CHARLESTON X

$1·74

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TELEVISION

SERVICING·VIDEO·CONSTRUCTION·DEVELOPMENTS

TV RECEPTION AT 11.6 GHz

LOPT TRANSPLANT

TESTS ON THE G11 CHASSIS

FAULT REPORT

SERVICING VCR SERVO SYSTEMS

PHD COMPONENTS

RADIO & TV COMPONENT DISTRIBUTORS
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SEMICONDUCTORS

AA113	0.16
AA116	0.16
AA117	0.16
AA119	0.16
OA91	0.12
OA95	0.12
OA202	0.18
BA100	0.18
BA102	0.10
BA130	0.15
BA154	0.10
BA155	0.20
BA164	0.12
BAX13	0.16
BAX16	0.08
BAY38	0.16
BY206	0.20
IN4148	0.04
BY126	0.20
BY127	0.15
BY133	0.22
BY164	0.50
SKB2/08	1.00
BY238	0.15
BYX10	0.18
IN4001	0.10
IN4002	0.10
IN4003	0.12
IN4004	0.12
IN4005	0.12
IN4006	0.14
IN4007	0.16
IN5407	0.33
BR100	0.30
BR101	0.60
BRY39	0.60
TIC1160N	1.50
BT119	2.00
BT120	2.00
BYX/71/600	0.80
2N444	1.50
TV106/2	1.50
BYX88 2V7	0.10
BZY88 3VO	0.10
BZY88 3V3	0.10
BZY88 3V6	0.10
BZY88 3V9	0.10
BZY88 4V3	0.10
BZY88 4V7	0.10
BZY88 5V1	0.10
BZY88 5V6	0.10
BZY88 6V2	0.10
BZY88 6V8	0.10
BZY88 7V5	0.10
BZY88 8V2	0.10
BZY88 9V1	0.10
BZY88 10V	0.10
BZY88 11V	0.10
BZY88 12V	0.10
BZY88 13V	0.10
BZY88 15V	0.10
BZY88 18V	0.10
BZY88 20V	0.10
BZY88 22V	0.10
BZY88 27V	0.10
BZY88 33V	0.10
BZX61 7V5	0.20
BZX61 8V2	0.20
BZX61 9V1	0.20
BZX61 10V	0.20
BZX61 11V	0.20
BZX61 12V	0.20
BZX61 13V	0.20
BZX61 15V	0.20
BZX61 16V	0.20
BZX61 18V	0.20
BZX61 20V	0.20
BZX61 22V	0.20
BZX61 24V	0.20
BZX61 27V	0.20
BZX61 30V	0.20
BZX61 33V	0.20
BZX61 36V	0.20
BZX61 39V	0.20
BZX61 47V	0.20
BZX61 72V	0.20
AC107	0.35
AC127	0.50
AC127/01	0.60
AC128	0.60
AC128/01	0.60
AC141	0.50
AC141K	0.60
AC142	0.40
AC142K	0.60
AC176	0.60
AC176/01	0.60
AC186	0.40
AC187	0.40
AC187K	0.60
AC188	0.40
AC188K	0.60
AD140	1.50
AD142	1.50
AD143	1.50
AD145	1.50
AD149	1.00
AD161/2	1.50
AD162	0.70
AD262	1.50
AF121	0.60
AF124	0.60
AF125	0.60
AF126	0.60
AF127	0.60
AF139	0.60
AF239	1.00
AL102	3.00
AU107	3.00
AU110	3.00

AU113	3.00
AL103	3.00
AY102	3.00
BC107	0.20
BC108	0.20
BC109	0.20
BC113	0.15
BC114	0.15
BC115	0.20
BC116	0.20
BC117	0.20
BC118	0.20
BC119	0.50
BC125	0.20
BC126	0.20
BC136	0.20
BC137	0.20
BC138	0.40
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BC177	0.20
BC178	0.20
BC179	0.20
BC182L	0.15
BC183L	0.15
BC184L	0.15
BC184LC	0.15
BC186	0.30
BC187	0.30
BC203	0.15
BC204	0.15
BC205	0.15
BC206	0.15
BC207	0.15
BC208	0.15
BC209	0.15
BC212L	0.15
BC213L	0.15
BC214L	0.15
BC225	0.40
BC237	0.15
BC238	0.15
BC251A	0.15
BC301	0.40
BC303	0.40
BC307	0.15
BC308	0.15
BC327	0.15
BC328	0.15
BC337	0.15
BC338	0.15
BC547	0.15
BC141-10	0.80
BD115	0.50
BD124	1.80
BD131	0.70
BD132	0.60
BD133	0.70
BD134	0.70
BD144	2.50
BD159	0.80
BD238	0.50
BD380	0.70
BD441	0.70
BD537	0.70
BD538	0.70
BD507	0.70
BD508	0.75
16181	1.20
16182	1.20
BD709	1.00
BD710	1.00
BD442	0.70
BD379	0.50
BF115	0.60
BF118	0.60
BF152	0.40
BF154	0.20
BF157	0.70
BF158	0.40
BF160	0.60
BF163	0.60
BF167	0.50
BF173	0.50
BF177	0.50
BF179	0.50
BF180	0.50
BF181	0.60
BF182	0.50
BF183	0.50
BF184	0.50
BF185	0.50
BF194	0.20
BF195	0.20
BF196	0.20
BF197	0.20
BF198	0.15
BF199	0.15
BF200	0.15
BF224	0.15
BF240	0.45
BF241	0.20
BF256LC	0.50
BF257	0.50
BF258	0.50
BF271	0.60

BF273	0.20
BF274	0.25
BF336	0.50
BF337	0.50
BF338	0.50
BF355	0.80
BF458	1.00
BF459	1.00
BFT43	0.50
BFX29	0.50
BFX84	0.50
BFX88	0.50
BFX89	0.50
BFY50	0.50
BFY51	0.50
BFY52	0.50
BFY90	1.20
BF381	0.50
BFR39	0.30
BFR79	0.30
BFR81	0.30
BFR89	0.50
BF259	0.25
BDX32	2.50
BU206	1.60
BU208/02	2.80
BU326S	1.00
BU406	2.00
BU406D	2.50
BU407	1.70
BU407D	2.50
R2008B	2.50
R2010B	2.50
R2540	3.00
ME0402	0.20
ME0412	0.20
ME4003	0.15
ME6002	0.20
ME8001	0.20
MJE2955	1.50
MJE3005	1.30
MP8113	1.00
MPSU05	1.20
MPSU55	1.20
TIP2955	1.30
TIP3055	1.30
TIS90M	0.30
2N2904	0.50
2N2905A	0.50
2N2905	0.50
2N3053	0.50
2N3703	0.20
2N3075	0.20
2N3710	0.20
2N3055H	0.60
TAA350	0.80
TAA550	0.50
TAA570	1.80
TAA611	1.75
TAA630S	2.50
TAA661B	2.00
SN76540N	1.50
TAD100	2.00
TBA120AS	0.75
TBA231	1.20
TBA480Q	2.20
TBA520Q	2.00
TBA530	2.00
TBA530Q	2.00
TBA540	2.20
TBA540Q	2.20
TBA550	3.00
TBA550Q	3.00
TBA560C	2.20
TBA560CQ	2.20
TBA570	2.50
TBA570Q	2.50
TBA641BX	3.00
TBA641B11	4.00
TBA651	3.00
TBA720A	1.50
TBA730	1.50
TBA750	2.00
TBA750Q	2.00
TBA800	1.00
TBA810S	1.50
TBA820	1.50
TBA920	2.00
TBA920Q	2.00
TBA990	2.00
TBA990Q	2.00
TCA2205A	3.00
TCA900	1.00
TCA940	2.00
TDA1170	2.00
TDA1200	3.00
TDA1270	4.00
TDA1412	1.00
TDA2020	4.00
SN76115N	2.00
SN76227N	1.20
SN76530P	1.00
SN76651N	1.50
SN76003N	3.00
SN76013N	2.00
SN76013NO	2.00
SN76013ND	2.00
SN76023N	2.00
SN76023ND	1.00
SN76033N	2.00
SN76110N	2.00
SN76226DN	2.00
SN76227N	1.20
SN76532N	2.00
SN76533N	2.00
SN76544N	2.00
SN766504	1.00
SN76665N	1.50
SN76666N	1.20
SL901B	6.00
SL917B	8.00

TBA396Q	2.00
TDA440	2.50
SN76001N	1.50
TBA520	2.00
TBA120S	1.00
TBA396	2.00
TCA270SQ	2.00
TDA2030	8.00
TDA2140	6.00
TDA2150	6.00
TDA2160	6.00
TDA1230	3.00
TDA3089	2.00
TDA1054M	2.00
MC1349P	1.50
SAA651	0.60
SAS560S	2.00
SAS570S	2.00
SN7400N	0.40
SN7413N	0.90
SN74122N	1.00
SN74141N	1.00
TBA395	1.80
TBA395Q	1.80
TBA950	4.00
TCA800	4.00
TCA800Q	4.00
TDA1180	3.00
TDA1190	3.30
TDA2002H	3.60
TDA2590Q	5.00
TDA2600	5.00
TDA2640	3.30
TDA3950	3.00
TAA621 AX1	3.30
TBA625X5	2.00
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We can often supply equivalents to transistors & I.C's not listed. Free list on request with any order.

