and coke (gin and *what?* – editor) and the foil often chafes at the bend. Flat types don't like being dropped: the battery contacts go intermittent, the small blue crystal resonator goes off frequency and the PCB develops hairline cracks.

VCR Clinic

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

Pye 65VR20/Panasonic NV370

The Pye 65VR20 is, I believe, equivalent to the Panasonic NV370, so the following fault which has come our way several times is likely to apply to both machines. The symptom is no capstan drive. This gives no fast forward, no rewind and no play, but unlike the Mitsubishi HS306 front loading and eject are not affected as a separate motor is used for these operations. The cause of the fault is the AN3822 capstan motor drive i.c. You'll probably also find that the motor supply to the i.c. is missing, due to failure of an 0·68Ω resistor. This is not shown on the circuit diagram – it feeds pin 24 of the i.c. On early machines it's fitted in place of a wire link but on later versions it's labelled as R96. **D.S.**

Faulty Eject Damping Mechanisms

A fault we've had several times recently with both the Ferguson 3V29/30 and the Hitachi VT8000 series is rapid eject due to failure of the eject damping mechanism. This is of the air-damped type and except for one tiny nylon cog is of metal construction. It's the cog that fails, splitting from the centre to the circumference. The units used on all these models are the same, so only one needs to be stocked. **D.S.**

Ferguson 3V29

The complaint with this machine was no sound in the E-to-E mode. A quick check showed that the sound was disappearing in the r.f. converter. Replacing the BA7003 i.c. in this unit cured the fault. **D.S.**

Mitsubishi HS306

No channel down was the complaint with a newly installed Mitsubishi HS306, but only when it was being operated via remote control. Channel change up and down was o.k. via the front controls, as was channel up with remote control. It's a cable remote control unit and the showroom had already checked this on another machine and found it to work correctly. A look at the circuit showed that there were only a couple of components specifically concerned with remote channel down, one of which was R712 which turned out to be missing. **D.S.**

Sony SL8000

This is an old machine. The complaint was that the whites in the picture sometimes went blue. We assumed that the customer meant the picture highlights. This could easily have been due to a fault in the modulator but in fact the deviation control needed cleaning. **S.B.**

Hitachi VT8000 Series

The modulator in this machine didn't work so a replacement was fitted. At a later date I decided to check it out as often only a series choke is open-circuit. The circuit diagram is given in the manual in the bottom left-hand corner of the tuner/i.f. page and on seeing it I was intrigued to know how power is supplied to transistors Q1, Q2 and Q6 since no direct connection is shown. Maybe this was why it didn't work! On checking through the r.f. modulator PCB I found that the supply comes via two pins on transformer T2 – or in this case it didn't. A link soon made sure that it did. Whilst it's now o.k. for testing I won't fit it. Maybe I'll boil it . . . **S.B.**

Sharp VC9300

There was no power as the mains fuse (F9001, 2·5A) had blown. After replacing this there was no take-up spool drive while rewind and fast forward were both very slow. The reel motor was suspected at first as the drive voltage to it from pin 2 of IC7751 via the emitter-follower buffer transistor was correct. It turned out that Q7754 was open-circuit, which left just the unloading torque control resistor R7758 (27Ω) to chassis. This is in series with the motor: normally Q7754 would be on, which would ground the motor by shorting out R7758. **S.B.**

Panasonic Video Movie NM1

After three weeks the power supply/battery charger/modulator failed. A well known high street store quoted ten weeks for the repair, which the customer thought was unreasonable. The cause of the fault was an open-circuit resistor in the switch-mode power supply start-up circuit – R2, 3·3kΩ 2W. Andy charged him £45 which I thought was extremely reasonable since it wasn't our sale and it was done in two weeks. **S.B.**

Panasonic NV333

The problem was occasional failure to record the audio track, though erase was o.k. It caused some difficulty as the fault was intermittent. In fact we checked with Panasonic's technical department to find out whether there were any problems in the audio record section. A man told me that the modification to overcome intermittent recording was to short out R4049. Ah! But this is the bias oscillator transistor's emitter resistor, and there were no erase problems. The man insisted that in the event of intermittent audio recording this modification would provide a cure. For anyone else's information, after checking D4001 and then Q4003 by replacement the fault went away.

The circuit operation here is not obvious (see Fig. 1). In the playback mode line PB is low. Zener diode D4001

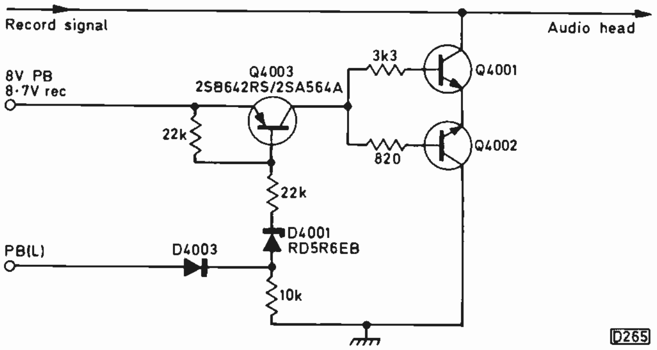


Fig. 1: Audio record/playback switching circuit used in the Panasonic NV333.

conducts and so does Q4003 since the emitter of this pnp transistor is at 8V and its base is returned to chassis via D4001. Thus Q4001 and Q4002 are on, earthing the record drive side of the audio head. In the record mode line PB is held high at 6V. This, via D4003, cuts of D4001 and all three transistors. If Q4001/2 are on in record then either D4001 or Q4003 is leaky. **S.B.**

JVC HR7700/Ferguson 3V23

The tape remaining indicator came on as soon as play was selected – it should have stayed off while the VCR measured the differential reel rotation and then displayed the result as a bar segment display. In addition the tape remaining display flashed erratically. Replacing the data gate array TA2 on the tuner/timer board cleared the fault. **S.B.**

Hitachi VT57

We had the same fault on two of these machines – the capstan motor intermittently stopped, with the result that unthreading took place. In the first machine the trouble was caused by a dry-joint on posistor PH1151. This removed the motor's power supply. In the second machine the motor drive switching chip IC1151 had failed. **S.B.**

Ferguson 3V36

Ray was having problems with a search tuning fault on this 3V36. It wouldn't stop when it found BBC-1 though it would stop on the other stations. Investigation revealed that the sync detect line wasn't going low when BBC-1

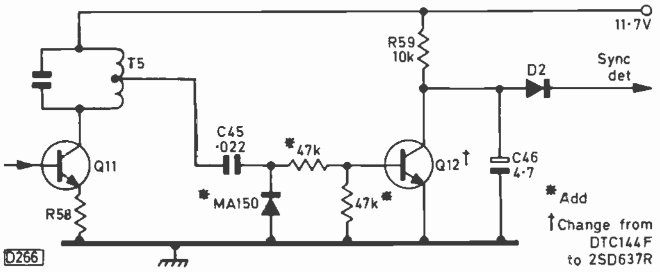


Fig. 2: Modifications to the sync detect circuit on the i.f. board, Ferguson Model 3V36.

was found, so attention was turned to the sync detecting circuit on the i.f. board. Adjusting coil T5 made the line go low on BBC-1 but then it didn't go low on BBC-2 – we also found that if the coil was tuned too far a buzz developed on sound! When I looked through past issues of *Ferguson Feedback* I found a modification for sound buzz – change Q12 to type 2SD637 and add the components shown in Fig. 2. Doing this cured the fault. What a team! **P.B.**

Tatung VRH8400

A new machine straight out of the box would sometimes fail to accept a cassette fed into the front slot, due to an intermittent high-resistance contact in its "cassette housing-up" switch. Problems of a converse nature, i.e. a cassette stuck in and won't eject, have been traced to a faulty cassette housing-down switch. Strangely the equivalent JVC and Ferguson machines (Models HRD120 and 3V35 respectively) we look after haven't developed this problem – so far! The sooner Hall-effect or optical position sensors are fitted the better. **E.T.**

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
2N3908	0.62
2N4101	1.33
2N4240	3.30
2N4444	0.90
2N4914	0.72
2N5064	0.71
2N5293	0.50
2N5294	0.50
2N5296	0.49
2N5297	0.50
2N5298	0.61
2N5490	1.49
2N5496	0.59
2N6107	0.59
2N6109	1.58
2N6122	1.76
2N6130	0.72
2N6133	1.25
2N6178	0.73
2N6180	0.73
2N696	0.43
2N698	0.43
2N707	0.43
2SA1027R	0.45
2SA1076	1.96
2SA329	0.40
2SA351	1.17
2SA489	1.17
2SA490	1.67
2SA493	1.05
2SA628	1.14
2SA637	1.46
2SA673	1.27
2SA683	1.61
2SA684	1.33
2SA748	1.08
2SA818	1.82
2SA835	2.50
2SA940	1.81
2SA951	1.26
2SA966-Y	1.16
2SB325	3.87
2SB375	3.87
2SB400	0.40
2SB407	3.24
2SB411	3.30
2SB511	2.50
2SB54	1.39
2SB56	2.80
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	4.56
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 TD-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	4.03
AL102	5.69
AL103	2.68
AL113	1.36
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	2.28
AN214	2.26
AN214Q	2.40
AN231	14.89
AN234	5.92
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
BYX71-600	0.85
BYX94	0.14
BYY56	1.20

BZX79 RANGE	0.10
BZY88 RANGE	0.10
C106D	0.46
C1129	0.58
CA1310E	2.70
CA3044	3.50
CA3046	2.06
CA3060	1.65
CA3065	1.29
CA3089	0.83
CA3089E	1.43
CA3090	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
HA11724	22.25
HA11725	18.26
HA11738	22.25
HA1180	5.15
HA1192	0.00
HA1196	7.43
HA12005 IN	9.00
HA1203	1.72
HA1306	2.26
HA1308	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

Commissioning a SMATV System

Geoff Lewis

The liberalisation of satellite TV reception regulations announced by the Department of Trade and Industry in May 1985 also included Satellite Master Antenna TV (SMATV) systems. These are basically satellite TV reception systems designed to supply signals to premises such as clubs, hotels or blocks of flats via a small cable network. Since only a single set of premises is usually involved the regulations are more liberal than those that apply to wideband cable systems. The following report aims to give guidance on the development and installation of SMATV systems, supplementing our earlier article "Commissioning TVRO Systems" (November 1985). The installation of a SMATV system is basically similar to that of a TVRO system, with the following differences.

Aerials

To provide a service for even a limited number of viewers will almost certainly mean that signals are required from two satellites simultaneously. This in turn means that two aerials will be required, one for each of the satellites of interest (ECS-1 and Intelsat VA F11). With operation from ECS-1, dual-polarity reception will need to be considered.

As the SMATV system will involve more signal processing, which will introduce signal-to-noise ratio degradation, a larger dish will be necessary. Whereas a 1·2/1·8 metre dish with offset feed is perfectly adequate for a TVRO installation, for a SMATV system a 2·5/3·5 metre diameter dish will increase the gain by 3-4dB, giving allowance for the signal-to-noise ratio degradation that occurs in the signal splitter stages. Planning permission will almost certainly be required for the dishes.

ECS-1 alone will provide a useful SMATV system with international appeal. This would involve the use of a 3·5m dish with an ortho-mode transducer. Apart from the English language programmes, ECS-1 carries programmes from W. Germany, France, Holland, Belgium, Spain, Norway and Italy.

Equipment Required

The main elements of a SMATV system, with typical average unit prices, are as follows:

Three-metre dish with "A" frame mount	£1,000
Ortho-mode transducer for dual polarity operation	£125
Low-noise block (LNB) converter, one for each polarity and dish	£500
Signal power splitters (2, 4 or 8 way), average	£30
Receiver/demodulator/remodulator, one per channel	£700
SECAM/PAL transcoder, one per SECAM channel	£1,100

Plus r.f. signal combiner and low-loss cable distribution equipment.

The use of a u.h.f. distribution system has two significant advantages: standard TV receivers can be used, and it's fairly easy to combine the u.h.f. terrestrial services to add four more channels. This is achieved at the expense of using low-loss coaxial cable in the system.

Legal Aspects

Guidance notes are available from the Cable Authority, Gillingham House, 38-44 Gillingham Street, London SW1V 1HU. These are quite complex and should be studied by anyone contemplating a SMATV system. The following is an extract to outline the licensing requirements.

Copyright of all programme material transmitted over the satellite link rests with the provider, to whom a fee is payable. Systems serving more than one dwelling or single set of premises require a licence under the Wireless Telegraphy Act. A hotel, being classed as a single set of premises, does not require to be licensed under the Telecommunications Act 1984 or the Cable and Broadcast Act 1984: a licence under the Wireless Telegraphy Acts, covering satellite reception, is necessary however. This must be obtained from the Department of Trade and Industry, Room 513, Waterloo Bridge House, Waterloo Bridge Road, London SE1 8UA.

The terms of the Cable and Broadcast Act involve some restrictions to a SMATV operator. He will be expected to give way to any operator who is granted a franchise for a wideband cable system in the same area, wideband cable systems being defined as those projects being licensed by the government to carry prescribed diffusion services and being regulated by the Cable Authority. Where a wideband franchise has already been granted in an area only the holder of the franchise can install and operate SMATV systems as a short-term measure.

There's a tendency today to build new hotels and motels on the outskirts of towns and cities. These are usually outside present cable system areas and may thus provide opportunities for SMATV operation.

Quick Tests: Hybrid Receivers

S. Simon

In the last article in this series we concentrated on two hybrid colour TV chassis. There's another, the Pye 697 chassis, that should be mentioned before we return, via a slight detour, to more recent designs. Since the 697 chassis has been extensively covered in past issues we'll keep the following notes to the bare minimum.