VALVES

DY/86/87	1.87
DY802	1.86
ECC82	1.40
ECC84	1.20
ECH83	1.10
ECH84	1.10
ECL80	1.10
ECL82	1.10
ECL86	1.10
EF80	1.10
EF95	1.50
EF183	1.70
EF184	1.60
EL34	3.00
EL84	2.00
GY501	3.00
PC97	1.50
PC900	1.50
PCF80	1.74
PCF802	1.60
PCF806	1.10
PCL82	2.51
PCL84	1.80
PCL85/805	2.91
PCL86	2.91
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PFL200	3.61
PL36	2.60
PL81	1.50
PL504	3.75
PL508	3.80
PL509	6.03
PL519	7.22
PL802	4.81
PY88	1.70
PY500A	3.51
PY800/801	2.28
UCL82	1.10
30FL2/1	1.40
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PCF808	1.20

VALVES NOT SHOWN HERE MAY BE IN STOCK. PLEASE WRITE FOR QUOTE.

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VA 1104 Thermister	0.80
Transductor TCE 3000	1.50
AEG Tuner (Repl Elc 1043/06)	9.00
Aerial Isolator Kit	1.60
Philips G8 Lopt	12.00
PYE 691/697 Lopt	11.00
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EHT MULTIPLIERS

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TCE950/1400 Tripler	5.04
TCE1400 (Piped System Only)	4.56
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TCE1500 Tripler	4.64
TCE1600 1/2 Wave	3.95
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DECCA CS 1910/2213 Tripler	6.67
DECCA 30 Series Tripler	6.01
DECCA 80 Series Tripler	6.43
DECCA 100 Series Tripler	6.68
GEC Hybrid 2028 Tripler	6.43
GEC 2110 Tripler Pre JAN77	7.21
GEC 2110 Tripler Post JAN77	6.43
ITT CVC 5/8/9 Tripler	6.51
ITT CVC 20/25/30	6.45
Philips 520 Tripler	6.51
Philips 550 Tripler	6.42
Philips G9 Tripler	6.63
PYE 691/693/697 Tripler	6.68
RRI 823 Tripler	5.48
RRI Z179/823	6.68
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TCE 9000 Tripler	7.28
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GEC 200 200 150 50/350	3.00
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GEC Philips G8 600/300	2.50
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RRI 300 · 300/300	2.50
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TCE 1500 150 150 100	2.10
TCE 3000/3500 175/400 · 100 · 100/350	2.70
TCE 3000/3500 600/70	1.00
TCE 3000/3500 220/100	0.70
TCE 8000/8500 2500-2500/63	1.50
TCE 8000/8500 700/200	1.00
TCE 8000/8500 400/350	1.00
TCE 9000 400/400	3.00
TCE 9500 220/400	2.20

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TCE 140 12R · 16, IK7 · 116 · 462, 126	1.16
TCE 1500 350 · 20, 128, IK5, 317	1.10
TCE 1600 18 Thermal Link 320 · 70, 39	1.10
TCE 3000/3500	0.80
TCE 8000/8000A 56 · 1K, 47, 12 5R · 1R · 100R	1.00
Philips G8 2.2 · 68	0.90
Philips G8 47	0.80
Philips 210 30 · 125, 2K85	0.70
Philips 210 118 · 118 · 148 (Link)	0.65
RRI 154 · 50 · 16 94	0.60
RRI A640 250 · 14 · 156	0.80
GEC 27840 10 · 15 · 19 · 10 · 63 · 188	1.00
GEC 2000	0.80
PYE 731, 735 36 · 27	1.00
PYE 11009 60 · 70 · 173 · 26 · 16 · 17 · 19	1.00
RRI823 56R · 68R	0.80

CONNECTORS

Sets of AVO Leads	10.00
Plug 13A (Box of 20)	8.00
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6DB Attenuator	1.00
12DB Attenuator	1.00
18DB Attenuator	1.00
Back to Back Coax	0.40

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Silicone Grease	1.20
Plastic Seal	1.20
Aeroklene	1.20
Freezit	1.20
Antistatic	1.20
Solder 18 SWG 60/40 .5 KGM	10.00
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SR3AS Mini Silver	7.00
SR3A Mini Orange	6.80
Replacement Nozzles	0.80
Replacement Washers	0.19
Solder Mop Red	0.60
Solder Mop Brown	0.60
Side Cutters ORYX	3.20
TVTY 80/80 Transistor EQV A-Z or 2N	5.00 each
Books PR	9.00 PF

TELEVISION

September 1982

Vol. 32, No. 11
Issue 383

this month

OUR NEXT ISSUE DATED OCTOBER WILL BE PUBLISHED ON SEPTEMBER 22

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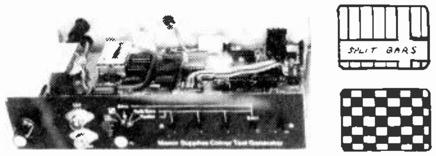
MANOR SUPPLIES

NEW MKV CHEQUERBOARD & PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE



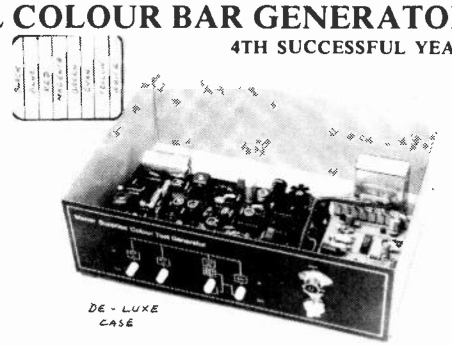
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
-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

Price of Kit	**£80.50**
Standard Case ($10\frac{1}{2}'' \times 6\frac{1}{2}'' \times 2\frac{1}{2}''$)	**£5.50**
De Luxe Case ($10'' \times 6'' \times 2\frac{1}{4}''$)	**£8.50**
Optional Sound Module (6MHz or 5.5MHz)	**£4.50**
Built & Tested in De Luxe Case including Sound Module	**£115.00**

Post/Packing £2.00.
All above prices include VAT 15%

PAL COLOUR BAR GENERATOR (Mk 4)

4TH SUCCESSFUL YEAR



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

PRICE OF MK4 COLOUR BAR & CROSS HATCH KIT £40.25 P&P £1.20. DE-LUXE CASE £5.95. ALUMINIUM CASE £3.30, P&P £1.20, BATT HOLDERS £1.70 P&P 85p, ALTERNATIVE STAB. MAINS SUPPLY KIT £5.55 (Combined P&P £1.80).

MK 4 DE LUXE (BATTERY) BUILT & TESTED £66.70 + £1.80 P & P.
MK 4 DE LUXE (MAINS) BUILT & TESTED £80.50 + £1.80 P & P.
VHF MODULATOR (CHI to 4) FOR OVERSEAS £4.60.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

(ALL PRICES INCLUDE 15% VAT)

MANOR SUPPLIES TELETEXT ADAPTOR KITS

MK 1 (Texas XMII) Cable remote control **£170.20** p.p. £2.80
MK 2 (Philips/Mullard) Infra-red remote control **£227.70** p.p. £2.80.
Further details on request.

Goods available if in stock immediately over shop counter (Mail order between 3 days and 2 weeks

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS
Large selection tested colour panels for popular models.

SPECIAL OFFER Leading makers Tuner-Timer in De Luxe Case. 12 station touch tune UHF-VHF + IF amp. Video Audio Outputs, Digital Clock etc. Less than half original trade price **£74.75** p-p £3.50.

TELEVISION MAGAZINE PROJECT PARTS
NEW COLOUR PORTABLE TV
TV PATTERN GENERATOR — SMALL SCREEN MONITOR
MONO PORTABLE TV — LARGE SCREEN COLOUR TV
PHONE, CALL, OR SEND FOR LISTS
WORKING MODELS & PANEL TEST SERVICE AT
172 WEST END LANE.

TV SOUND IF PANELS, FULLY TESTED **£7.82** p.p. £1.00.
SAW FILTER IF AMPLIFIER PLUS TUNER COMPLETE AND tested for T.V. SOUND & VISION **£32.80** p.p. £1.20 (SUITABLE FOR USE WITH TELEVISION SIGNAL BOARDS).
SPECIAL OFFER TEXAS XMII TELETEXT MODULE NEW & TESTED, AT REDUCED PRICE **£57.50** p.p. £1.60.
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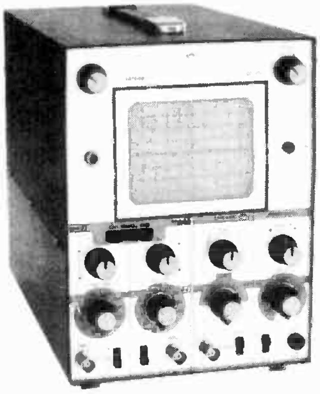

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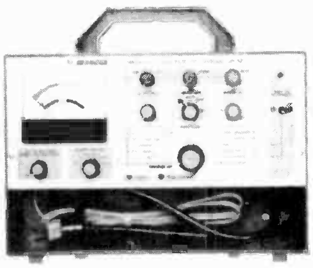

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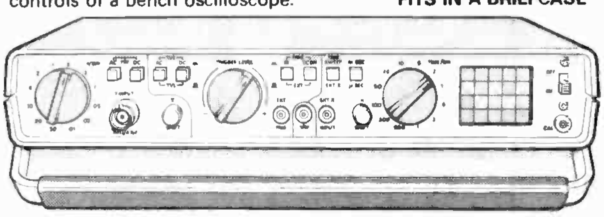

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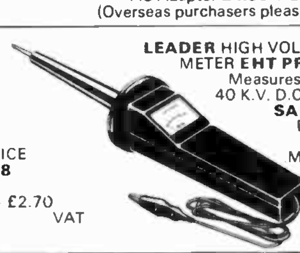

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7812	78	7912	98
7815	78	7915	98
7818	78	7918	98
7824	78	7924	98
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78L08	68	79L12	72
78L12	68	79L15	72
78L24	68	79L24	72

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74LS02	19
74LS03	19
74LS04	20
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74LS09	19
74LS10	19
74LS11	19
74LS13	37
74LS14	46
74LS15	19
74LS20	19
74LS21	19
74LS22	19
74LS26	19
74LS27	19
74LS30	19
74LS32	20
74LS37	19
74LS38	20
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74LS51	19
74LS54	19
74LS55	19
74LS73	28
74LS74	26
74LS75	46
74LS76	22
74LS78	22
74LS83A	60
74LS86	26
74LS85	62
74LS90	35
74LS92	35
74LS93	35
74LS107	46
74LS109	27
74LS112	27
74LS113	27
74LS114	27
74LS123	52
74LS125	46
74LS126	46
74LS132	46
74LS138	48
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74LS151	44
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74LS161	60
74LS162	85
74LS163	60
74LS164	65
74LS165	65
74LS174	57
74LS175	47
74LS191	66
74LS192	65
74LS193	66
74LS194A	69
74LS197	80
74LS240	80
74LS241	80
74LS242	76
74LS243	76
74LS244	80
74LS245	1.18
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74LS253	1.00
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74LS258	67
74LS259	74
74LS273	80
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74LS353	1.10
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4001B	21
4002B	21
4008B	72
4011B	21
4012B	21
4013B	30
4014B	74
4015B	76
4016B	31
4017B	66
4018B	72
4020B	76
4021B	70
4022B	70
4023B	21
4024B	50
4025B	21
4027B	39
4028B	64
4029B	90
4032B	1.04
4035B	80
4038B	99
4040B	72
4042B	58
4043B	71
4044B	71
4046B	96
4047B	70
4049UB	32
4050B	32
4051B	72
4052B	72
4053B	72
4060B	96
4066B	43
4068B	22
4069B	22
4070B	22
4071B	22
4072B	22
4073B	22
4075B	22
4076B	80
4077B	22
4078B	22
4081B	22
4093B	43
4094B	1.56
4099B	1.20
4160B	72
4161B	72
4162B	72
4163B	72
4502B	72
4505B	1.88
4510B	76
4511B	76
4512B	72
4513B	1.68
4514B	1.88
4515B	1.88
4516B	76
4518B	76
4519B	64
4520B	76
4521B	1.68
4522B	88
4526B	88
4527B	1.20
4528B	88
4529B	1.04
4530B	62
4531B	72
4532B	1.00
4536B	2.64
4538B	1.04
4539B	77
4541B	96
4543B	1.12
4551B	96
4553B	2.40
4554B	1.20
4556B	48
4560B	1.76
4561B	74
4566B	1.20
4580B	3.60
4581B	1.84
4582B	80
4583B	1.00
4584B	40
4585B	88
4597B	1.84
4598B	2.40
4599B	2.00

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AC107	35
AC126	22
AC127	22
AC128	20
AC128K	32
AC141K	34
AC142K	30
AC176	25
AC176K	32
AC186	41
AC187	26
AC187K	28
AC188	25
AC188K	37
AD143	82
AD149	79
AD161	42
AD161/2	1.15
AD162	42
AF106	49
AF114	89
AF118	62
AF121	56
AF124	34
AF125	35
AF126	34
AF127	32
AF139	42
AF178	1.54
AF239	45
AF279	97
AL102	2.00
AU106	2.50
AU107	2.00
AU110	2.00
AU113	1.40
BC107	20
BC107A	20
BC107B	20
BC108	20
BC108A	20
BC108B	20
BC108C	20
BC109	20
BC109B	20
BC109C	20
BC114	12
BC115	17
BC116A	12
BC117	20
BC118	24
BC119	36
BC139	26
BC140	32
BC141	26
BC142	21
BC143	24
BC147	9
BC148	9
BC149	10
BC157	11
BC158	10
BC159	10
BC160	25
BC161	28
BC170B	15
BC171	9
BC171A	10
BC171B	10
BC172	9
BC172B	10
BC172C	10
BC173C	12
BC174A/B	10
BC177	27
BC178	26
BC182	9
BC182LB	10
BC183LB	10
BC184L/B/C	10
BC204	10
BC208	13
BC209	10
BC212	9
BC212L	9
BC213	9
BC213B	10
BC213L	9
BC214	9
BC214L	10
BC237B	12
BC238A/B/C	8
BC251A	12
BC252A	12
BC252B	12
BC261A	18
BC261B	15
BC262A	15
BC262B	15
BC300	33
BC301	28
BC303	28
BC307	10
BC308A/B	17
BC327	11
BC328	9
BC337	11
BC338	9
BC461	30
BC547	10
BC548	10
BC549	8
BC550	7
BC557	8
BC558	9
BCX34	27
BCY72	13
BD115	32
BD116A	65
BD124P	60
BD131	33
BD132	35
BD133	40
BD135	26
BD136	27
BD137	26
BD138	23
BD139	28
BD140	31
BD144	1.20
BD159	65
BD160	1.30
BD166	52
BD179	52
BD182	72
BD183	75
BD201	85
BD202	80
BD203	80
BD204	84
BD222	46
BD223	56
BD225	47
BD232	45
BD233	35
BD234	37
BD235	33
BD236	40
BD237	33
BD238	35
BD410	55
BD434	55
BD437	86
BD438	94
BD507	52
BD508	55
BD509	56
BD510	60
BD517	60
BD520	75
BD526	62
BD696A	1.49
BDX32	1.50
BF115	35
BF117	36
BF125	26
BF127	26
BF154	12
BF158	18
BF160	27
BF167	24
BF173	22
BF177	35
BF178	26
BF179	28
BF180	36
BF181	36
BF182	30
BF183	29
BF184	30
BF185	30
BF194/394	11
BF195	11
BF196	10
BF197	11
BF198	18
BF199	15
BF200	30
BF224	18
BF225	20
BF241	15
BF256LC	28
BF256	28
BF257	28
BF258	25
BF259	24
BF262	84
BF263	50
BF271	24
BF273	12
BF274	24
BF310	30
BF311	30
BF336	36
BF337	30
BF338	34
BF355	37
BF362	37
BF363	33
BF371	30
BF457	35
BF458	28
BF459	35
BFR39	27
BFR90	1.74
BFT42	28
BFT43	28
BFW10	60
BFX29	30
BFX84	27
BFX85	28
BFX86	30
BFX88	25
BFY50	20
BFY51	22
BFY52	20
BFY90	75
BR100	17
BR101	30
BR103	59
BRC4443	80
BRX46	40
BRY39	30
BRY56	57
BT100/02	92
BT101	1.20
BT102/500R	1.20
BT106	1.00
BT107	1.69
BT108	1.69
BT116	1.21
BT119	3.66
BT120	3.66
BT151/800R	1.20
BU104	2.00
BU105	1.25
BU108	1.80
BU124	1.30
BU126	1.49
BU204	1.50
BU205	1.34
BU206	1.80
BU208	1.60
BU208A	1.65
BU208/02	2.10
BU326A	1.42
BU407	1.25
BU500	1.95
BU526	2.46
BU807	2.94
BUW81A	3.84
E1222	28
MJE340	40
OT112	1.91
OT121	1.91
SW150	3.90
SW153A	2.74
BU105/02	1.58
OC71	27
DC79	20
R2008B	1.80
R2010B	1.80
R2265	1.40
R2322	58
R2323	67
R2461	1.50
R2540	2.80
RCA16334	90
RCA16335	80
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP41C	46
TIP42C	47
TIP47	70
TIP120	65
TIP2955	90
TIP3055	63
TIS91	21
TV106/02	1.55
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	60
2N3702	11
2N3703	10
2N3705	10
2N3706	10
2N3708	17
2N2904	30
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.50
2SC1096	1.72
2SC1172Y	2.20
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73

I.C. SOCKETS

DIL to DIL

8 way	22
14 way	29
16 way	32
18 way	32
20 way	32
22 way	34
24 way	36

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

CERAMIC FILTERS

6Mhz	74
5.5Mhz	74

THERMISTORS

VA1104	75
VA1040	
VA8650	55
VA1039	35
GEC Dual Posistor	1.50
GEC Dual 2040 (CK1)	1.50