PYE 697 CHASSIS

The important thing to remember with this chassis is that the mains supply is taken direct to the top centre of the right-hand vertical panel, where the 2·5A mains fuse FS1 is to be found. Thus the fuse and its contacts, the associated print and plugs, are live when the set is switched off. Remove the mains plug to render this area safe.

Mains Transformer

There's a thermal cut-out incorporated in the input to the mains transformer, which is used for the l.t. supplies. In the event of a severe overload here, for example a short in the l.t. bridge rectifier, the mains fuse won't blow: instead, the transformer will overheat and the thermal cut-out will open. This is a common fault: if the tube heaters are not alight and there's no sound, this is what has happened. Locate the bridge rectifier, at the bottom right, and note that its four contacts are in a vertical strip. Check for shorts. Due to its position replacement is rather difficult and the writer has his own pet way of doing this: I hesitate recommending this however because it's easy to get it wrong. So have patience and do it right.

After fitting a new bridge the cut-out must be repaired or replaced. Access is by removal of the main smoothing block, which is no bad thing since the condition of this often means that it should be replaced. The cut-out was not present in the earlier versions of the chassis (the 691 and 693). With these a short in the bridge can result in the demise of the transformer. So be grateful for the cut-out. If difficulty is experienced a 315mA fuse can be fitted across the cut-out's contacts to restore normal operation.

No A1 Supplies

If a meter check at the tube base reveals lack of first anode voltages, the 100kΩ filter resistor R227 will be found to be damaged due to a short in the associated 0·1μF, 1kV capacitor C224. The resistor is located above the line output transformer in the centre of the main panel: the capacitor leads off to the right. Replacement of these two items will restore normal working.

Field Collapse

A very common symptom is a white line across the centre of the screen. Although the cause could be a fault on the field timebase subpanel (under the tube's neck) the first step should be to ensure that both the 20V positive and 20V negative supplies are present at the plug and socket on the right of this panel. More often than not one of these will be absent, the cause being over on the main, vertical panel. Concentrate on the upper centre section where the heat is. Examine this very carefully for fine hair cracks and test the continuity of the long tracks that go down to the bottom. The weak points are where these tracks pass an area that normally runs hot. To avoid further damage, run wires from the top to the bottom. This unsightly step will prove to have been a wise one. If the supplies to the field timebase panel are present, check the AC128 driver transistor under the board (this transistor is mounted under the board because it's inclined to be heat sensitive), the two BD124 output transistors on the vertical heatsink, the associated resistors and the electrolytic capacitors, especially those that may be black with silver markings.

The CDA Panel

The CDA panel is the left side unit with four valves, the PL802 luminance output valve and the three PCL84 colour-difference output valves. This is the unit that's most likely to give trouble, due mainly to the heat from the valves affecting the panel, causing cracks and poor connections. Good earthing of the rear clips is essential to avoid blue/green shading. Check the voltages at the test points near the three 12kΩ PCL84 pentode section anode load resistors. All three test points should be at approximately 140V. The absence of any of these voltages should direct attention to the 12kΩ wirewounds: a high voltage (say 200V) should direct attention to the relevant PCL84 and its base contacts – check for an open-circuit cathode tag etc. Similar remarks apply to the PL802: the brightness decreases as this valve loses emission. If you find odd voltages on the CDA panel, e.g. negative readings at the anodes of the triode sections of the PCL84s instead of approximately 100V, check the condition of the main h.t. reservoir/smoothing electrolytic C306/C315.

Weak Sync

In the event of poor sync locate the sync separator transistor VT7 on the right side of the left side swing out i.f. panel and check the value of its 4·7MΩ base bias resistor R33. This regularly goes high in value.

Blown Mains Fuse

When the situation is no results with a blown fuse, make the usual checks for shorts across the h.t. supply and also check the resistance between the PY500's top cap and chassis. If the reading is low, check the 0·47μF boost reservoir capacitor which is mounted on the line output transformer. Its voltage rating is 1kV. Disconnect one end for a conclusive test. Alternatively the trouble could be due to the previously mentioned 100kΩ resistor (R227) having fallen to a very low value or perhaps to the disc capacitor (C219, 180pF) associated with the line output transformer.

If no shorts can be found replace the fuse, switch on and observe the behaviour of the PY500 and PL509 valves in the line output stage. Allow time for them to warm up then note whether one or both overheat. Check both valves and the PCF802 (line oscillator) at the bottom of the panel and if necessary the associated components. R219 (33kΩ) and C214 (820pF) are suspect, also R210 (100kΩ).

Line Hold Problems

For line hold troubles check the PCF802 and R210 which regularly changes value. If these items are not at fault check the value of R203 (47kΩ). This resistor is farther up the panel and is mounted horizontally.

MONOCHROME HYBRID SETS

These few notes should allow these old sets to be approached with a fair degree of confidence. But wait a minute. The hybrids we've mentioned so far have all been colour sets. We've not mentioned monochrome sets at all. Yet a goodly percentage of sets that come in for service attention are monochrome hybrids, e.g. the Thorn 1500, ITT VC200 and Bush A640 and A774 chassis. It's all right for more experienced engineers to shrug their shoulders and say "kids' stuff", but what about those who encounter these sets for the first time? For them, a few notes on the Thorn 1500.

THORN 1500 CHASSIS

This chassis was used in a large number of Ferguson, HMV, Marconiphone, Ultra and other models, ranging from 24in. sets down to 17in. portables. They can be identified by the four-button u.h.f. tuner at the front and the rear aspect with three controls arranged vertically at the right side – line hold at the top, field hold in the centre and contrast at the bottom. If the set looks like that it's a 1500.

First some stock faults with these sets. For weak sync check R44 (47kΩ). For lack of contrast check C37 (64μF), R40 (2·2kΩ) and R41 (5·1kΩ). For field linearity troubles check R103 (300Ω), C79 (160μF) and R101/2 (both 18kΩ). For lack of width check the preset R132 (1MΩ).

Blown Mains Fuse

The mains supply is taken to the front on/off switch then neutral to chassis and live to the 1·6A fuse F1 at the top of the panel. With the set switched on the a.c. can be checked at this fuse to prove that it's intact. If the fuse has blown, switch off and check diodes W7 and W8, again at the top. It's common for one of these to go short-circuit. W7 is the "heater dropper" diode and W8 the h.t. rectifier. The mains filter capacitor C84 (0·1μF) is near W8. If this has gone short-circuit – as it frequently does – the replacement must be rated at 300V a.c. or 1kV d.c. The 600V d.c. type fitted is not reliable.

If these items are without fault, check the resistance between the top cap of the PY801 valve or the PL509 and chassis. A low reading indicates that C95 (180pF), a high-voltage disc capacitor wired on the line output transformer, is probably short-circuit. It could have damaged the PY801.

These are the usual causes of F1 failing.

Heater Chain Faults

If the set appears to be dead but F1 is intact, with a.c. at both ends, transfer attention to the long mains dropper at the top. The centre section should read 148Ω. It often goes open-circuit, thus robbing the valves of their heater supply. Beware: the h.t. is still present – switch off to test. Ideally the whole dropper should be replaced but it's quite in order to mount a 150Ω wirewound resistor, rated at 20W or more, securely across the defective section. Dabbing a hot iron on the wire ends to secure the new resistor is not acceptable: wrap the ends firmly round the arms of the dropper, having thoroughly cleaned these to accept the final soldering.

In rare cases the dropper may be intact and one of the valve heaters may be open-circuit. Check at pins 4 and 5 of the PY801, then at the same pins of the other valves, to ascertain which one is faulty. The c.r.t.'s heater is the last one in the chain but is not returned direct to chassis: the earth link is via R79 (left section of the dropper) which has a value of 317Ω thence R136 (62Ω). Pin 1 of the c.r.t. goes to R79, and this point is decoupled by C58 (330μF) which is at the lower left centre of the main panel. It's very important to appreciate that the 26V supply for the transistors is taken from this point. Why? Because R79 can go open-circuit. The excess voltage applied to the transistors can then ruin one or more of them. Usually the final i.f. transistor VT7 (BF179) is the one that suffers. Its collector voltage should be 23V. If it's over 26V, check R79 before proceeding further. Read that again and remember it.

HT Resistors

Valves glowing, no results means that the h.t. supply is missing. Check the right side of the dropper, second section in. The reading should be 20Ω. In fact this section rarely goes open-circuit. It's more common for either the sound or the raster to be lost due to one of the h.t. feed resistors going open-circuit.

The fusible resistor R124 (80Ω) often springs open due to excess current in the line output stage. The cause is usually a faulty PL509 or lack of drive to it from the 30FL2. Lack of sound with a normal picture should direct attention to R96 (2·2kΩ) which supplies the PCL82 audio output valve. This resistor is either immediately below the dropper (right side) or farther down the right side edge. Although it can fail on its own there could be a contributory cause, either the PCL82 itself or leakage in the audio coupling capacitor C64 (0·022μF).

Servicing Teletext Receivers

Part 1

Mike Phelan

The purpose of this new series will be to explain briefly the operation of a typical teletext decoder and to give guidance on fault finding. We will use as our example the Philips/Mullard teletext decoder as fitted to the G11 chassis. Many of these sets are now available from trade disposal warehouses at reasonable prices. They perform quite well if thoroughly serviced – a recent article (October 1985) covered the basic chassis.

Surprising as it may seem to the unitiated, the diagnosis of teletext faults is quite easy. Being a mainly digital device the teletext decoder tends to produce on the screen a display that indicates precisely what ails it. A large percentage of faults can be diagnosed by watching the display, those that remain needing only the application of a logic probe. The multimeter and scope can meanwhile gather dust (assuming that this is not their normal role!).

Teletext Basics

As most of us know, teletext is transmitted in the form of a digital signal that occupies some of the lines following the field sync pulse train, before the picture information starts at line 336 or 23. The decoder basically has two functions which it must carry out concurrently. It must receive the digital signal and store it in a memory if the page number matches the one selected, and it must convert this digital signal to achieve the required page display on the screen. The page will then remain on the screen until another is called up or we return to the TV mode.

The data reading and display are not, strictly speaking, simultaneous: the data can be read into the memory only during the field flyback blanking period, the display being during the picture period. At the start of teletext transmissions only two lines per field carried data. This has since been increased several times. Each TV line of data represents one row of the display. A row is a horizontal line of characters or graphic symbols – there can be 40 per row. Each row occupies the centre 40μs of the active line period, leaving a border of 6μs at the left and right of the display. There are 24 rows per page, using the centre 240 lines of each field. So there's a border at the top and at the bottom, similar to those at the left and right. This allows for a normal amount of overscan.

As just mentioned the data is transmitted using one TV line per row. Rows are transmitted sequentially, so the time taken to transmit a page depends on how many lines are being used for teletext. As the pages are transmitted sequentially this affects the waiting time for the selected page to appear – in practice it depends also on which page was being transmitted when the required page was selected.

The first row, the page header, contains slightly different information from the other rows. It includes the real-time clock information, status (BBC, ITV etc.) and the page number, leaving little room for other characters.

A page is read into the memory only if the page number corresponds to that selected by the viewer. The display information is stored as ASCII codes – 32 to 127 for presentable characters or graphic symbols, the numbers below 32 being used for control codes (attributes). Those who followed my articles on microcomputers may recall that we spoke of series attributes. A control code occupies one character space and can determine the method of displaying the rest of the line, i.e. the background/foreground colours, text or graphics, or whether the line is flashing or double height. An attribute can be cancelled by a succeeding attribute or automatically by the line coming to an end: the space occupied by an attribute cannot contain anything else.

The transmitted data consists of a train of highs and lows corresponding to binary one or zero. If there are several ones in succession the signal remains high – this is called NRZ (non-return to zero) code. The data frequency can be as high as 6·9375MHz, corresponding to a succession of alternate ones and zeros. Hence the need for excellent front-end performance in a teletext set (I did once receive two out of three channels perfectly on a much modified Kuba Florence with a diode vision detector, but that's another story).

When the page has been safely stored in the memory it must be displayed by converting the printable characters into the correct pattern of dots and applying any attributes. All this requires some sort of synchronisation to the incoming data. This is taken care of by beginning each row with two bytes of 10101010, i.e. a 6·9375MHz signal. This causes a high-Q tuned circuit (bit clock) to ring throughout the line, providing a master signal to control the various functions. The arrangement is reminiscent of the passive chroma subcarrier generator used in the Rank A823 series chassis. The two bytes are referred to as the clock run in.

The Mullard Decoder

The Mullard decoder used in the G11 chassis employs a set of four i.c.s which operate with matching remote control transmitter and receiver chips and standard TTL RAM i.c.s for the memory. We'll go into TTL later: for now, suffice it to say that except for the first part of the circuit that amplifies the incoming video signal everything runs off a 5V supply. Fig. 1 shows a simplified block diagram. We'll consider this first then examine each section in more detail.