CRYSTALS

4.3Mhz	1.30
8.8Mhz	1.30
10.692Mhz	6.00

NEW VALVES

30FL2	1.60
DY802	72
DY86/7	66
ECC81	60
ECC82	68
ECC83	60
ECC84	80
ECC85	98
ECC88	1.35
ECF80	80
ECF82	88
ECF86	1.50
ECH81	1.04
ECH84	1.13
ECL80	84
ECL82	77
ECL86	84
EF80	68
EF85	68
EF86	1.19
EF89	1.43
EF183	68
EF184	68
EH90	1.02
EL34	3.50
EL81	2.05
EL84	68
EL90	82
EL509	4.50
EY86/7	68
EY500A	1.50
EZ80/1	56
GY501	1.45
GZ34	1.56
KT66	7.00
KT88	8.00
PC86	81
PC88	81
PC92	90
PC97	1.14
PC900	80
PCC84	70
PCC85	85
PCC88	82
PCC89	79
PCC189	1.02
PCC805	1.40
PCF80	75
PCF86	1.13
PCF200	1.35
PCF800	1.38
PCF801	1.13
PCF802	86
PCF805	1.80
PCF806	1.30
PCF808	1.63
PCH200	1.45
PCL82	78
PCL84	81
PCL85/805	90
PCL86	81
PD500	2.93
PFL200	1.35
PL36	1.15
PL81	94
PL82	46
PL83	1.43
PL84	84
PL95	1.00
PL504	1.50
PL508	2.90
PL509/19	4.50
PL802	3.25
PY33	61
PY88	81
PY500A	1.90
PY800/1	69
UCF80	67
UCH81	1.43
UCL82	84
UCL83	94
UL84	1.02
U26	1.30
U191	95
6F23	85
UY85	80
PL802T	3.00
40KD6	4.50
21LU8	3.00
17DW4A	1.60
3AT2B	2.25
12BY7A	3.75

LINE OUTPUT TRANS.

R.B.M. T20A	13.95
R.B.M. A774 Mono	11.74
R.B.M. Z179	15.00
R.B.M. Z718 22"	23.00
PHILIPS 320	8.70
PHILIPS 210/300 Mono	10.00
PHILIPS G8	8.75
PHILIPS G9	7.75
PHILIPS G11	13.50
PYE 691/3	17.75
PYE 697 (Printed)	14.50
PYE 713	10.00
PYE 731	10.00
PYE 725 90°	10.50
PYE 169	10.00
DECCA 80	8.58
DECCA 100	8.58
DECCA 1700	9.00
DECCA 1730	8.58
DECCA 2230	8.58
GEC 2110	9.45
GEC 2040	9.50
GEC 2200	6.65
ITT CVC 1-9	9.60
ITT CVC 25/30/32	8.00
ITT CVC 20	7.75
THORN 3000 EHT	6.90
THORN 3000 SCAN	6.90
THORN 8000	11.33
THORN 8500	11.33
THORN9000	10.65
THORN 3000/3500 Mains	10.00
THORN 1591	8.68
THORN 1691	9.68
THORN 9800	18.00
THORN TX10	12.50

L.E.D.'s

5mm T1 ¾ PACKAGE

Red	12
Green	14
Yellow	14
Amber	22

T1 PACKAGE 3mm

Red	12
Green	14
Yellow	14

FLASHING L.E.D.

CQX21	62
CQX22	66

RED ONLY

THREE COLOUR L.E.D.

3 Colour options Red/Green/Yellow V518P 76

PANEL CLIPS

For stnd. range L.E.O. as above

3mm	4
5mm	4

REBUILT COLOUR TUBES

ALL AVAILABLE EX-STOCK ON GLASS FOR GLASS EXCHANGE BASIS FROM TRADE COUNTER

17" A44/271X	30.00
18" A47/343X (Stnd Focus)	30.00
18" A47/342X (Low Focus)	30.00
19" A49/120X	30.00
20" A51/110X	30.00
22" A56/120X	30.00
22" A55/14X	30.00
25" A63/200X	34.00
26" A66/120X	34.00
26" A67/120X	34.00
22" A56/140X (400) 110°	50.00
26" A66/140X (410) 110°	50.00
26" A51/161X	50.00
22" A56/510X	50.00

P.I.L. TUBES – we can rebuild your own glass – please ring for quotes.

NB Mail Order supplies of tubes. We will send 12" + 14" portable for £5 **carriage.** For 20" + 24" Mono and **all** Colour tubes please ring for quotes on next day delivery service and quotes for the return of old glass. Certain tube types can be supplied without a glass exchange with a basic glass charge incurred. Please ask – we will try to help.

*CARBON RESISTORS

¼W	3R3-8M2	20	pkt.
⅓W	3R3-8M2	20	10
1W	10R-10M	36	per
2W	10R-10M	62	type

WIREWOUND RESISTORS*

(Preferred Values)*

4W	1R-10K	20p each
7W	1R-22K	21p each
11W	1R-22K	24p each
17W	1R-22K	28p each

MULLARD COLOUREX/NEW LIFE

18" A47/343X	59.00
19" A49/120X	53.00
20" A51/110X	53.00
22" A56/120X	43.00
25" A63/200X	55.00
26" A66/120X	53.00
26" A67/120X	53.00

SPECIFIC COMPONENTS

PHILIPS

G8 Knobs S	50
E.W. Correction Coil G11	1.95
Transductor 90°	2.60

THORN

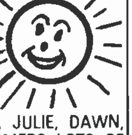
1591 Speakers Sm	3.45
Lg	3.95
1500 Frame Hold 390K	32
1500 Line Hold 470K	32
1500 Contrast 1K5	32
Focus Control Thorn/GEC	1.83

DECCA 100

Bridge Transformer	97
30 Series Width Control	50
3R9 Modulohm	60
Height Control 2M2	25
RR1 T.20 Focus Control	2.20

SOLDERING EQUIPMENT

Solder Iron Stands	2.50
WELLER Iron 15W	4.31
WELLER Iron 25W	4.31
WELLER 3/16" Single Flat Tip	51
MIN Soldering Iron	5.00
WELLER Heat Gun	11.75
(Pair) Tips for Gun	42
WELLER Cordless Iron	24.78
ANTEX Soldering Iron 25W	5.20
Solder Remover Sucker	6.50
Solda Mop	72
500G Reel Solder	7.00
DIY Type Solder	43
250G Solder	3.50



SHEILA AND ALL THE GIRLS, SUSAN, CHRISTINE, ANNE, JANET, JULIE, DAWN, DAWN II, SEND ALL THEIR CUSTOMERS LOTS OF SUNSHINE – WATCH OUT FOR PHOTO!

NEW MONO TUBES

MULLARD A31/510 110° 12"	18.50
MULLARD A34/510 110° 14"	20.00
A50/120WR 20"	14.50
A61/120WR 24"	16.90
VEGA 12" 90° (Japanese Types)	15.00
CME1520 (15" Mono)	15.00

P. V. TUBES

REPLACEMENT ELECTROLYTICS

PYE 169 (200/200/100/32)	2.12
PHILIPS 320 (400/400/200V)	2.07
DECCA 30 (400/400/350V)	2.96
DECCA 80 (400/350V)	3.15
DECCA 100 (800/250V)	3.15
DECCA 1700 (200/200/400/350V)	4.83
PHILIPS G8 (600/300V)	2.21
PHILIPS G9 (600/300V)	2.21
PHILIPS G11 (470/250V)	2.90
PYE 691/7 (200/300/350V)	2.39
PYE 731 (600/300V)	2.31
RBM A823 (2500/2500/30V)	1.26
RBM A823 (600/300V)	2.30
RBM Z146 (300/300/350V)	3.15
RR1 T20A (220/400V)	2.00
ITT CVC5/9 (200/200/75/25)	2.47
ITT CVC 20 (220/400V)	2.00
GEC 2110 (600/250V)	1.94
GEC 2040 (1000/2000/35V)	1.19
GEC 2040 (300/300/150/100/50)	4.10
THORN 3500 (400/40V)	30
THORN 950 (100/300/100/16/275V)	1.83
THORN 140 (150/100/100/100/150/320V)	2.79
THORN 1500 (150/150/100/300V)	2.01
THORN 1500 (12/300V)	31
THORN 3500 (175/100/100/400/350V)	2.46
THORN 3500 (1000/63V)	65
THORN 3500 (1000/70V)	84
THORN 8000/8500 (2500/2500/63V)	1.54
THORN 8000/8500 (700/250V)	2.31
THORN 8000/8500 (400/350V)	2.56
THORN 9000 (400/400V)	3.05
GEC (200/200/150/50)	2.64
PHILIPS 69 2200/63V	1.25