The first item on the left is the VIP (video input processor). Associated with this are a crystal oscillator and

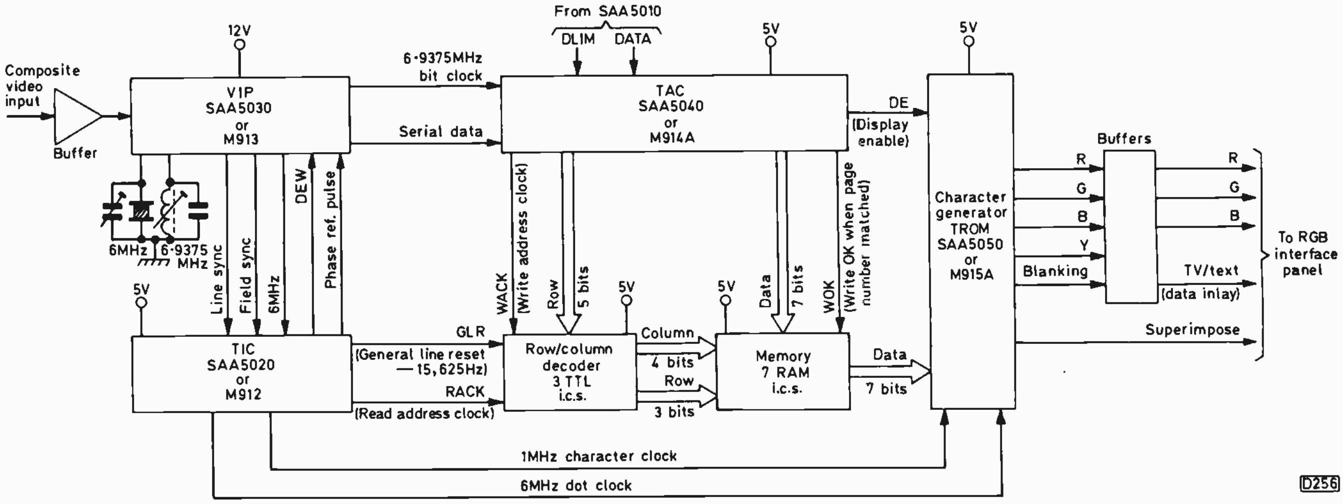


Fig. 1: Simplified block diagram of the Mullard decoder.

an *LC* tuned circuit – the latter is the 6·9375MHz bit clock which is synchronised to the incoming data. This frequency has no relationship to the display function however, so we need another clock to control the character generator (TROM – teletext read only memory). As there are forty characters per row of 40μs the character rate is 1MHz. Each character is formed on a 6 × 8 matrix of dots (pixels) so the pixel rate is 6MHz (dot clock). This is what the crystal oscillator is for – but unlike the bit clock it's an active oscillator since there's nothing within the incoming signal to synchronise it to.

The VIP also contains a sync separator that produces line and field sync pulses. These, together with the dot clock signal, are passed to the TIC (timing chain) i.c. which uses these signals to provide various control pulses for the decoder. One of these, the DEW (data entry window), acts as a gate for the incoming video, opening only during the data period.

The data is clocked into the TAC (text acquisition and control) i.c. which also receives a data stream from the SAA5010 remote control receiver i.c., clocked in by the DLIM (delimiter) signal. The TAC also takes care of page number matching, timed text selection and, most important, converts the serial data stream to a parallel one of seven bits for storing in the RAM – after parity checks on the data.

We'll deal with the row and column decoder later. The final i.c. in the Mullard set, the TROM, is fed with 1MHz and 6MHz clock signals and seven bits of parallel data and produces the correct dot patterns in the correct colours. It also performs character rounding. As its outputs are at the TTL 5V level these are followed by level-shift buffers. The luminance and blanking signals are added here.

The DE (display enable) line goes low for the picture mode – this causes the TROM's blanking output to go low. As the luminance (Y) and blanking outputs are added and inverted to give a combined signal (data inlay), a low blanking signal causes the data inlay line to go permanently high, switching the interface so that the RGB signals from the normal chroma decoder are displayed. For subtitles, newsflashes etc. the blanking signal goes high for the duration of the box only.

In the mix mode the picture and teletext signals are displayed simultaneously but the picture contrast must be reduced so that the text is legible in areas of saturated colours that match the text. In addition the parts of the display occupied by text must not contain picture information. The latter requirement is taken care of by the fact that the Y output from the TROM goes high for the duration of each text pixel, i.e. it gives monochrome teletext. This has no apparent effect in the text mode but in the mix mode when the blanking signal is low the Y signal causes the TV/text output to go low for the duration of each text pixel, i.e. it cuts "black holes" in the picture into which the text is inlaid.

For contrast reduction the superimpose output from the TROM goes low in the mix mode. This makes the RGB interface reduce the contrast and also brings into operation an extra beam limiter which neatly gets round the problem that because the normal beam limiter operates on the brightness control, which has no effect on a text

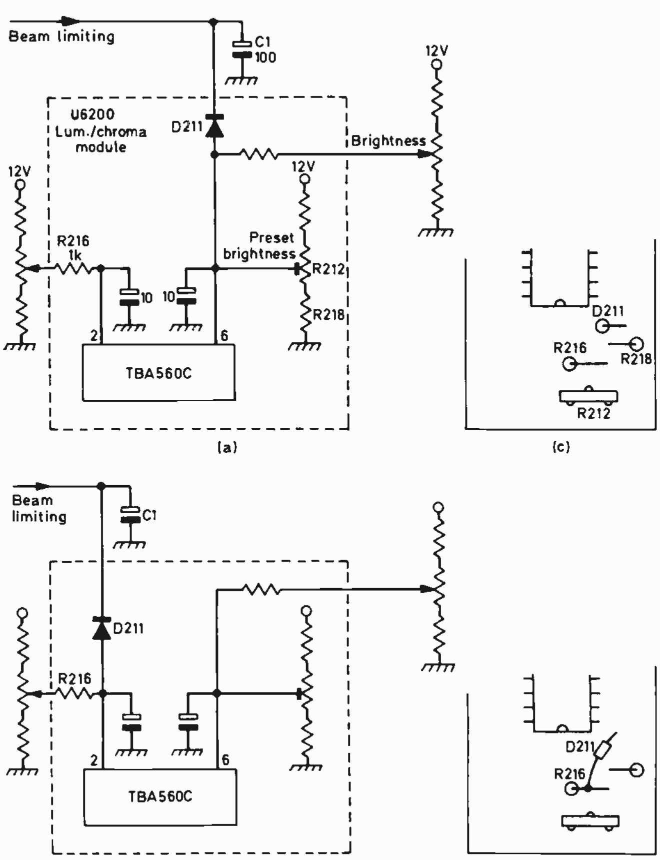


Fig. 2: Beam limiter modification for the G11 chassis.

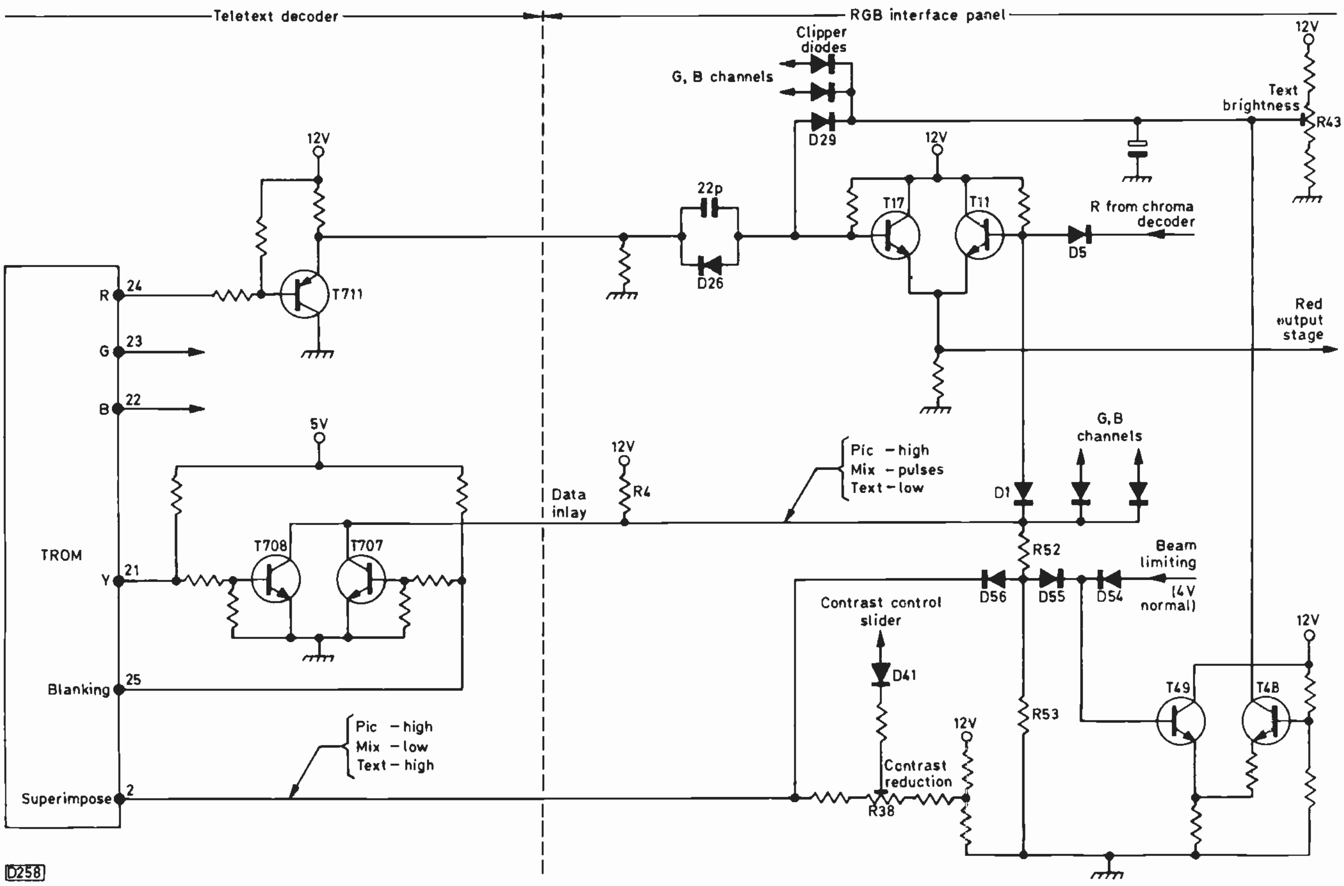


Fig. 3: Basic interfacing circuitry used in the G11 chassis.

display, it would otherwise be possible to exceed the maximum beam current in the mix mode.

While on the subject of beam limiters we'll digress slightly to give details of a very useful modification to all G11s, not just teletext models. You may have noticed that the G11's beam limiter has a slightly delayed action. This is caused by the time-constant of C1 and the brightness control's high impedance – see Fig. 2(a). Fortunately the layout in module U6200 makes it very easy to arrange things so that the beam limiter controls the contrast rather than the brightness – see Fig. 2(b). The practical effect of this is to give much smoother control with no time lag. It's well worth the trouble. Simply remove the screening can from U6200 and locate D211 and R216 behind the preset brilliance potentiometer – see Fig. 2(c). Unsolder D211's anode lead and solder it to the top end of R216 – Fig. 2(d). Hey presto the job's done and after seeing the improved results you'll probably want to do it on every G11 that passes through your hands.

Interface Circuitry

Back to teletext. Fig. 3 shows the basic circuitry used at the output of the teletext decoder and on the RGB interface panel. Only the red channel is shown, the other two being identical. The outputs from the TROM are all open-drain f.e.t.s, so external load ("pull-up") resistors are required. Where these are taken to the 12V rail the output will be 12V peak-to-peak. The red signal is fed to the interface panel via the emitter-follower transistor T711. The interface panel contains the beam limiter, blanking and three RGB interface circuits.

In the picture mode the data inlay line is high. D1 is thus reverse biased and D5 and T11 pass the TV video signal to the red output stage. In the text mode the data inlay line goes low, D1 conducts and the TV video is blocked – D5 and T11 are both off. The red text output from the teletext decoder then passes to the red output stage via T17. T17's conduction, and therefore the text brightness, depend on the voltage at R43's slider since the incoming signal is clipped when D29 conducts.

Mix mode is a combination of the two modes just described. The data inlay line goes low for each text pixel, punching holes in the display as previously mentioned. The superimpose line also goes low, with the result that D41 conducts and the voltage at the slider of the contrast control, and thus the contrast, decreases. The amount of reduction is preset by R38.

For the reason mentioned above there's an auxilliary beam current limiter. This consists of T48 and T49 which are active in the mix mode. In the picture mode the superimpose line is high: D56 is reverse biased and D55 and T49 conduct, the voltage developed at T49's emitter holding T48 cut off. When the mix mode is selected the superimpose line goes low. D56 conducts and D55 turns off. This leaves T49 under the control of the beam limiter line: when the voltage on the latter falls, T49 turns off, T48 comes on and the voltage at the slider of R43 – and hence the text brightness – is decreased. In the text mode the superimpose line is high and the data inlay line low: thus D55 and D56 are both reverse biased. The beam limiter T48/49 is active but beam limiting should occur only if a fault occurs – or if R43 is incorrectly set.

It may look as if we've started our description of the teletext decoder at the wrong end. It seemed sensible however to cover the analogue circuitry before getting involved in the detail of the digital side. Next month we'll take up the digital story with the VIP.

Vintage TV: The McMichael Story

Chas E. Miller

The Leslie McMichael company was one of the most venerable of British radio concerns, predating even the BBC. Over the years it had established an excellent reputation for radio receivers, and when it came to develop TV sets the designs avoided a lot of the overcomplication that seemed to afflict the sets produced by so many of its contemporaries. The company started to make TV sets in the late thirties, but we've been unable to unearth any details of these. The chassis used in Model 912 and its associated models, the 909 and 129, marked McMichael's re-entry into the TV field after the war.

Model 912

During the thirties some of the best-selling McMichael radio receivers had been housed in pseudo-antique cabinets with Queen Anne style legs. The 12in. Model 912 followed this same pattern. It had a superhet receiver section designed for reception of the London or Sutton Coldfield transmissions: it also provided radio reception on three preset, switch-selected frequencies, normally the BBC Home, Light and Third programmes though full coverage of the medium and long wavebands was possible. Radio reception facilities were by no means uncommon on early television receivers, but the way in which McMichael accomplished it in this set was extremely unusual, as we shall see.

For TV reception the signal from the aerial was switched to the control grid circuit of an EF42 pentode that operated as an r.f. amplifier, passing next to an ECC91 double triode arranged as a mixer/oscillator. The local oscillator operated above the signal frequency, at 68·5MHz for London or 85·25MHz for Sutton Coldfield. This produced 27MHz and 23·5MHz sound and vision i.f.s (in those days it was not always the case that the sound i.f. was higher than the vision i.f.). Two further EF42s provided vision i.f. amplification. These were followed by an EB41 detector/interference limiter, then another EF42 which drove the cathode of the MW31-14C c.r.t.

The sound i.f. signal was meanwhile taken to the grid circuit of a second frequency changer, this time an ECH42 triode-hexode. The local oscillator again operated on the high side, at 29MHz, producing a second i.f. at 2MHz which was amplified by an EF41 variable-mu pentode then passed to an EB41 demodulator/interference limiter. The detected audio signal was returned to the EF41's control grid before going to the interference limiter section of the EB41, the EF41 thus acting as both an i.f. and a.f. amplifier (reflex amplification). The EL33 audio output pentode drove a 10in. speaker in the base of the cabinet, sound quality being an important feature of these sets.

For radio reception a low-pass filter was switched into the ECH42 frequency changer's grid circuit. Whilst it cut off sharply at around 1,600kHz it had a substantially flat response over the long and medium wavebands. No r.f. tuning was employed here, station selection being achieved by switching in one of three oscillator coils that were tunable over ranges 2MHz higher than the long/medium frequencies. This arrangement didn't provide a great degree of r.f. selectivity, but for local station reception the wide i.f. bandwidth assured high quality.

Yet another EF42 was used as the sync separator, operated in the conventional manner. The field and line timebases both used blocking oscillators. Fig. 1 shows the field timebase circuit. An interesting point here was the care taken over synchronisation. The field sync pulses were fed to the grid of the first section of the 6SN7 double triode, whose cathode voltage was set by the field hold control. This triode acted as a limiter, so that equal amplitude sync pulses were applied to the oscillator section of the 6SN7 to ensure good interlacing. The sync pulse coupling was to the grid of the second section of the 6SN7 via the 1:1 blocking oscillator transformer. The sawtooth waveform developed across C70 was fed to the EL33 output valve via the linearity control. Choke-capacitance coupling was use to the high-impedance scan coils.

The line output stage is modern looking (see Fig. 2) but operated in the class A mode. An EF42 was used as the line blocking oscillator, the sawtooth developed across C76/R76 being used to drive the EL38 line output pentode. The overwinding on the line output transformer developed some 4kV which was fed to a voltage doubler circuit using two EY51s. V12 (EZ35) was included to damp the circuit following the flyback – it's not an efficiency diode. The EZ35 full-wave rectifier valve had a well-insulated cathode and was primarily intended for use in car radio receivers. Setting up this circuit, with its two linearity controls, was not easy: the coarse linearity and hold controls were to some extent interdependent, as were the fine linearity and width controls.

The 912 had two power supply units that delivered 275V at 70mA and 385 at 220mA respectively. Switching reduced the consumption for radio reception. The heaters were supplied by a 6·3V, 9·5A secondary winding on the main power supply transformer.

The 909 was a 9in. model that omitted the radio reception facilities and was housed in a simple console cabinet – no Queen Anne legs this time. It was fitted with an 8in. speaker. A 12in. version, Model 129, was also produced.

The Economical 512

McMichael's next effort was the 512, which was similar in appearance to the 912. It was another 12in. set, this time with an r.f. tuning system that gave complete coverage over Band I with simple three-knob tuning. The number of valves used was small for the time – just thirteen. This was achieved by the use of some ingenious circuitry, as we shall see.

A conventional superhet circuit employed an EF91 r.f. amplifier followed by a 12AT7 mixer/oscillator. There were two stages of vision i.f. amplification, using EF91s. One then looks in vain for the detector/limiter valve preceding the video output valve. This was the first bit of simplification. McMichael took the very unusual step of using anode bend detection in the video output valve itself. This method involves biasing the valve near to its cut-off point, the result being rectification plus amplification. It's not a very efficient form of detection but offers

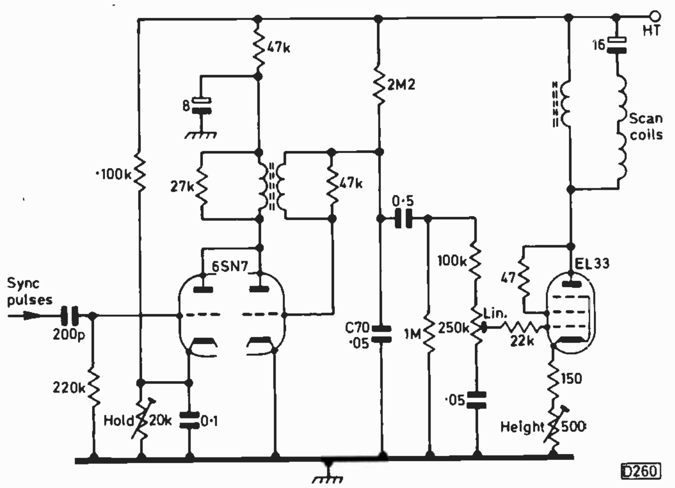


Fig. 1: Field timebase circuit, Model 912.

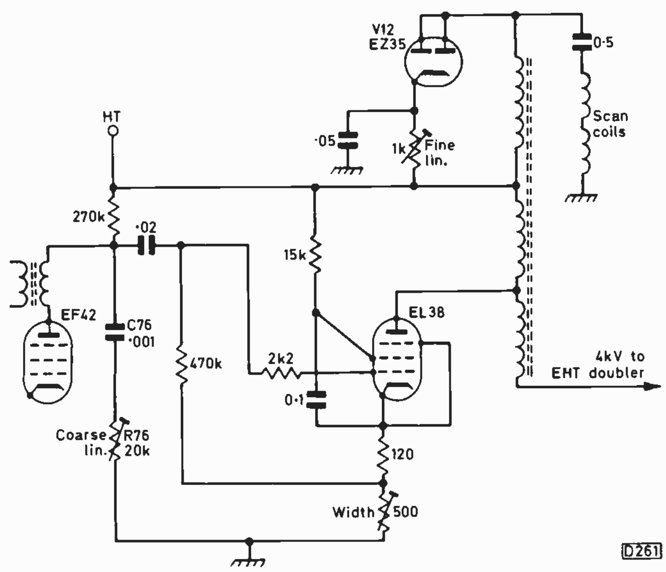


Fig. 2: Line output stage, Model 912.

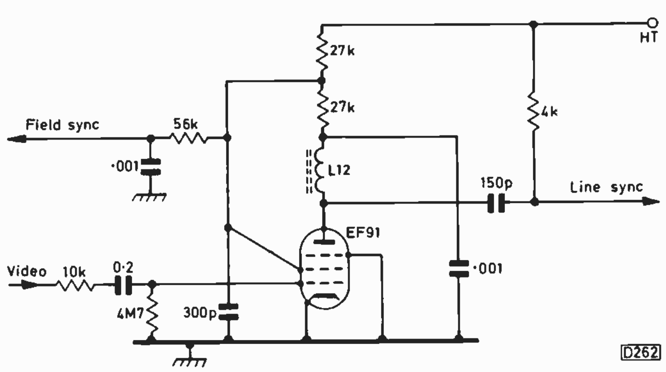


Fig. 3: Sync separator circuit, Model 512.

the advantages of high input impedance, high amplification and a good measure of self-limiting as regards interference. A filter was included in the anode circuit to remove the i.f. component.

The sound section was straightforward. An EF91 provided both i.f. and a.f. amplification, an EB91 provided detection and interference limiting, and a PL33 served in the output stage.

A conventional pentode sync separator was used (see Fig. 3) but the load circuitry was unusual. The field sync pulses were tapped from the screen grid and then integrated while the line sync pulses were developed across a coil (L12) in the anode circuit, differentiated and fed to the line timebase.

There was considerable simplification in the timebases, the field timebase in particular revealing the modest scan powers required for the narrow deflection angle tubes of the time. It consisted of a miniature 12AU7 double triode acting as blocking oscillator and output stage. The 12AU7 has a rated anode current of only 10·5mA at 250V, and supposedly a maximum anode voltage of 300V. McMichael applied 330V and presumably got away with it. The 17V cathode bias implies that the anode current was just over 7·7mA. No one could say that the field timebase was not economical of h.t.! Negative feedback for linearity correction was applied between the anode and grid of the output triode and the scan coils were transformer coupled.

The line timebase was even simpler. It consisted of a PL38 in a self-oscillating arrangement and an EY51 to provide the e.h.t. When we say a self-oscillating arrangement there were in fact two modes of operation. The valve was connected as a transitron oscillator, with capacitative coupling between the suppressor and screen grids, and as a feedback oscillator with coupling from the secondary winding on the line output transformer back to the control grid.

H.T. was provided by a PZ30 rectifier fed from an overwinding on the mains autotransformer – this provided an input of 315V a.c. Secondary windings gave two 6·3V supplies, one for the c.r.t. heater and another for use with an optional preamplifier. The other heaters were series connected and supplied via a thermistor and a mains dropper resistor in the conventional a.c./d.c. manner.

TM51 and TM52 Series

The 512 set the pattern for a while. The following 512RV, which incorporated a separate five-valve radio, and TM51 differed mainly in reverting to a conventional EF91 video output stage with an EB91 as vision detector and interference clipper of the time-constant type. In the sound section reflex amplification was out, an ECL80 being used as audio amplifier/output valve.

The following TM52 series again saw little change. A GZ32 came in as the h.t. rectifier, the vision interference limiter was changed to an adjustable type and in the line timebase the transitron coupling was deleted. Maybe in earlier versions it had simply provided a start-up action? In later versions the line sync pulse coil was omitted – apparently this gave improved line hold performance. So much for earlier efforts! A Metrosil was added to give improved e.h.t. regulation and the first anode supply was tapped from this.

A Full-specification Chassis

1953 saw the introduction of the TM53 series, of more modern design and incorporating just about everything – flywheel line sync of the coincidence detector type, gated vision a.g.c., a triode vision interference limiter, multivibrator timebase oscillators and a line output stage with efficiency diode (PL81, PY81, EY51). The e.h.t. regulating Metrosil was retained and a further Metrosil (voltage-dependent resistor) was used as the cathode bias resistor in the video output stage. As with previous designs, McMichael took care over the field sync pulses. The circuit used here is shown in Fig. 4. This strange circuit used a triode as second sync separator followed by inductive integration with a diode that was described as a "field pulse damper". It seems that there was trouble with the line output transformer, since a different type was supplied for replacement purposes.

Swan-song

The chassis introduced in 1954 for the TM54 series of models marked the swan-song for McMichael as an independent manufacturer: soon after, the firm was taken over by Sobell. Yet looking at a contemporary brochure there was nothing to suggest – much the opposite – that the Slough firm was running out of ideas or steam. The models were all fitted with twelve-channel turret tuners and some incorporated f.m. radio facilities (the BBC's first f.m. radio station, at Wrotham, Kent, was officially opened in May 1955). The radio unit was completely separate electrically and could thus be used independently: for models that didn't have a radio fitted a trolley with a compact m.w./l.w. superhet built into the top platform was available at £25. It had a mains socket for the TV set so that only one mains lead was required, a thoughtful touch to avoid "spaghetti" around the carpet.

As with the TM53 series, up-to-date valves (EF80 etc.) were used but the valve complement was reduced from 22 to seventeen (plus six crystal diodes and a metal rectifier). The tuner employed the then standard PCC84/PCF80 combination and was followed by a brace of EF80s each for vision and sound i.f. amplification. Crystal diodes were used for detection in both channels. Out went the vision a.g.c. and flywheel sync for some reason, but the chassis was still quite a complicated affair. One strange arrangement was the two-valve video amplifier, an EF80 driving a PL83 (see Fig. 5). According to the contemporary *Trader* service sheet the reason for this was to provide sufficient drive for the c.r.t., as an alternative to using an extra stage of i.f. amplification (weren't two EF80s sufficient?). Anyway, a lot of effort went into the design of this curious arrangement. There were video correction chokes in V5's control grid circuit and in the two anode circuits and a preset video gain control was provided (R16). Because of the a.c. coupling between the two stages, d.c. restoration was provided by driving the second valve into grid current.

Care was also taken over the design of the sync circuitry. The pentode sync separator was followed by an EB91 plus an integrating network in the field sync pulse feed and by no fewer than three clipper and clamping diodes in the line sync feed (all GEX34s). The timebases otherwise followed the pattern set by the TM53 series, with multivibrator oscillators and separate pentode output stages. On the line output side, the contemporary brochure claimed that the "exclusive McMichael Direct Drive Line Output is a far greater safeguard against Electrical Breakdown. The prestige of British research has been enhanced throughout the world by this exclusive McMichael development (McMichael's capitals)." Looking at the circuit diagram one finds it difficult to see what precisely was meant here: there was no scan coupling capacitor (there generally wasn't at the time) while the high-impedance scan coils were wired in series with the primary winding on the line output transformer.