CAPACITORS AXIAL

Volts	Mfd	Price
6V3	33	9
10V	22	8
	47	8
	100	10
	220	12
	470	20
16V	33	11
	68	11
	220	14
	1000	20
	3300	53
25V	10	8
	22	8
	47	10
	100	12
	220	19
	470	24
	1000	38
	2200	48
	4700	80
40V	10	10
	22	10
	400	30
63V	1	8
	2.2	8
	4.7	8
	10	10
	15	12
	22	10
	47	18
	100	20
	220	32
	470	40
	1000	56
	2200	85
100V	10	13
	22	15
	47	20
	100	29
	220	35
450	1	25
	4.7	30
	10	30
	22	58
	33	64
500	1	32
	10	32
600	1	35

MIXED DIELECTRIC CAPS

Volts D.C.		
250V	0.91mF	84
400V	0.22mF	20
600V	0.1mF	38
1000V	0.01mF	20
	0.047mF	29
	0.033mF	31
	0.1mF	32
	0.22mF	48
	0.47mF	75
1250V	0.1mF	45
	0.91mF	85
1500V	0.0022mF	19
	0.0047mF	20
	0.022mF	24
	0.033mF	59
	0.005mF	60
2000V	0.0052mF	70

CERAMIC CAPACITORS

63V A range of pref. values each 22pF-4700pF 6p

ELECTRONIC TUNERS AND ASSEMBLIES

Mullard ELC1043/05	7.60
Mullard ELC1043/06	7.60
4 P/B DECCA/GEC/ITT	5.80
6 P/B DECCA/GEC/ITT	7.00
4 P/B PYE	9.00
6 P/B PYE	16.00
PHILIPS G8 Tuner	10.50
PHILIPS G8 Ass. (Square/Early)	13.50
PHILIPS G8 Ass. (Sloping/Late)	13.90
PHILIPS G9 Tuner	10.50
PHILIPS G11 Tuner	9.00
ITT/PYE/GEC 7 Button P/B	13.95
GEC 2110 6 way P/B	7.75
U321 UHF Tuner Mullard	7.50
THORN 8800 SELECTOR (HMV Model 2725/6 way round button)	7.50
THORN 9000 SELECTOR	11.40
U322	7.20
HITACHI 4 way Chan. Selector (Also Rank A823)	8.00
RR1 T20A 6 way Chan. Selector	9.75
RR1 T20/22/26	11.00
PHILIPS 8 way TIP Switch Unit (suitable for all G11)	23.00

SWITCHES

4A Double Pole On/Off Switch General Purpose Push/Push	66
Philips G8 Push On/Off Switch	1.38
4A Double Pole Rotary On/Off	66
A1 Beam Switch (THORN 3500)	50
A1 Controls 5m (THORN 3500)	69
GEC 2110 A1 Control IM5 (Red, Blue, Green)	58
GEC 2040 On/Off Switch	88
On/Off Switch G11/G12	1.58
On/Off Switch GEC/TCE TX9/10	1.06

FUSES

	Per type	Pack of 10
1¼" QUICK BLOW		
100ma		73
250ma-500ma-750ma-1A		54
1.5A-2A-2.5A-3A-5A		45
1¼" ANTISURGE		
250ma, 500ma, 600ma, 630ma, 750ma, 850ma, 1A, 1.25A		
1.5A, 2A		1.60
2.5A, 3A, 5A		2.49
20m ANTISURGE		
80ma		3.43
100ma		2.30
160ma, 200ma		2.09
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A		1.18
2.5A, 3.15A		1.53
20mm QUICK BLOW		
100ma, 250ma, 500ma, 630ma, 800ma		81
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A		40
1" MAINS		
2A, 3A, 5A, 10A, 13A		91

AERIAL ACCESS

Aerial Jump Lead 2m		
Triang Splitter		1.20
Surface Mount Splitter		1.70
Surface Mount Outlets		80
Cable Clips	per 100	1.18
Coax Plugs	per 10	1.80
P.V.C. Tape		35
F.M. Plugs		25
PL259 Plugs		40
Line Connectors		35
Reducers for PL259		16
T.V. Filter 50db Rejection 27mhz		2.10
Attenuators 6db, 12db, 18db		1.60
Olympic II Set Top		2.20

M.H.A.P.U. the pair 18.00
Aerial Isolator Kit 2.08

ANTIFERENCE

CS200/SP Comb/Splitter	2.96
SB11 Indoor Splitter	1.91
COB11 Single Outlet	78
TRR/VSP Transformer 75-300R	2.25
Super Set Top Aerial	6.80
Caratenna	7.80
XG8 High Gain Aerial A-B-CD or W.B.	17.50

NB A full range of aerials and accessories available from trade counter

LABGEAR

CM7025 UHF High Gain MHA 24V (Specify A-B or C/D)	15.66
CM7061 Power Unit 12V	10.19
CM7062 Reg. Power Unit 12V	11.11
CM7060 MHA 10db 12V W/B	8.51
CM7065 VHF/UHF MHA W/B 12V	12.39
CM7067 UHF 12V MHA (Specify A-B or C/D)	9.26
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	13.78
CM7053 Behind Set UHF Amp. (Mains)	11.24
CM7054 Behind Set UHF Amp. (Battery e.g. Caravans)	9.00
CM7043 Second Set Amp. UHF	10.47
CM7093 Behind Set UHF Amp. 3 Sets	13.20
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	19.14
CM7073 VHF/UHF 8+1 Dist. Amp.	37.37
CM9700 27mhz CB Suppress	3.50
CM6011 Outdoor Splitter (2 way) W/B	6.76
CM9003 Flush Single Outlet	1.27
CM9010 Flush Twin Outlet	1.69
CM6006 6 Way Passive Splitter	10.97
CM7042 TV Games Combin.	2.43
CM9009 Flush TV/FM Outlet	2.63
CM7069 Tri Star Amplified Set Top Aerial W/B	16.75
CM7090 Amplified Caravan Aerial 12V DC W/B	14.78
CM6038 UHF/VHF 625 Pattern Gen.	91.47
CM6052 UHF/VHF PAL Colour Bar Gen.	223.86
CM7056 Teletext Adaptor	210.00

RECTIFIER TRAYS

THORN 950 Mk II	4.25
THORN 1400 3 Stick	4.25
THORN 1500 3 Stick	4.55
THORN 1500 5 Stick	4.95
THORN 1600	3.90
THORN 3000/3500	7.39
THORN 8000	4.25
THORN 8500/8800	6.10
THORN 9000	7.93
DECCA 1730/1830	4.08
DECCA 1910/2213 Bradford	5.92
DECCA 30	6.26
DECCA 80	6.40
DECCA 100	6.14
UNIVERSAL ITT or REMO	6.00
GEC 2100	7.40
GEC 2200 (20AX)	6.50
GEC 2040/2028	5.79
GEC 2110 Pre Jan '77	7.00
GEC 2110 Post Jan '77	7.00
PHILIPS G8 Short Focus Lead	6.35
PHILIPS G8 Long Focus 550	6.35
PHILIPS G9	6.33
Pye/Philips K3 Tripler	6.67
PYE 691/3	5.83
PYE 713/4 Lead	7.00
PYE 731/25	6.75
R.B.M. A823 (plug in) AV	6.45
R.B.M. A823	6.45
KORTING (similar to Siemens TVK1)	6.65
ITT KB CVC5/9	5.95
ITT KB CVC20/25/30 (Mullard)	5.95
RRI T20	6.80

RECTIFIER STICKS

TV11	74	TV18	81
TV13	75	TV20	95

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA317	26
BAX13	4
BAX16	8
BB105B	30
BB105G	30
BY126	12
BY127	11
BY133	15
BY164	45
BY176	85
BY179	63
BY182	87
BY184	55
BY199	28
BY206	14
BY210/600	28
BY210/800	33
BY223	90
BY227	28
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX36/600	35
BYX55/600	30
BYX71/600	90
OA47	9
OA90	10
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	5
IN4007	6
IN4148	2
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	16
ITT44	4
ITT2002	11
Y969 (30V Thorn 3500)	89
BZY15-24R	1.18
BZY15-12R	1.18

MINIATURE SKELETON PRESET POTS

Horizontal or Vertical
100R-220R-470R-1K0-2K2-4K7-10K-22K-47K-100K-220K-470K-1M0 15p each

STANDARD SKELETON PRESET POTS

Horizontal or Vertical
100R-220R-470R-1K0-2K2-4K7-10K-22K-47K-100K-220K-470K-1M0-2M2-4M7 15p each

SLIDER POTENTIOMETERS

Lin or Log

470R	55p	4K7	55p
1K	55p	10K	55p
2K2	55p	47K	55p
		470K	55p

MIDGET CONTROLS

Insulated Spindle Length 44mm

Log or Lin Without Switch 5K-10K-25K-50K-100K-250K-500K-1M	39p
With D.P.S.T. Switch Log: 5K-10K-25K-50K-100K 250K, 500K, 1M, 2M	81p
Dual gang Controls	1.25

THERMAL CUT OUT

THORN 3000 2A Metal	1.60
THORN 8500 2.5 Plastic	1.60
GEC 2040 Metal	2.50

MULTITURN POTS

100K	55
GEC TCE	55
PHILIPS G8	
DECCA, RANK	55

THICK FILM RESISTOR NETWORK

THORN 3500 (5 pin connection)	1.98
PYE 731 (6 pin connection)	2.20
THORN 9000 (Circuit Ref. R704/7)	1.98

EAGLE PRODUCTS

Please send **large** S.A.E. for full EAGLE Catalogue

DF615 Full Range Speaker 6½"		8.95
SE500 Headphones		3.75
SE540 Headphones with Volume Control		5.50
SE600 Lightweight Headphones		7.95
Multimeters		
KEW 7N	2,000 opv	5.25
EM5	5,000 opv	9.95
EM10	10,000 opv	11.50
EM50	50,000 opv	19.95
EMC321 Carrying Case for above		2.25
Digital Meter TS1000		44.50
MM20 20,000 O.P.V		21.95
MM50 50,000 O.P.V		25.95
MM100 100,000 O.P.V		36.50
Case for MM100		15.95
T1206 2 Station Intercom		6.95

DATA BOOKS (No VAT)

Transistor Equivalent TVT 80 A-Z only	3.75
TVT 80 2N/2S series only	4.00
TVT 80/80 A-Z and 2N/2S together	7.50
LIN IC Books LIN 1	5.95
LIN 2	5.95

Please ensure that you order out of the latest magazine to avoid missing some inevitable price changes.