The h.t. rectifier was an LW7, which will be well remembered by all "old hands". The output from these little fellows used to drop sharply with age, and much engineers' time was spent in replacing them, often with the bewilderingly small new silicon rectifiers (plus addi-

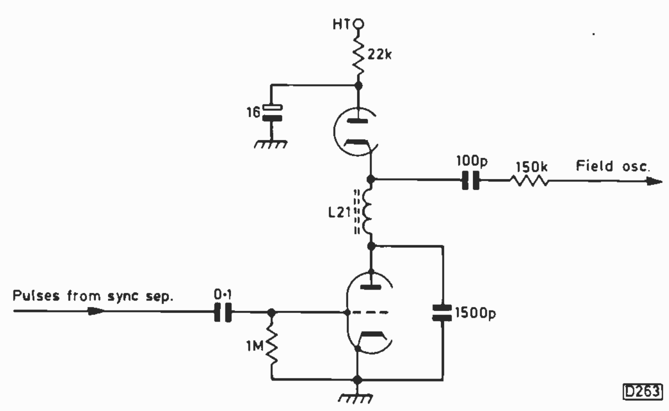


Fig. 4: Field sync circuit, TM53 series chassis.

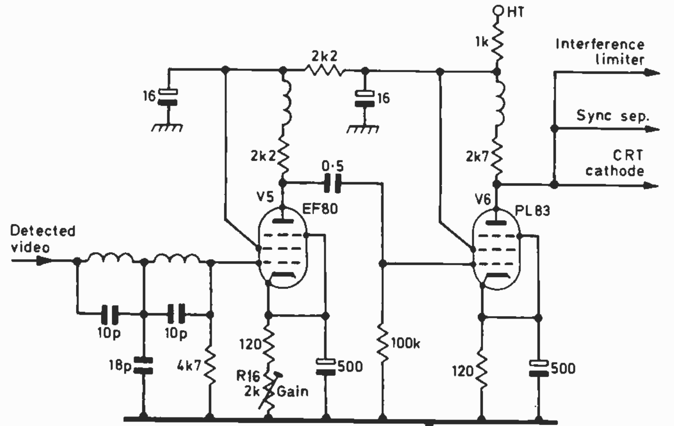


Fig. 5: Video amplifier circuit, TM54 series.

tional 21Ω surge limiter). Apart from the odd open-circuit dropper section and dried up electrolytic, nothing else ever went wrong with this type of power supply. The McMichael circuitry here was a little more complex than that of some of its contemporaries, but it still used only seven components apart from the rectifier and mains dropper. I think of this sort of thing when I see circuits of modern power supplies that take up a whole page of *Television* . . .

Thus ended the story of another of the pioneering firms in the history of TV. Following McMichael models were fitted with chassis developed by the Sobell team.

Letters

TELETEXT PROBLEM

I wonder whether anyone can offer any help with the following problem? Being one of those who like to be in at the beginning I obtained a set fitted with the Tifax XM11 teletext decoder module. The trouble is that it doesn't seem to like today's transmissions with extra teletext lines. The symptoms for me are mainly lack of perfect decoding: on Ch. 4 for example lines of teletext will be lost and only sometimes regained next time round. So there we are. Has anyone any ideas or do I have to suffer evermore the consequences of buying an early design?
G. Beard,
Wandsworth, London.

WHERE ARE THE TUBES?

The problem I've had for the last twelve months or more is in trying to obtain small monochrome c.r.t.s for monitors. I've at present two Shibaden 9in. (230mm) monitors requiring tubes and it seems that there are no stocks anywhere in the UK. Suppliers of spares for TV sets seem to be able to provide everything you require from a PL81 to the very latest microcomputer chip – but not the display component. So if any supplier does have stocks of such c.r.t.s, please let us all know!
C. D. Thompson, Senior Lecturer,
Liverpool 18.

PCB TIP

Here's a quick tip worth adopting. After working on a printed circuit board remove any dried flux with a suede shoe brush (not a Hush Puppy brush) and spray the board with PCB lacquer (RS type 554 989). If we all did this repairs would look like first ones every time.
J. Hopkins, The TV Workshop,
Wisbech, Cambs.

SIMPLE FADER CIRCUIT

The little circuit shown in Fig. 1 might give readers food for thought (or a bloody good laugh!). It's a very simple fader unit. I use the word fader but in fact the circuit actually limits the amplitude of the video signal depending on the setting of VR1: VR2 stops the bias dropping too far so that the sync is lost. As the signal is removed from the top down the burst is the last thing to go, so chroma remains to the very end.

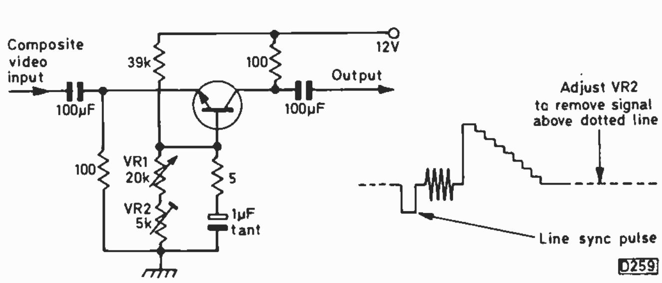


Fig. 1: Simple video fader circuit.

To set up, turn VR1 to minimum resistance then adjust VR2 until all video is only just removed. VR1 should then fade the video in and out.

This little circuit can't compare with a proper fader of course, but it does allow you to go down to black level for a cheap and cheerful edit.
D. C. J. Tilley,
London E2.

BELTS 'N' MOTORS

I'm not sure how serious Steve Beeching intended to be in his letter in the November issue. My colleagues and I have changed over thirty loading belts in Ferguson 3V29s and 3V30s and have never had a comeback for the motor, though we have had a motor fail. The difference in the time required to change an assembly and a belt is about thirty seconds in favour of the belt, mainly because you don't have to wait for the soldering iron to heat up. As for Steve's final comment, it's well known that all engineers in this trade are paid very low wages.
Derek Snelling,
Brownhills, Staffs.

COLOUR PORTABLE PROJECT

Although the *Television* colour portable project dates from 1981 the design was so good that many readers may still be interested in building it. One problem that would arise is with the SL470 chip (IC3) in the remote control decoder/interface unit – the BCD to one of ten decoder/varicap tuning i.c. The SL470 chip in our receiver recently failed and on trying to get a replacement we were told that it has now been superseded by the SL471.

The SL470 is used in the remote control receiver system in many Ferguson TX9 and TX10 receivers. On odd occasions we've replaced this chip with an SL471 that's worked admirably without any need for modifications. This is not the case with the remote control receiver panel in the colour portable project however. We found that when we replaced the SL470 with an SL471 the display read 1, 2, 3, 4, 8, 8, 8, 8 . . . 1, 2, 3 etc. Also the varicap drives were all over the place. So we set out to find why this was happening.

We found that the SL471 and the MC14493 LED driver/decoder together reduced the outputs at pins 8, 9 and 10 of the SAA1251 receiver chip (IC1) to such an extent that the SL471 and MC14493 couldn't be driven properly. The modifications required to overcome this problem are simple and relatively cheap. We also found that the MC14493 doesn't like operating at much less than 5V, and discovered that the voltage at the anode of the BZX61C13 zener diode D7 is barely 4V. The first modification therefore was to replace this zener diode with a 7805 5V regulator. The input to this is taken from the 18V rail via a 150Ω current limiting resistor. The second modification was to add 100kΩ resistors in series with the A, B, and C inputs to the MC14493 LED display decoder chip, i.e. between pins 8, 9 and 10 of IC3 and connections D3/4/5.

All this suggests that the SL471 consumes more current than the SL470. In the Ferguson TX9 and TX10 chassis the use of different receiver chips enables the SL470 to be replaced with the SL471 without modification.

Our main reason for writing is to help people who've built the project and find that they have to replace the SL470 with an SL471 due to failure of the device.

K. Stanley and R. Wateridge,
Stanley Television, Portsmouth.

Editorial comment: Our thanks for this helpful suggestion. We would not recommend constructors to build this project today since difficulties are likely to be experienced in obtaining line output stage components.

In the Workhouse

Les Lawry-Johns

Yes we're back in the workhouse again – after a very lean period that extended from before spring until well into the autumn, a period when we fretted and wondered whether the trade would ever come back. The theories we pondered were many and varied, e.g. more reliable sets, too many spare sets and so on. Whatever the real reason, the wheel seems to have turned and the sets are now coming in thick and fast. Mainly G11s and T20s, with the odd ITT and GEC set for good measure. I'm glad of this since I don't like those odd sets with strange sounding names that were born half a world away, and I don't take in videos or computers either. They're too complicated for me. Fault tracing with a logic probe? Ugh! "How does he live?" I can hear you say. I suppose the answer is that we don't have a staff to pay, we don't want expensive holidays and we're always here when wanted. In the workhouse so to speak.

Tony's Ordeal

It seems that not only us men read this magazine. Apparently lots of women do as well. I know Keith Cummins' wife does, but then she was a local lass before she met him – him and that Casablanca image he projects. It would appear that Tony's wife also reads this Macho Magazine and when she read that bit in the November issue about Tony wearing black tights etc. she wasn't very pleased. What can I say? It was all by way of a joke dear, honest. The fact that Tony has been threatening to throw bricks through our windows late at night has nothing to do with this apology, nothing at all. It wasn't Tony who wore the tights. It was Jim (now I'm for it).

The Pye 725

Do you remember me telling you about the struggle I had with a friend's Dynatron fitted with the Pye 731 series chassis? If you recall, the trouble was to do with changing the BU208 line output transistor. Following the nightmare of removing the vertical panel I found that the screws holding the BU208 refused to budge. Son-in-law Douggie came upon the scene and offered to help using his car repair kit. The BU208 then came out all right but the panel was well nigh destroyed and took hours to repair. When I say how much I welcome a well known name on a set that comes in for repair I do have to admit to being dubious when one of these Pyes comes along.

One that I'd sold several years ago came in the other day. The centre 800mA h.t. fuse had failed but a meter check didn't record a short. Now this usually means that the 0·1μF (1·25kV) first anode supply reservoir capacitor inside the top of the line output stage screening has shorted, but it hadn't. So a new fuse was fitted. It blew and another check was made. This time there was a short-circuit, and it just had to be the BU208. I tried to slacken the screws without removing the panel but had to accept defeat. So the nightmare started. It eventually came out and the BU208 was replaced. Now it's one thing to remove these panels, another to put them back complete with all the plugs etc. I know there's an easy way. It just doesn't seem to work for me and reading instructions is an art I've never mastered. I always forget what I've read as soon as I've read it you see. No, the 725/731 series isn't one of my favourites – not when there are line output stage troubles.

Droopy Draws

I suppose the G11 is one of my pets. These sets don't seem to give much trouble when they come in – and they do come in, thick and fast. EW troubles are normally due to dry-joints or the fact that the BY223 has caused the BD238 to fail. One that was a little different came in recently. No dry-joints could be found so we swung the line scan panel round and there it was: old droopy draws. The EW loading coil hung down in shame. It was like looking at myself. We always keep a few of these in stock, so in no time the new and more substantial coil was fitted and the raster sides were nice and straight again. It did look sad though, drooping down like that.

Such a Nice Girl

A car stopped outside and I could see that the driver was a young and very pretty girl with long blonde hair. So I resolved that I would do my best for her. She got out and I could see that there were two young kids and a baby in the car. Someone else had been doing his best already. She yanked a 22in. T20 out of the back of the car and casually brought it into the shop. Strong too I thought. She put it on the bench and without further ado told me about it.

"Fucking thing's gone again" she declared.

I didn't know what to say, me with my delicate upbringing.

"Where's it gone?" I gasped.

"It ain't gone nowhere you nit" she snapped. "I mean it's gone wrong again and I'm bleedin' fed up with it."

"When did I last do it?" I asked.

"Ain't bin here before. Those Snappy Service idiots had it – three times."

So I ventured a look and found that the BU208 was short-circuit. "Call back in half an hour and I'll tell you more about it" I whispered.

"Hope it's going to be done properly."

"So do I."

And away she went, roaring off down the road and leaving me to fit a new transistor and test the set.

It had a funny way of coming on, remaining faint with curled edges for quite some time. This suggested to me that the power supply module was at fault, with probably one of the small 47μF capacitors suspect. So I fitted a replacement power panel and everything came on nicely and behaved itself.

She came to collect it. "Do you think the bloody thing will be all right now?"

"I hope so, but I've only fitted a power board and line output transistor so I can't speak for the rest of it. It's yours dear, not mine."

She said something nasty, paid up and went.

She was back next day and the air was blue. I yelled for help and Zeb came bounding in. He took one look and bounded out again. Some guard dog. H.B. popped her head around the corner and popped it back again. I was alone and felt lonely. I got the set in – she didn't carry it this time – and found that the 1·6A fuse on the power panel had blown. Fortunately I'd fitted a pair of 47μF capacitors (7C4/5) on the original board and this was now in full working order. It was replaced in a flash.

"Just a little thing. I'm sorry you've been bothered" I apologised.

"I suppose you want another small fortune?"

"Oh no madam, it's on the house. Our pleasure, so pleased to see you . . ."

"Bollocks" she snapped as she departed, I hope never to return.

The Network Colour Portable

After all those G11s and T20s and the experience just recounted an old friend popped in with a set I'd not seen before. It was a Network NW1414 14in. colour portable. I took the rear shell off, peeped inside and was depressed to see a chassis that lowered just like a NordMende, with a thyristor line output stage etc. Dead was the complaint and I just happened to spot a wirewound resistor sprung open at the top centre. R607, 1·2kΩ, 5·5W. The set started up when I touched the resistor together so I soldered it back. The set then worked perfectly and I left it on for some time, noticing that the resistor remained quite cold. I concluded therefore that it was a start-up resistor that had been suddenly asked to do a bit more than usual and wondered why. Having run it for some time I returned it to its owner.

He brought it back next day and I said I'd keep it for a week just to make sure. Once more the resistor was open and the set functioned perfectly when the contact was restored. It then continued to function every day for a week and has now gone back. I wonder what it was – and hope I don't have to find out.

(Editor's note: The set is one of the Grundig Networks, GCS100 chassis. See page 608 of the September 1984 issue for information on R607 going open-circuit.)

Zeb

I mentioned Zeb's cowardice when confronted with the young lady of the blue language. He's not really like that. It's just that he doesn't like high pitched noises – and she was certainly high pitched. Fireworks have the same effect. Otherwise he seems to know no fear. He's a very good guard dog and kicks up merry hell when anyone comes near the door and we're not around. That means a lot to us. Just thought I'd put the record straight. Now, about that cat . . .

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.

ITT CVC25 CHASSIS

The set works perfectly when switched on from cold, but if switched off then on when warm the h.t. trips on and off for about ten seconds then the set goes dead. It works perfectly again from cold.

The fact that the set operates happily from cold suggests that the line timebase and other stages are probably o.k. The most common cause of this effect is incorrect setting of the trip circuits in the CMP30 chopper control module. First set R808 for 160V at C52 then trim R817 (over-volts) and R810 (excess current) as laid down in the manual.

SONY KV2000UB

There's picture break up in a horizontal band that's about an inch wide and four inches from the top of the screen. This is accompanied by a loud, irritating buzz.

We've had this very fault. It took a long time to find the cause, which turned out to be C612 (3·3μF – 4·7μF will do) in the chopper power supply. This electrolytic had dried up: it's the 21V rail's reservoir capacitor.

PANASONIC NV366

The fault is present with prerecorded tapes only – saturated colours streak to the left of the luminance image. There's no trace of the fault with the machine's own recordings. With the machine in the still-frame mode the effect is less pronounced but still very obvious. When a tape recorded on the machine is played back on another one the symptom is reversed, the streaking being to the right.

This problem is not uncommon and is caused by incorrect back tension in the afflicted machine. You can prove this by manually altering the position of the back tension pole while watching the picture from a prerecorded tape. The trouble doesn't arise with the machine's own recordings because self-recorded tapes are laid down and read off under the same tension conditions. The back tension with this machine should be 25-30 grams. Adjustment requires the use of a Tentelometer type gauge.

GRUNDIG 8610

The sides of the picture are bowed in by about two inches at the centre. The EW modulator diodes and the Darlington driver transistor have been checked and found to be o.k. and the supplies in this area are correct. One odd fact is that the bowing reduces to about half an inch at each side when the set has been on for half an hour. A check for dry-joints failed to reveal anything amiss.

It sounds as if the EW drive circuit is operational but being starved of a field-rate parabolic input. This can be caused by a dried up or open-circuit coupling capacitor. Check, by substitution, C480 (4·7μF) on the EW module, C468 (47μF) on the field timebase module and C490 (220μF) on the mother board.

FERGUSON 3V43

This machine gives perfect results apart from the fact that the still tracking control has to be set fully clockwise to eliminate noise on a still picture. This is so whether the tape has been recorded on the machine or on another one. With the control in the centre-click position the bottom third of the screen is obliterated by horizontal streaks.

It's our experience that this machine doesn't give a good still frame with half-speed recordings: also, if the machine isn't on a level surface the chassis can distort sufficiently to produce a noise bar.

PYE 731 CHASSIS

With the brightness, colour and contrast controls at minimum there's a bright, greyish raster with flyback lines. Adjusting the colour drive and first anode controls has little effect on this. The thick-film unit has been replaced and all the resistors in the first anode control networks are within specification.

These symptoms are basically those of a c.r.t. with grid emission, when a particle from the emissive cathode gets detached and lodges on the gun assembly sufficiently close to the cathode to become hot enough to start emitting. This produces a colourless raster that cannot be controlled by any adjustment and is usually displaced by a few millimetres from the picture raster. You can try tapping the neck of the tube when cold and with the set face down, replace the tube or put up with the condition.

SONY KV1810UB Mk I

There are two problems with this set. First the verticals on a test pattern are bent at the bottom of the screen, predominantly on the right-hand side. Secondly there's a slight ripple on certain pictures.

For the bent verticals, replace the pincushion correction signal coupling capacitor C585 (4·7μF) then adjust the pincushion controls VR585 and VR586 as specified in the manual. The ripple on picture effect is likely to be due to a dried-up smoothing capacitor in the power supply: check the h.t. smoothing capacitor C621 (47μF) and the 19V rail smoothing capacitor C624 (47μF), also if necessary C616 (0·47μF) which decouples the emitter of the error amplifier transistor. Replacement capacitors should be obtained from Sony.

TOSHIBA V8600

The fault occurs on playback of material recorded on my other machine (a Sanyo VTC9300), sometimes with prerecorded tapes and very rarely on playback of the machine's own recordings. It takes the form of a loud buzzing whenever there's a noticeable amount of white in the picture – switching the NR doesn't affect the noise or its amplitude.

Remove the top of the cabinet and check for at least 9V on the red wire going to the r.f. converter. If this supply is o.k., reduce the setting of the modulation level preset inside the converter slightly. If the supply is below 9V, Q661 on the servo/logic board is defective – any medium-powere npn transistor will do in this position (remove the cabinet base for access).

TEST CASE

277

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.

Fidelity Radio has by tradition been associated with value for money radio receivers and audio products: its entry into the television world represented a brave venture into a field dominated by the big boys. The TV sets are well designed and presented, and maintain the low price/good value image associated with the company.

Our concern this month is with a Fidelity 14in. colour portable, Model CTV14. It's an up-to-date design with most of the of the circuitry in i.c. form. The chopper is controlled by a TDA2581, a TDA1180 looks after the sync processing and the field timebase consists of a TDA1170S. Our problem is easy to describe: complete loss of line hold. Should have been easy to diagnose too . . .

The line sync wasn't far out – there were ten or twelve slanting lines across the screen. The line hold control P14 had no effect whatsoever on the number or angle of these lines. Field lock was good and the first, perhaps misguided, step taken was to check the sync separator stage's bias resistor R604 (1·8MΩ). Not surprisingly it turned out to be all right. A more sensible check was made next – for correct voltage variation at the slider of the line hold control. It ranged from zero to around three volts, which was judged to be correct for the resistor values involved. Certainly the crucial voltage, 2·8V, could be obtained at pin 15 of the TDA1180. The voltages at the other pins were reasonably correct, though it was not easy to interpret those at pins 11, 12 and 13 because of the out-of-lock condition. The feedback pulses from the line output transformer were present and correct at pin 6, though out of lock of course. The next step taken was replacement of the 0·0047μF frequency-determining capacitor C611, again with no effect on the symptom. This was followed by substitution checks on C608, C607 and C606 and resistance checks on R609, R610, R613, R614 and R619. These components all proved to be in good health. A low-impedance bias voltage was then applied direct to pin 15 of the i.c.: by this means a large voltage swing could be and was applied to the i.c., again with no effect.

At this point the technician involved became convinced that the TDA1180 was faulty. It's not one of the most common devices, and since none were held in stock a written order was sent off and the set was put to one side. During the few days that elapsed before the replacement chip arrived the details of the struggle became half forgotten, and when the time came to complete the job it was given to the workshop trainee ("general bleedin' dogsbody" is his own description of the role he plays). He fitted the i.c., checked over the set and switched on. "Can't get rid of the lines 'ere" he said, winding the hold control P14 from one end to the other of its travel.

It wasn't the TDA1180 then. The faulty part was finally tracked down and another written order went winging off to Fidelity. This time the diagnosis was right, and the little telly's correct operation was finally restored. Most of the hassle described above could have been avoided if someone had taken a good look at the circuit diagram at the outset. What had been overlooked? Full details next month.

ANSWER TO TEST CASE 276

— page 114 last month —

Some strange cases turn up on this page, and last month's puzzle was perhaps as strange as any. The unhappy participant was Mrs. Tedham, whose new ITT VR3905 wouldn't record clear pictures in the timer mode. Unattended recordings were very snowy, but investigations at the site and in the workshop failed to bring to light the cause of the problem.

Our trouble was that we were too near the trees to see the wood! If we'd had it set out as we've done for you maybe we'd have twigged it much sooner. It will be recalled that Ace Aerials had installed a high-gain aerial atop a tall pole, and of course a masthead amplifier was involved. This was powered from the usual set-back mains power unit whose mains lead was wired into the TV set's 13A plug in the usual way. Whenever the lady left home, off went the wall switch for the TV set and off went the power to the masthead amplifier. So there were virtually no signals for the VCR to pick up when it clicked into life in the absence of its meticulous mistress.

The set-back power unit now shares a 13A plug with the VCR and all is well. Mrs. T is convinced that she'll return one day to find that the house has burnt down. If it does we may have material for another Test Cast item – what caused the conflagration? Did the aerial pole buckle in the heat? Perhaps not . . .

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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 6.03
2998 RRI A823 PLASTIC CAM 0.48
5300 RRI A823ETC RING SPK EAP 0.55
4988 RRI T20 (TYPE) FOCUS ASY 8.60
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 MODE TX 11.20
4849 RRI 2718 3K3 SH+VOLUME 3.15

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4969 PHILIPS 128711 4K7 VOL+SH 3.23
3288 PHILIPS 300 470L VOL+SWITCH 2.87
4449 PHILIPS 570/713 IF MODULE 7.00
5425 PHILIPS CTX-S EHT LEAD 8.95
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
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4576 PHILIPS G11 SQ SHAFT SWITCH 2.32
4645 PHILIPS G11 TOA2600 HOLDER 0.65
5284 PHILIPS G8 100K TUN P/SET 0.84
2977 PHILIPS G8 10K COLOUR CTRL 0.98
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) 3.80
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4523 PHILIPS G8 5R CONV POT (550) 0.64
4858 PHILIPS G8 6×4" 7OR SPKR 5.98
2979 PHILIPS G8 EQUALIS. COIL 2.25
4503 PHILIPS G8 METAL SH 1.72
2978 PHILIPS G8 REO/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 8.60
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 4.05
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

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5562 T3292 CAPSTAN BELT 3.48
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 DRUM MOTOR 47.70
5577 T3292 F/F IDLER 2.02
5582 T3292 GUIDE ROLL ASSY 11.40
5585 T3292 LOWER DRUM ASY 80.40
5587 T3292 PINCH ROLL ASSY 9.84
5591 T3292 REWIND IDLER ASSY 7.04
5592 T3292 REWIND RUBBER TYRE 0.80
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 0.00
5637 T3V00 DRUM MOTOR 49.39
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 5.58
5657 T3V00 UPPER DRUM+MOD KIT 35.94
5663 T3V16 PINCH ROLLER ASSY 7.31
5666 T3V00 CAPSTAN MOTOR 51.16
5688 T3V00 TENSION BAND 1.86
5689 T3V00 TIMING GEAR 4.12
5692 T3V00 UNLOAOING IOLER ASSY 6.43
5710 T3V01 TENSION BAND 1.86
5716 T3V16 CAPSTAN BENT 3.48
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 5.58
5759 T3V16 T/U IOLER ASSY (LA) 7.55
5765 T3V16 UNLOAOING IDLER 6.43
5772 T3V22 CAPSTAN MOTOR 51.16
5773 T3V22 CAPSTAN MOTOR BANO 0.60
5774 T3V22 CAPSTAN BELT 3.48
5790 T3V22 F/F IOLER 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 7.04
5822 T3V22 SUPP SPOOL CARRIER 4.80
5824 T3V22 TAKE UP IDLER SMALL 5.58
5825 T3V22 TAKE UP IDLER LARGE 7.55
5828 T3V22 TENSION BANO 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
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5896 T3V24 CASSETTE LAMP 1.62
5899 T3V24 DEW SENSOR ASSY 9.05
5902 T3V24 F/ERASE HEAD ASSY 10.41
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5909 T3V24 LOAOING MOTOR 8.57
5912 T3V24 PINCH RLR LVR ASSY 0.62
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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 1.48
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5974 T3V29/30 LOADING MOTOR 0.60
5976 T3V29/30 LOHR DRUM ASSY 78.72
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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
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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
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6087 T3V35/6 BRUSH ASSY 2.07
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6117 T3V35/6 TENSION BRAKE 0.60
6118 T3V35/6 UPPER DRUM ASSY 35.94
6119 T3V40 SERVICE MANUAL 12.00
6158 T3V29/30 UPPER ORM ASSY 35.94

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6136 SONY C6UB THREADING BELT 1.20
6138 SONY C6UB CAPSTAN BELT 1.77
6145 SONY C7UB BRAKE ASSEMBLY 1.77
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6192 V4002H UPPER CYLINDER 34.66
6204 V4004 CLUTCH ASSY 9.51
6212 V4100 AUDIO CONTROL 28.13
6253 V4000H SERVICE MANUAL 7.08
6254 V4001H SERVICE MANUAL 7.08
6255 V4002H SERVICE MANUAL 9.45
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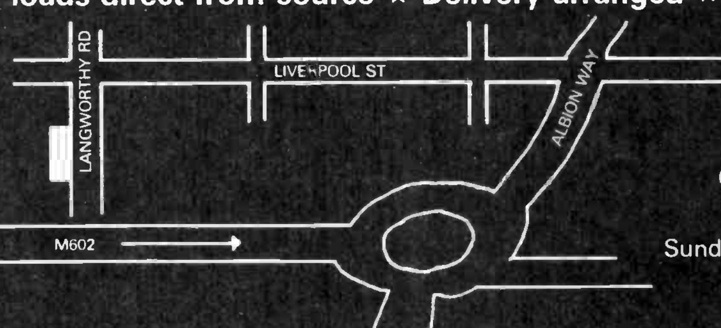