ELECTROLUBE PRODUCTS

Electrolube Adhesive	59
Electro-Mech lubricant	1.39
Elect. cleaning solvent	1.50
Freezer	1.39
Foam cleanser	1.00
Heat transfer compound	1.07
Silicone compound	1.81
Special contact fluid (Snorkel)	2.07
Permagard	1.43
Elec. mech. lubricant pen	69

DISC CERAMIC CAPACITORS

8kV (12kV Wlag) 39pF 200pF 150pF 220pF each 30p 180pF 250pF

CONVERGENCE PRE-SETS

3 Watt complete with knob
5R0-6R8 10R-15R-20R
50R-100R-200R-500R 35

METRIC CONVERGENCE POTS

PHILIPS G8
5R-10R-20R-50R 35

EVER READY

13A Compact Plug	43
13A Super Plug	64
13A Rubber Plug	69
13A 2 way Adaptor	1.79
13A 3 way Adaptor	2.15
Batten Lamp Holder	88
Cordgrip Lamp Holder	62
13A Trailing Socket	1.00
Flex Connector	60
Ceiling Rose	65
13A Shaver Adaptor	1.10
Single Socket Mount. Box (13A)	47
Double Socket Mount. Box (13A)	84
Plateswitch Mount. Box	45
5A Extension Lead	5.86
13A Switched Socket	1.40
13A Double Switched Socket	2.71
5A 2 way Switch	78

EVER READY RECHARGEABLE BATTERIES

CHARGERS

CH1 22 For PP3/NN1604 1 battery (RX22)	6.40
CH4/50 For HP7/NN1500 1-4 batteries (RX6)	5.55
CH3/RX6 For SP2/HP2/NN1300 SP11/HP11/NN1400 HP7/NN1500 2-4-6 batteries in pairs (RX6-RX14-RX20)	14.00
CH3/RX4 For SP2/HP2/NN1300 SP11/HP11/NN1400 HP7/NN1500 2-4 batteries in pairs (RX6-RX14-RX20)	9.55

BATTERIES

RX6 – HP7/NN1500	1.39
RX14 – SP11/HP11/NN1400	2.17
RX20 – SP2/HP2/NN1300	2.34
RX22 – PP3/NN1604	4.69

VIDEO/AUDIO

Beta Tapes Available

VHS E180 Video Tape	7.00
PHILIPS VCC 240 (2x2)	8.06
PHILIPS VCC 360 (2x3)	12.08
PHILIPS VCC 480 (2x4)	16.11
Video Cassette Cases (any format)	80
Video Record Heads VHS	35.00
Video Record Heads Philips V2000	49.00
Scotch Audio Tape C90 Ferric	65
C90 Super Ferric	96
VHS E120 Video Tape	5.50
E180 Video Tape	6.32
Coloured Book Type Video Cases. Any Format, 8 on carved wooden stand	15.50

PANELS + UNITS

AFC UNIT PHILIPS G8	8.82
IF GAIN MODULE (Pye/Philips)	9.00
CDA PANEL (Pye/Invicta/Ecko/Dynatron)	20.00
REAR CONVERGENCE PANEL (Philips G8)	23.00

SUNDRY TUNER ACCESS.

RANK Tuner P.B. 1½" × ½"	35
2" × ⅜" (yes we have some!)	35
2" × ⅜"	35
RANK Drive Cams	10
GEC 2110 Tuner Neons	14

SUNDRIES

Delay Lines DL60, DL700, DL50	2.20
CRT Tube Base	70
EHT Final Anode Cap	53
EHT Cable	25p mtr.
6.3V CRT Boost Trans.	4.35
13A Plug Top box 12	4.80
Quick Set Adhesive	78
Moulded Plastic Hex. 6mm Trim Tools	10
Double End 4mm/8mm Trim Tools	20
Focus Rod	1.25
Focus Holder	2.00
Keynector Safe Block (mains	5.50
Cassette Drive Belts per pack of 5	
44.5mm	1.65
64mm	1.71
74mm	1.80
57mm	1.65
89mm	1.90
Torch (handy for tool box)	42
I.C. Inserter	1.18
SM Neon Screwdriver	40
DIN Plugs 3 pin	22
4 pin	22
180° 5 pin	20
Stnd. 5 pin	20
Phono Plugs	12
Car Aerial Plug	18
2.5mm Jack Plug	14
3.5mm Jack Plug	14
Stnd. Jack Plug	20
Stereo Jack Plug	36
5A Connector Block (12)	40
Fuse Wire 5A-15A-30A	5
Battery Plug Thorn TV's	28
Gen. Purpose Power Supply 9V 200ma 12V 200ma	3.25
Mains Connector 4 way 13A	5.00

TEST EQUIPMENT

Portable Oscilloscope	150.00
Probes x10	10.90
TF200 Frequency Meter	155.00
CRT Tester/Rejuvenator	172.00
KHP30 Measuring Probe (3 ckv) EHT	29.95
T19 Transistor Tester	9.80
T120 RF Signal Injector	4.00
Avo 8 Test Lead Set	4.20
Degaussing Coil (stick type)	15.50

SERVICE AIDS

SERVISOL Freeze-It	92
SUPER SERVISOL	84
SERVISOL Foam Cleanser	82
SERVISOL Plastics Seal	85
SERVISOL Silicone Grease	98
SERVISOL Tubes Silicone Grease	1.56
SERVISOL Aero Klene	72
SERVISOL Aero Duster	90
SERVISOL Excel Polish	74
Penetrating Fluid	70
Fire Extinguisher 640G	2.60
Heat Sink Compound 25G	1.05
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	72

MAINS DROPPERS

DECCA 20	2.20
DECCA 2R5	50
DECCA 27R/47R	75
DECCA 56R/6R8	75
R.B.M. A823	88
R.B.M. 161	82
GEC 2000/2018	70
GEC 27840	64
PYE 713/15 3R5/15/45R	1.70
PYE 725/31 3R0/56R/27R	1.19
PYE 725 56R/27R	1.04
PHILIPS 210/5050 30R/125R/2k85	1.75
PHILIPS 210/5051 -/118R/148R	93
PHILIPS G8/5081 47R Section	50
PHILIPS G8/5083 2R2/68R	85
THORN 1400	1.15
THORN 1500	1.32
THORN 1600	1.60
THORN 3500	94
THORN 8000	96
THORN 8500	88

ZENER DIODES

BZX61/85 (1.3W) 20 6V2-7V5-8V2-9V1-10V-11V-12V-13V-15V etc. up to 75V	
BZY93C 18v	1.18
BZY88 (400MW) 2V7-3V-3V3-3V6-3V9-4V3-4V7-5V1 etc. up to 24V	10

HOW TO ORDER

ADD 65p per order for Post and Packing (UK) (Export orders will be charged at cost.)
THEN ADD 15% VAT TO TOTAL COST.
Orders which contain aerosols or degaussing coils are very heavy – please add extra 30p per can/coil
First Class Mail is used whenever possible.
All enquiries S.A.E. please.
VAT invoice on request.
SEE SPECIAL NOTE RE MAIL ORDER TUBE COSTS.
Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible.
We try our best to give a speedy, fair and efficient service. As our regular customers know, orders telephoned in before 4 p.m. will be despatched the same day.
Give us a ring – we'll give you service.
Please ask if what you need is not listed – we will try to help.