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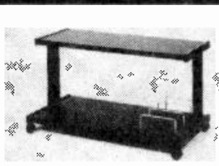

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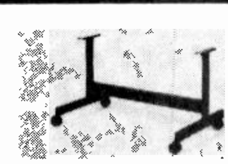

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Y 997	30p
Min 12 volt Relays	75p
R 1038	40p
R 1039	40p
R 2009	80p
R 2010b	£1
R 2029	50p
R 2210	60p
R 2257	60p
R 2265	50p
R 2305	50p
R 2306	30p
R 2322/2323 pair	80p
R 2323	15p
R 2396	50p
R 2461	80p
R 2030	50p
R 2443=BD124	40p
R2737	40p
R2738=TIP41	30p
R2775=TIP41c	40p
R3129=TIP47	40p
S 2008b	80p
2SD898B	£1
Hitachi sets etc.	
STR441	£2.50
STR454	£2
2SC940	£1
BU 105/04	80p
BU 108	£1
BU 124	50p
BU 126	80p
BU 180a	65p
BU 204	70p
BU 205	£1
BU 206	£1
BU 207	£1
BU 208	80p
BU 208A	£1.10
BU 208D	90p
BU 222	£1
BU 326	£1
BU 407	60p
BU 426V	60p
BU 500	£1.10
BU 508A	£1.20
BU 526	75p
BU 807	£1
BU 824	50p
BUW 84	30p
BYW 20-08-9	£1
TIC 106a	30p
TIC 116m	40p
TIC 116n/Y 1003	35p
TIC 126N	40p
TIC 206m	30p
TIC 225S	40p
TIC 226E	40p
TIC 226m	30p
TIC 236m	30p
TICV 106D (T092 case 2A/400V)	10p
TIP 29	20p
TIP 30	35p
TIP 30A	35p
TIP 30B	40p
TIP 30C	45p
TIP 31	30p
TIP 32	25p
TIP 33B	50p
TIP 33C	70p
TIP 34A	50p
TIP 34B	60p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41B	40p
TIP 41D	70p
TIP 42/BRC 6109	30p
TIP 48	40p
TIP 49	30p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 115	50p
TIP 117	50p
TIP 120	35p
TIP 125	35p
TIP 130	30p
TIP 131	25p
TIP 136	30p
TIP 140	50p
TIP 640	50p
TIP 2955	35p
T 6032	30p
T 6036	40p
T 6040	30p
T 6047	40p
T 6049	40p
T 6051	40p
T 6052	40p
T 9004	40p
T 9005	40p
ZTX 107	10p
ZTX 108c	10p
ZTX 109k	5p
ZTX 213	5p
ZTX 341	10p
ZTX 342	10p
ZTX 384	10p
ZTX 451	10p
ZTX 550	10p
MJ 2253	60p
MJE 3040	60p
MJE 2209	10p
SP 8385	50p
SAB 3205	£1.00
SAB 4209	£1.00

G11 condenser £1.75
300M + 700 320V £1.80
200 + 100 + 100 + 50 300V 50p
150 + 200 + 250M 300V 50p
Chassis complete £35
Computer Transformer 20v/2.25A; 20v/1.5A; 17/.5A; 19/.5A; 28/.05A £3
Mains ViewData Torroidals £3.75
240V/240/6V/4 amp/6v 500m/a in / out
Mains trans 240/12v-0-12v 2 amp £3.50

Voltage Regulators	
+5V/UA78PO5SC	30p
−5V/LM79MO5CP	25p
−8V/79M08c	30p
+6V/78M06c	30p
+10v/78LA10	20p
LM 337	30p
LM 342/18	30p
LM 340T 5.0	50p
+12V/LM 340T12	50p
+15V/78M15	15p
+18V/MC78M18	20p
+24V/78M24	30p
MC 7724cp	40p
MC 7824	40p
TIS 90	10p
TIS 91	20p
TIS 92	20p
TIS 93	20p
U 19885	40p
U 3832	15p
U 3845	15p
MR 508	10p
MR 501	10p
MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	6p
BYX 36/600	35p
BYX 38/300	25p
BYX49/600R	75p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 71/350	20p
BYX 71/600	50p
BYX 72/300	20p
BYX 36/600	50p
BYV 95B	10p
BVY 95C	12p
BYZ 106	10p
BPW 41	15p
BYW 56 2A/1000v G11	8p
BZU 15/24	54p
BZY 93c75	50p
BZV 15/18	30p
BZV 15/30	30p
BZW 70c6v2	10p
BZX 79.3v	10p

Bush thyristor RCA 76122 £1
Transformer 240v/20v-500Ma 75p
Chassis type Transformer 240v/12 Volts 500m/a 75p
CVC 20 tube base £2
Tube Base Rank & G11 £1.20
6v-9v-13v tape motor 75p
Swiss made 250rpm/240V motor very small 75p
Infra red led LD57CA 15p
Mono scan coil £3
G 8 transductor £1.25
AT 4041/41 transductor £1
VHF 3 Transistor rotary tuner DX-TV £1
15K-20 turn pots 20p
Thorn panel 6×100 pot + changeover switch (Irish) 50p
Battery converter TA 75 for colour TV. 12/24v Thorn 3787 £6
Thorn 3500 2A cut out 50p
Stereo GEC amp 20 watt + pre-amp with 4 pots + mains power unit with circuit £6

SPECIAL OFFER
Decca-TTT etc.
FEO4/1/250AC/4
Mains filters
(grey type) × 4
80p

BRIDGES	
SKB 2/08 L5A	30p
KBL 005	30p
KBL 02	30p
KBP 04	30p
W02	15p
W004	15p
W005	20p

AT 2076/35 £7
AT 2076/55 GEC split diode transformer £10
AT 2048/11 LOPTI Mullard £2.50
HT520 Multimeter 20,000 Ohms per volt. Fuse & Diode protected £17.50
Hitachi Split Diode 2433752 £6
K35 Split Diode £6
Z918 Front Panel with Mains Switch & I.C. £4
Thorn Chass U916D Compleat £10
K3-K30 Hand Set Repaired £8
Thorn TX9 Remote Panels with I.C.s £2.50
Thorn 9000 4 Slider Front Panel £4

HITACHI CPT2225 CHASSIS WITH TELETEX £30

10 Mixed TV & radio speakers £4
Philips car radio speaker door pair £7
2× Hi-Fi Philips car tune up tweeter EN8320 £10
ITT CVC45 8 way resistor unit for v/cap £3

4700/10v × 10	50p
68/16 × 10	50p
150/16 × 10	50p
47/25 × 10	50p
220/25 × 10	50p
1/250 × 10	50p
G8 Speaker	£1
8000/30v	50p
470/40v × 10	£1
22/100v × 10	£1
100/350v	70p
400/350v	70p
.47/500v	25p
1/600v	25p
.022/1kv	10p

VIEW DATA PANELS
NEW £3

VM6101
MULLARD TELETEX DECODER
With interface panel and data command panel
New £6 Post £2

12 Volt Aerial Changer over Relays 144 Mc/s 45 watts 50p

GEC Hitachi
V/Cap tuner, after 1979 Series £8
6 Push Button Unit for GEC 2100 Series
Replacement for Touch Button Unit £8

8 SEG LED Display with driver I.C. LM1017 50p

20AX GEC Split Diode lead £1.00

MODEM
Line Terminal Unit
VM6501 £6
Designed to work at 1200/75 or 1200/1200. Diagram and Connection Data Supplies

Indicator Tube
ITT 58705 £1
8 Seg Display FND500 20p
Mullarad 12.5V/170 Mc/s 45 watts
BLW60C £4.00
Mullard Broadband R.F. power modules UHF. BGY22E £10.00
PT4236C, PT8706C, PT9783 £3
ITT Micro Phone M5 50p with switch
Sub-min Relay low voltage 50p
Mains relay coil 230v 30p
Philip PP3 batterys 10 for £3
12v battery holders A.A. 50p 1.5 battery
T/V 12v 2 pin battery lead 30p

Various Tools and Accessories

T/V V/Aerial 300Ω or 75Ω	£1.50
L.C.D. clock display with alarm	75p
* D/P push mains switch	20p each
Mains lead & two pin socket for radio cassette	35p
3 Video Leads	£1.00
Xcelitr cutter	£3.90
T/V loop aerial	75p
Radio Telescopic Aerial	£1.00
Philips Neon Lamps for TV sets	5p
Freeze	£1.20
Foam Cleaner	£1.20
Contact Cleaner	£1.20
Cans of Anti Static, Degrease Cleaner and Anti Corona	All at £1.20
Push Button Mains	75p
Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt	£1.00
Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket	£3.00
Sellotape PVC Electric Insulation 50mm × 20M	70p
Screen locking agent, large can	£1.50
20 GEC Service Manuals	£5.00
Red E.H.T. LAED and Anode Cap	£1.00
10 × G11 Cap 470/250	£15.00
Weller solder iron 15 watt/25 watt	£5.00
2 way baby alarm/intercom with long leads	£5
Phillips universal battery tester/charger, fuse/bulb tester	To Clear £4
12V Nicad pack. "AA"	£2.50
Hitachi 7.2v/1.8A Nicad pack	£6.00
Hitachi TP 007 Battery pack 7.2v/1.6A	£7
Hitachi Silver Oxide Battery G13 UCC357 IEC SR44 1.5V	60p
70ML Silicone Sealer (clear)	£1
100 Coax Plugs	£12.00
De-solder pump + 2 nozzels	£5.20
Plastic box for i.c.s 6"×3"×½"	50p
Can of handy oil 'mobil'	40p
Flat Red LED	12p
500gm 60/40 solder reel	£7
Clearweld glue pack	30p
Dual v/u meter -20 – +10db	£1
K30 thermistor 232266298009	75p
GEC Mains Power Supply R.E.G.	£3.00
1Kg reel of solder	£8.00

75R/25 Watt	25p
18R/11 Watt	25p
Front End Music Center. VHF/MW/LW 13"×3½"	£3
Output Stage for music center	£5
SONY 1400KV Chroma Panel	£6
SONY 1400KV Tuner unit	£3.50
SONY 1400KV Touch button unit	£3.50
12 Volt Mains Trans 500M/A	£1.00
18V or 12 Volt Mains Trans 500M/A	75p
Texas Viewdata Decoder VDP 12/80 Issue 3 with all IC's	£10.00

Quantity Reductions	
BY204/4	25 for £1.00
BY206	25 for £1.00
W005 bridge	20 for £2
KT3 touch button black	6 for £1
G11 touch button red	6 for £1
K30 full remote Dawer Ass with 3 I.C.	£7.00
K30 VHF. UHF Dawer Ass	£6.00
BY298 3 amp/fast/R	20 for £1.50
BU126	10 for £6.00
BU205	10 for £8.00
BU105	10 for £6.00
2SC2122A	10 for £8.00
BF458	10 for £1.00
BD136	10 for £1.25
BF224	20 for £1.40
OA90	40 for £1.00
BYX10	100 for £4.00
KT3 multicaps	10 for £7.50
50 Ceramic Condensers	£1.50
Mixed Mounting Kit for Power Transistors	50p
300 Condensers	£1.50
300 Resistors	£1.50
150 Electrolytics	£2.00
15 Bulbs	40p
Antistatic Discloth	5 for £1
100 Diodes	£1.50

Plastic Boxes 4¾ × 4 × 1 × ¾	50p
100 Fuses	£2.00
100 W/W Res.	£1.50
BF 199	20 for £1
10 × 20 Turn 100k pots. Rank	£2
Thorn 9 volt power supply regulated	£3.00
BF 470	20 for £2
20 Slider Knobs	70p
6 Mixed UHF Aerial Isolating Sockets, some with long leads. Fit ITT, GEC, Philips, Pye	£1.00

Mixed Packs

TO66 12 Power Trans RCA 16182 NPN Replacement for BD124 and Mounting Kits	£1.00
50 Mixed AC series Transistor	£4.50
15 Panel mount rocker switch 250V/10A	£1.50
25 Panel Mount Bulbs & Neons 10A	£1.50
25 LED red/yellow/green	£1.50
20I/C Holders	£1.20
20 Large LED Red	£1.00
20 Small LED Red	£1.00
10×20 Turn 100K Pots	£1.00
100 Transistor	£2.50
20 Convergence Pots	80p
10 Thermistors	50p
20 Slider Pots	£1.00
30 Presets	50p
15 VDR + thermistors, degaussing, HT, etc.	£1.00
40 glass reed switch	£1
10 press to make switch	70p
40 Pots	£1.50
5 Tube Bases	£1.00
1,000 Diodes, Condensers, Resistors on Bandolier	£2.00
Lucky Dip 600 gram	£1.00
Jungle Bag 5Kg	£5.00
20 Knobs	£1.00
20mm Fuse Holders Chassis Mount	20 for £1
IN4001/6 100 mixed	£2.50
EHT Diodes, small	20 for £1
20 Mixed Switches	£1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

SENDZ COMPONENTS

TO ORDER SEE BACK PAGE

Thorn Spares

New 9000 Decoder	£8.50
9000 Frame panel	£8
9000 Cyclops panel	£1.50
8000/8500 timebase panel	£8
8800 convergence panel	£6
8500 convergence panel	£6
4000 Power supply	£3
1600 Mains lead, switch	
3500 6 push button + cable form	£1.50
T605 1vNPN T066 80v/6A	10p
9000 Sound output panel	£1
3500 Focus unit	£1.50
3500 Mains Trans	£4
3500 cut outs	10 for £4
3500 IF panel	£2
3500 Frame panel	£3
3500 Line panel	£3
3500 A1 Diode	20p
Export 3500 IF panel	£2
IC board with set of SN74LS	£1
4000 Tube base	£4
3500 A1 pots	50p
Beam limiter panel	£1.50
3500 Power panel with Y969	£1
3 Way regulated adaptor 240V 6V/7.5/9V/300mA	£3.50
Rank/Toshiba preh unit 0354	£9.50
2 banks of 3 PB unit. Pye 731	£2
4 Push button unit preh	£1.00
6 Push button VHF/UHF for v/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
KT3 12 Push button unit	£2.00
KT3 (Export) 12 P.B.u	£2
6 Push button Unit Thorn	£1.00
6 Push button Unit fits GEC & Decca etc.	£6.00
Hearing aid unit	£3
Rank Z718 4 P/B/Unit MECH	£4
7 Button Unit GEC with Lamps	£7
Bush T515A 6 button unit with Pos & mains lead. 6 bush buttons. Bush	£6.00