THE BEST T.V. BARGAINS IN THE SOUTH

DECCA BRADFORDS 5 FOR £75.00 (Varicaps also)

PLENTY OF REFURB-WORKING SETS FROM £35.00

PHILIPS G8's 5 FOR £60.00

THORN 8-8K5 5 FOR £100

R.B.M. TWIN CHIP 5 FOR £95.00

SPECIAL DISCOUNT OFFERS ON LARGE ORDERS

G.E.C. 2040 MOST WORKING 5 FOR £60.00

THORN 3-3K5 5 FOR £100

MONOS-1500s ETC ALL AT £3.00 IN BATCHES OF 10 £5.00 SINGLES

VIRTUALLY EVERY KNOWN MAKE IN STOCK INC JAPANESE AT GIVE AWAY PRICES

G.E.C. SOLID STATE 5 FOR £100.00

EXPORT SPECIALISTS – 1000s SETS AVAILABLE EVERY WEEK – OPEN 7 DAYS

Bulk Shipments catered for

PANELS EX-EQUIPMENT

R.B.M.	I.F. Power Conv.	£7.50 + £1.60 P.P.
	Time Base-Decoder	£12.00 + £1.50 P.P.
Philips G.8.	All Panels	£7.50 + £2.00 P.P.
G.E.C. 2040	Decoder-C.D.A.	£2.50 + £1.60 P.P.
	I.F. Panel	£3.50 + £1.40 P.P.
Thorn 3-3K5.	Power Line	£12.00 + £2.00 P.P.
	All others	£7.50 + £1.40 P.P.
Thorn 8-8K5.	I.F. Decoder Time Base	£7.50 + £1.50 P.P.

All Parts available all sets.

PLEASE TELEPHONE YOUR NEEDS
SPEEDY RETURN OF POST SERVICE

Special Offer G-8 Iopts (new type) £9.00 + £1.00 P.P.

All prices subject to 15% V.A.T.

COLOUR T.V. & MUSIC CENTRE
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C.R.T.s Regun or Ex Equip.
T.V. Trolly Stands £5.00

Visit our massive ultra modern premises
Tea, coffee, snacks available

Whatever your needs we are in the lead.
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Easy Motorway Access
Ample Free Parking
Open 7 Days

POST A PART ELECTRONICS

SEMICONDUCTORS

BC153	10p	BD131	25p	BU126	1.00p
BC154	10p	BD183	1.00p	ME0404	7p
BC171	7p	BF137	20p	ME0412	7p
BC172	7p	BF240	8p	ME6002	7p
BC208	7p	BF255	10p	NKT241	7p
BC237	10p	BF256c	35p	NKT276	20p
BC238	7p	BF256LC	35p	PN107	7p
BC250	7p	BF257	30p	R2010B	1.00p
BC251	7p	BF259	40p	R2443	25p
BC307	10p	BF274	10p	R2540	1.00p
BC308	7p	BF337	25p	R2781	1.25p
BC347	7p	BF391	7p	RCA16446	30p
BC394	7p	BF394	8p	TIS90	20p
BC455	7p	BF459	80p	TIS91	20p
BC546	7p	BF596	7p	2N2193	7p
BC549	7p	BFR87	25p	2N3703	20p
BC556	7p	BU105	75p	2SA473	12p
BC559	7p	BU108	1.00p	2SC346	7p
BC595	7p	BU207	1.00p	TIC106C	30p
BCX34	10p	BU208	1.00p	R2265	1.35p

MIXED PACKS

300 mixed resistors	1.50
300 mixed capacitors	1.50
150 mixed electrolytics	2.00
100 W/W resistors	1.00
20 mixed conv pots	1.00
40 mixed potentiometers	1.50
20 mixed sliders	1.00
40 mixed presets	60p
20 mixed VDR & thermistors	1.00
20 mixed ferrite cores	50p
20 mixed valve bases	1.00
10 spark gaps	1.00
10-16 pin Quil IC socket	90p
20 assorted T.V. knobs	1.00
10-16 pin Quil to Dil IC socket	90p
100 mixed diodes	1.00
50 mixed mica washers	65p
300 mixed resistors & capacitors	1.50
10-16 pin Dil to Dil IC socket	1.00

DIODES

AA112	8p	BZU15C12R		IN2070	8p
AA119	8p		14p	IN5254B	8p
AA143	8p	BY204	8p	IN4742A	8p
BA115	8p	BYX22/400	8p	IS025	8p
BA131	8p	BZY79C 20V		IS1653	8p
BA154	8p		8p	ITT638 CV9	
BA157	8p	DA002	8p		6p
BB103	8p	IM102255	8p	ZX150	8p
BR303	26p	IN60	8p	SKE1/02	18p
BY127	12p	IN5349	8p	MR854	30p
BY133	10p			MCR406	35p

INTEGRATED CIRCUITS

BAV40	50p	SN74123N	40p	TBA480	1.00
BRC/M/200	1.00	SN74154N	1.40	TBA1440C	1.00
BRC/M/300	1.00	SN76110N	40p	TDA2680	40p
DM74123N	50p	SN6622N	40p	TDA2590A	40p
SN15846N	40p	TAA570	1.00	TBA540	90p

General purpose mono scan coils. Thorn etc.	3.40
Tube base ITT CVC32	85p
Thorn 4000 red/green/blue static controls and blue lateral control	3.75
Thorn 4000 coil L401	55p
Thorn 4000 coil L701/2/3	25p
Korting shift pot 50R	75p
Philips G9 lum. delay line	1.25
7 segment display red (Toshiba) TLR306	1.45
7 segment display red (Toshiba) TLR307	1.10
4 push button switch assy. 20K resistance	2.55
3500 6 push button unit plus knobs, Thorn v/cap	1.00
Most values of presets available. Horizontal or vertical, miniature or standard. 10 of any value	1.00

E.H.T. TRAYS

Thorn 8000 EHT doubler	3.12	Thorn 4000	5.00
LP1174	3.50	Pye 18" early type	3.50
PYE731	4.00	Pye 18" late type	4.00
Thorn 8500	5.00	Thorn 900/950	2.50
Thorn 9000	5.00	Thorn 3000	6.00

E.H.T. STICK FOR THORN

950/1400/1500 triplers E.C.T. type 80/150	5p
E.H.T. stick. 83/200	5p

FUSES 20mm

50MA	10 for 70p	500MA	10 for 40p
315MA	10 for 50p	1 Amp	10 for 40p

Thorn 3000 metal 2A cut out	1.25
Thorn 8500 plastic 2.5A cut out	1.25
Degause thermistor PT37P ITT/GEC + fits some Pye/Bush etc.	25p
Degause VDR type E299D+ P230 3000/8000	25p

TRANSFORMERS/LOPT

Mains TX 3000/3500	10.00
Mains TX 8000/8500	10.00
S.O.P.T. 8000/8500	3.50
3000/3500 Scan TX	6.00
3000/3500 EHT TX	6.00
8000 LOPT	9.35
8500 LOPT	[illegible].65
9000 LOPT	10.15
Mono portable LOPT. Thorn, GEC, etc.	3.75
Mullard diode splitting LOPT. GEC, etc.	[illegible]4.75

DROPPERS

Pye 78+161	40p
Pye 147+260	40p
Thorn 6+1+100 3K	50p
Thorn 56+1K+47+12	1.00
Thorn 350+20+148+1K5+317	1.00
Thorn 50+40+1K5	50p
RBM 250+14+58TV161	50p
3R5 + 15R + 45R 28W Working @	90p
140+140 28W	40p

3000, 8500 Thorn focus pot	1.25
9000 Thorn focus pot	1.00
IC inserters. 16 pin	50p
Large IC extractor	50p
Crystals 4.433619MHz	50p
EHT lead for split diode LOPT	1.00
Litesold 20 watt 240V soldering iron element	65p each or 4 for 2.00
EHT final anode cap	47p
6MHz ceramic filter	30p
ITT bridge rec. FXS 244/2A	15p
Castors, sets of 4	2.50
Direct panel mounting. 20mm fuse clips	pair for 25p

WIRE WOUNDS

1.5R 5W Thorn 3K	30p	270R 5W	15p
2R 5W Thorn 3K	30p	270R 7W	16p
2.2R 4W	15p	280R 17W	23p
3.3R 9W	30p	330R 5W	15p
4R 11W fusible	25p	330R 7W	16p
5R 9W fusible	25p	330R 11W fusible Thorn	25p
8.2 7W	15p	370R 17W	23p
10R 7W	15p	820R 4W	15p
12R 9W	20p	1K2 9W Thorn 3K/4K	18p
15R 5W fusible	25p	1K2 11W fusible	25p
15R 7W	16p	2K2 5W fusible	25p
15R 11W Thorn 3K	30p	2K2 7W	16p
15R 17W	23p	2K2 7W fusible	25p
22R 4W	15p	2K2 9W fusible	25p
22R 9W fusible	25p	2K3 5W	15p
27R 7W	16p	2K7 9W fusible	25p
27R 7W fusible	25p	3K9 5W fusible	25p
36R 17W	23p	3K3 4W	15p
82R 4W	15p	4K7 7W fusible	25p
82R 9W fusible	25p	5K1 7W	16p
100R 5W fusible	25p	8K2 7W	15p
220R 7W Korting fusible	30p	8K2 9W 8K Thorn	23p
220R 17W	23p	10K 7W	15p
235R 9W fusible	25p	10K 9W	16p
240R 9W Thorn 4K	30p	39K 4W	15p