Mains Droppers

G8 2R2+68R	£1.25
G8 47R 15 watt	75p
Pye 731 3+56+27R	50p
Pye 3R5/15R/45R	50p
Thorn 50/17/1K5	£1.00
120/20/20/48/117	£1.00
270/10/6 for Thorn 4000	50p
18/320/70/39	£1.10
Thorn 50-40R-1K5	50p
Ae Socket & Lead GEC, ITT, Philips, Pye	25p
7×3¾ Thorn	£1
Thorn 1600-1700	£1.50
Rank Toshiba Tube Bases	30p

Speakers

Pair 25 watt 4Ω speaker & tweeter in cabinet		£15.00
6×4 G11	25 ohm	£1.00
5½×2½	3 ohm	£1.00
5×3	80 ohm	70p
5×3	50 ohm	50p
5×3	35 ohm	70p
6×4	15 ohm	£1.00
7×3	70 ohm	£1.00
8×5	8 ohm 15 watt	£2
8×5	8 ohm	£1
5×3	8 ohm	70p
7×3	16 ohm	£1.00
5" dia	16 ohm	£1.00
5" dia	8 ohm	£1.50
6½" dia	4 ohm	£1.50
6½" dia	3 ohm	£1.50
2¾" dia	8 ohm	75p
3" dia	8 ohm	75p
4½" sq.	15 ohm	75p
KT3 speaker	K30	75p
3" dia	15 ohm	60p
1690 5×3	12 ohm	£1
K45 Philip	15 ohm	75p
K30 15 watt		£1

KT3-K30

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

DIODES

BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 164	50p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600: 4.8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 229/400	30p
BY 237	5p
BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 602	10p
F 247	10p
XK 3102	50p
International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
6A/1000V Stud Diodes	20p

KT3 Decoder	£8
K30 Sound OP	£4
Hitachi 2A/1500V metal case wire end FARST/REC	10p
Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00

Line Transformers

1690 Lopt	£6
Hitachi Split Diode and GEC 1981 to 1984	£13
2 J/Pots 3,500 1 off each type	£3.00
G8 Symmetry Coil	£2.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
1690 Thorn EHT over-wind with diode lead & anode cap	£2.50
GEC 2040	£3.00
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono T704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3
Rank L.O.P.T. Z970	£3
CVC 5-8-9	£3.00
CVC20 ITT	£3.50
AT2080/15	£5.00
CVC30 ITT	£5.00
CVC32 Line Tran	£4.75
CVC800 Line Trans	£6.00
CVC40 Slip/Diode	£12.00
CVC 45	£5.00
GEC Portable G1OT2041	£3.00
GEC Portable G1OT2046	£3.00
EHT Split Diode Leads ITT	£1.00
3500 L.O.P.T. & HT Trans	each £2
LOPT Rank Z763	£5

Triplers

ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
9000 Thorn	£5
9500 Thorn	£4.50
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
TVK 76/9	£3.00
G8	£4.00
CVC 825 ITT CVC 20/25/30/32	£3.50
Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBQ Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
T/text ultrasonic rec'r panel	£14.00
Video cassette lamps on lead. 12-14V.	50p or 3 for £1.00
20 for £5.00	200 for £25.00
GEC 8 touch unit assy complete with all I.C.'s + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	10 for £1.00
G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
KT3 IF panel	£6.00
KT3 line OSC transformer	£1
KT3/K30 infra-red receiver head	£1
K30 drawer unit with IC's (home)	£10
K30 drawer unit with IC's (export)	£10
KT3 AE Sockets	50p
KT3 receiver panel	£8
KT3 line driver transformer	50p
Pye, K30, GEC, etc. Pre-mains stand-by switch	£1
Decca 80/100 IF panel	£5
NPN PNP 80V 6 Amp TO66 O.P. Trans.	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B.U.	£24
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans. & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10
CVC 20/25/30/35/40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
G11 Line Driver Transformer	35p
KT3 Front Panel Control Assy.	£2.50
BTW 30/50	50p

TELETEX DECODER

I.C. SAA 5051 K30	
I.C. SAA 5042	
I.C. SAA 5030	
I.C. SAA 5020 etc.	£8.00
BTW 92/800R	£3
25A473 PNP C/P	10p

NEW 1617 THORN Chassis with ICs & AU113	£8.00
30V Power Supply 500M/A 4×2¼	£2.50
Pye 731 Power Panel	£13
6 Diode Universal Triplers	£4.00
NEW PYE 725 line O/P panel with L.O.P.T. & Tripler	£10.00
NEW GEC 20AX Power Supply Switch Mode	£12.00
Complete new GEC portable chassis M1201H/M1501H with P.B.U./v.cap/LOPTI	£10
Field + Jungle panel for GEC 3133/3135	£1.50
GEC 2110 line panel with transformer	£7.00
GEC 2110 tuner unit + IF Panel	£12.00
Pye/Chelsea Line op panel	£12.00
Pye 205 T/unit	£3.90
Pye 205 Line op panel	£7.50
Pye 713 IF panel and tuner	£7.00
Pye 713 Chroma	£10.00
Pye/Chelsea Timebase panel with LOPTI	£10.00
Pye 731 Frame Panel	£5.00
Pye 731 Convergence Panel	£5.00
Pye 731 Chroma	£10.00
Pye 731 IF panel + tuner	£10.00
Pye CDA/205 panel	£6.00
GEC portable chassis + LOPTI 2114 New	£4.00
Thorn 1613/1713 chassis	9.75
G9 Power Panel	£6.00
Mono RANK Chassis 127A NEW	£10.00
NEW G9 Frame Panel	£10.00
NEW G11 IF Panel	£10.00

NEW MULLARD TELETEX

Panel 6101	£6.00
G8 Tuner Unit + Panel	£4.00
G8 Power Supply	£5.00
G8 6 Sloping PBU	£8.00
G8 IF & Chroma	£10.00
G8 Chroma	£3.00
G11 IF Detector	£3.00
G11 Selector gain module	£3
Complete CVC 825 Chassis (both panels)	£40.00
AEC V/Cap Resistor Unit UHF with IC	£1.00
SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz 1 I.C. SL437F	£3.00
Z909B RANK IF Panels Export 5.5MHz 2 I.C.'s TBA1205B TCA2705Q	£2.50
K35 IF	£6.00
Z743 RANK IF Panel Export 5.5MHz 3 I.C.'s TBA750+SC9504P+SC9503P	£1.50
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead	£5.00
Pye 6 button switch portable	£1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export)	£12.00
GEC Line O/P PC 659B3	£6.00
2110 GEC Power Panel	£8.00
GEC Power Supply (Export)	£10.00
G11 dynamic correction panel	£6
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots	£14
CVC9 slider pots panel	50p
CVC 5 Mains on/off + 5 pots	£2
Universal Focus. Fits Pye, Thorn and Decca Units.	
T147 Rank tube base on panel	£1.00
Z718 Focus Unit	£1.50
T20 Focus Unit	£1.00
Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
K30 Tube base on panel	£1.00
TX10 Focus Units	£7.00
CVC 32 Focus Unit	75p
Fedility Focus Unit 14R-14S	30p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split	
Z718 Bush Focus	£2.00
Diode	50p
TV11	50p
Remo TV12SP	50p
1600 Thorn EHT Rec and Lead	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p

G7000 Philips Video Games Packs 11 types	£5
G11 drawer ASS 3 pots Mains switch and lead	£2.00
Line O/P panel GEC 2217/2218/2213/2214/2226/2227/2228	£10

CLOCK DISPLAY

4 SEG ACDM45	£1.00
4000 thick film	£2.00

DISPLAYS

4040 Clock	£1.00
7seg Red LED	50p
2 digit LED 8.8	50p
2 digit LED ÷1.8 with panel + MC14511	£1.00
4700/63	£1.50
250/64	10p

3300/70	50p
.1/100	5p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
2000/100	70p
4700/100	75p
47/160	10p
300 300/300V	80p
800/160	50p
.1/250 Pulse	5p
2.2 250v	10p
3n3/250 A.C.	10p
.33/250V	20p
.39/250V	15p
4n7/250 tested 5KV	25p
.91/250	35p
.91/400	30p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
GEC600/250	60p
700/250	£1
300+300 MFD 350v	£1.00
800/250	40p
32/300	20p
4/350	5p
8/350	8p
4.7M/350v	10p
33/350	20p
220/350	30p
300/350	40p
400/350	50p
10/375	10p
22/375	15p
220/385	75p
330/385 CVC 820HT	60p
0.1/400	15p
KT3 E/W .39/400	20p
.56K/400v	20p
4700pf/400	10p
.22/400	10p
8/400	15p
33/400	20p
400/400	40p
394K/400V	20p
220/450	40p
.47/500	25p
0.1/600	15p
0.1/1200V wire end	20p
0.1/450 A/C wire end	20p
.047/600	15p
0.047/1000	10p
0.01/1000	10p
0.1/1000	10p
.47/1000v	65p
.47/250V A.C.	10p
.001K/1250	10p
0.0047/1500	10p
.005/1500	10p
.0105/1500	10p
1n8/1500	15p
2n0/1500	10p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0.1/2KV	20p
10n/2KV	15p
3n9/2KV	15p
0.0015/2KV	10p
5n2/2KV	10p
6n2/2KV	15p
2n0/2KV	15p
2n2/2KV	15p
7500pf/2KV	10p
3000PF/3000V	10p
4n7/2KV	15p
8n2/2KV	15p
0.0082/2500	15p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
.47/100V	80p

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

Tube Thermpath 167	£1.00
Rank Secam Decoder Panel UHF & VHF T115A	£13.00

NEW GRUNDIG SPARE PANELS

Set No. SC4127; SC4337; SC6227; SC6237

GRUNDIG MODULE TYPES

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

From £3 to £8

Multi-Caps

4,700/75 6 amp Rip	£2.00
350V 300M + 300M	£1.00
400V 400M	60p
350V 400M	60p
Thorn 3500	
175/100/100/350v	£1.00
KT3/200/25/25/385v	£1.00
300+300+150+100+50MFD 350V	£2
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
150/200/200/300v	70p
400/400/200v	£1.70
300/100/100/16/275v	£1.50
100/200/325v	40p
150/150/100/375v	£1.50
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
Jelly pot Thorn 00D4013	£3
150/150/100/100/320v	£2.00
100/350 + 300/200/100/16/275v	£2.00
225+25/380 GEC	70p
200/100/100/350v	£1.50
500/500/25v	50p
150/150/100/300v	75p
200/150/150/300v	1.00

ITT Panels

CVC 40/2 Chassis, new £30, complete with intrfase panel	
CVC 820 Line O/P Panel	
CVC20 Mains Panel	£3.00
ITT 8 & 6 Push Button Unit	£1.00
CVC40/2 New Chroma Panel	£10.00
CMA 10	£2.00
CMA 11	£2.00
CMA 30	£2.00
CMA 40	£1.50
CMC 10/2	£5.00
CMC 16	£4.00
CMC 38	£8.00
CMC 45	£1.50
CMC 47	£1.00
CMC 52	£15
CMC 57	£6.00
CMC 58	£8.00
CMC 59	£8.00
CMC 67	£3.75
CMC 67/2	£4.00
CMC 68	£4.00
CMD 12	£10
CMD 32	£5.00
CMD 33	£5.00
CMD 40	£5.00
CMD 41	£5.00
CMD 800	£10.00
CMF 25	£2.00
CMF 26	£2.00
CMF 40	£2.00
CMH 10	£1.50
CMH 31	£1.00
CMK 12 (untested)	£4.00
CMK 30 (untested)	£4.00
CMN 20	£1.50
CMN 21	£1.50
CMN 40	£1.00
CMN 45	25p
CMP 10	£2.00
CMP 11	£4.00
CMP 40	£2.00
CMS 11	£2.00
CMS 40	£2.00
CMU 12	£10.00
CMU 14	£8.00
CMU 30	£7.00
CMU 45	£7.00
CMZ 30	£5.00
GMA 90	£5.00
GMC 120	£2.50
GMR 64	£5.00
TMN 2	£2.00
VCA 20	£10
VCA 21	£10.00
VMC 26	£3.00
VMC 34	£5.00
VMC 44 + 45	£4.00
VMC 51	£5.00

Hand Sets

G11 Ultrasonic Teletex Handset	£24.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£24.00
Rank. Infra-red	£10.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
G11. Full remote top button assy.	£12.00
G11. Full remote repair service (exchange unit)	£12.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
Philips Key Pad set KT3/K30	£3.00
KT3/K30 T/Text	£15.00
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
Hitachi 8 button unit with resistor unit. Last year mod.	£7.00
GEC infra-red 2236-2026	£4.00
GEC push pad hand set button blobs	10p each
Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177. **Special Price**	£13.00
ITT Hand Set with TV-Teletex-VCR	£12.00
RC4001	£17.00
Philips Tops for Teletext & Full Remote KT3-K30	£9.75