8500 IF/decoder panel. Ex-equipment, untested	4.75
Mains on/off switch, rotary	20p
Mains on/off switch, push	20p
A1 switch. Thorn 3000/3500	50p
A1 switch. Thorn 4000 + fits ITT/Pye	50p
A1 pot 5M 3000/3500	70p
100K 40 turn pots for v.cap tuners	25p
Double fuse holder on small pax. board (20mm type)	10p
Single fuse holder on small pax board (20mm type)	5p
In line fuse holder (1¼" type)	50p

Ex-equipment untested 3000/3500 panels any specified panel	3.75
UHF aerial socket & lead. Pye, ITT, Thorn	25p
UHF aerial socket & lead. GEC	25p
UHF aerial socket & long lead. GEC	35p
UHF aerial socket & mounting bracket for Thorn 4000	40p
UHF TV aerial for portable	50p
625 aerials + fittings available. Price list on request	
Coax plugs	12p
Switched flush fitting aerial outlet (white)	1.20

CARBON RESISTORS

12R ½W, 22R ¼W, 27R ½W, 39R ½W, 56R ¼W, 56R ½W, 62R 1W, 68R ⅛W, 68R ¼W, 68R ½W, 75R ½W, 82R ½W, 100R ½W, 120R ¼W, 120R ½W, 130R 2W, 150½W, 180R 1W, 220R ½W, 220R 2W, 240R ½W, 240 R1W, 270R ½W, 270R 1W, 300R ½W, 330R ½W, 470R ½W, 560R ½W, 680R ½W, 820 R½W, 820 R1W, 1K ½W, 1K 1W, 1K 2W, 1K 5½W, 1K 5.1W, 1K 8½W, 2K 2.1W, 2K 7.1W, 4K 7⅛W, 11K ½W, 12K ½W, 18K 2W, 22K 1W, 33K ½W, 36K ½W, 47K ½W, 68K ½W, 100K ½W, 110K ¼W, 270K ½W, 330K ½W, 330K 1W, 390K ½W, 500K ½W, 1MEG ½W, 1MEG 2W, 2M 2½W, 2M 7½W, 4M 7.1W, 10M ½W any 10 for 25p

Thorn 9K thick film units FR1 or FR3	1.25
10 Meg thick film focus resistor	65p

EX-EQUIPMENT SPARES

Convergence yoke 3000/3500	1.75
Scan coils 3000/3500 please state which	2.75
3000/3500 LTB (tested) L501/L502/L503/L504/T502/T501,	50p each
3000/3500 PSU (tested) T602/L601	50p each
3000/3500 chroma delay line DL301 (tested)	65p
3000/3500 lum. delay line L203 (tested)	65p
3500 convergence (tested) T751, L751, L752, L753, L754	50p each
3000/3500 frame output transformer (tested)	1.00

CAPACITORS

3.3PF	350V	3000PF	2KV
6.8PF	63V	3300PF	250V
8.2PF	350V	4700PF	400V
10PF	350V	.0047MF	500V
12PF	1000V	.0075MF	2KV
22PF	63V	.01MF	250V
3[illegible]PF	63V	.01MF	600V
47PF	350V	.015MF	400V
182PF	63V	.02MF	200V
250PF	2000V	.02MF	250V
330PF	63V	.022MF	250V
330PF	160V	.047MF	400V
330PF	8KV	[illegible]MF	250V
470PF	250V	[illegible]MF	2KV
560PF	63V	[illegible]MF	400V
1000PF	250V	[illegible]MF	250V
1500PF	250V	[illegible]MF	250V
1800PF	160V	.47MF	250V
2700PF	63V		

Any 10 @ £1.00

ELECTROLYTICS

1MF 63V	20/£1	100MF 100V	10/£1
1.5MF 63V	20/£1	100MF 150V	10/£1
2.2MF 25V	20/£1	125MF 16V	10/£1
4MF 64V	20/£1	150MF 25V	20/£1
4MF 350V	10/£1	160MF 25V	20/£1
6.8MF 40V	20/£1	160MF 40V	10/£1
10MF 40V	20/£1	220MF 40V	10/£1
10MF 160V	10/£1	250MF 25V	10/£1
15MF 16V	20/£1	330MF 10V	20/£1
15MF 63V	20/£1	330MF 35V	10/£1
22MF 10V	20/£1	330MF 63V	10/£1
22MF 40V	20/£1	470MF 6.3V	20/£1
22MF 63V	20/£1	470MF 10V	10/£1
22MF 160V	10/£1	470MF 25V	10/£1
32MF 275V	10/£1	470MF 40V	10/£1
33MF 40V	20/£1	640MF 10V	20/£1
33MF 50V	20/£1	680MF 16V	20/£1
33MF 250V	10/£1	680MF 40V	10/£1
47MF 350V	10/£1	1000MF 10V	10/£1
50MF 25V	20/£1	1500MF 16V	10/£1
68MF 250V	10/£1	2200MF 25V	6/£1
100MF 18V	10/£1	3300MF 25V	10/£1

MULTI SECTION CAPACITORS

175+100+100 350V Thorn 3K	2.00	200+200+100 350V	70p
100+150+50 350V	50p	200+100+50 300V	60p
200+32+300+100 350V	50p	150+150+100 300V Thorn 1K5	1.90
2500+2500 63V Thorn 8K	1.20	32+32+16 350V	40p
		32+32 350V	30p
200+100+100+50 350V	50p	200+100 325V	70p
		200+47 250V	65p

CAN TYPES

2MF 20V	50p	800MF 250V	70p
22MF 375V	50p	1250MF 40V	50p
50MF 350V	50p	1250MF 50V	50p
100MF 150V	65p	1500MF 70V Thorn 3K	1.00
220MF 400V Thorn 9K6	1.30	2000MF 30V	50p
200MF 450V Thorn 4K	1.30	2200MF 40V Thorn 4K	1.00
400MF 350V Thorn 8K	90p	2500MF 35V	65p
		2500MF 40V	65p
800MF 250V print type	80p	300MF 25V	50p
		3300MF 25V	60p

39 HIGH ROAD, NORTH STIFFORD, GRAYS, ESSEX, RM16 1UF.

(Mail Order Address Only) Delivery within 28 days.

PLEASE ADD 60p P&P, PRICE INCLUSIVE OF VAT, ADD POSTAGE FOR OVERSEAS ORDERS

THOUSANDS OF ADDITIONAL ITEMS AVAILABLE, ENQUIRIES INVITED

I wish to pay by Access.

Access No. ....

Amount ....

NAME ....

ADDRESS ....

Signature ....

TRANSISTORS, ETC.

Type	Price (£)
AC107	0.48
AC117	0.38
AC126	0.36
AC127	0.54
AC128	0.46
AC128K	0.55
AC141	0.65
AC141K	0.70
AC142	0.60
AC142K	0.65
AC151	0.31
AC152	0.36
AC153	0.42
AC153K	0.52
AC154	0.41
AC176	0.45
AC178	0.51
AC179	0.55
AC187	0.56
AC187K	0.65
AC188	0.52
AC188K	0.61
AC193K	0.70
AC194K	0.74
ACY17	1.20
ACY19	0.95
ACY28	0.98
ACY39	2.02
AD140	1.79
AD142	1.90
AD143	1.78
AD149	1.42
AD161	0.66
AD161/162	1.22
AD162	0.71
AF114	1.32
AF115	1.26
AF116	1.28
AF117	1.32
AF118	0.98
AF121	0.68
AF124	0.38
AF125	0.38
AF126	0.36
AF127	0.86
AF139	0.58
AF147	0.52
AF149	0.45
AF178	1.35
AF179	1.36
AF180	1.35
AF181	1.33
AF186	1.48
AF202	0.27
AF239	0.73
AF240	1.40
AF279S	0.91
AL100	1.30
AL103	1.58

Type	Price (£)
AU103	2.40
AU107	2.75
AU110	2.40
AU113	2.60
BC107*	0.16
BC108*	0.15
BC109*	0.16
BC113	0.22
BC114	0.22
BC115	0.24
BC116*	0.25
BC117	0.30
BC118	0.24
BC119	0.34
BC125*	0.30
BC126	0.30
BC132	0.20
BC134	0.22
BC135	0.21
BC136	0.22
BC137	0.30
BC138	0.352
BC140	0.36
BC141	0.44
BC142	0.35
BC143	0.38
BC147*	0.12
BC148*	0.12
BC149*	0.13
BC152	0.42
BC153	0.38
BC154	0.41
BC157*	0.13
BC158*	0.12
BC159*	0.14
BC160	0.52
BC161	0.58
BC167B	0.15
BC168B	0.14
BC169C	0.15
BC170*	0.15
BC171*	0.15
BC172*	0.14
BC173*	0.22
BC174A & B	0.26
BC176	0.22
BC177*	0.20
BC178*	0.22
BC179*	0.28
BC182*	0.15
BC182L*	0.15
BC183*	0.14
BC183L*	0.14
BC184*	0.15
BC184L*	0.15
BC185	0.36
BC186	0.25
BC187	0.27

Type	Price (£)
BC192	0.56
BC204*	0.39
BC205*	0.39
BC206*	0.37
BC207*	0.39
BC208*	0.37
BC209*	0.39
BC211*	0.36
BC212*	0.17
BC212L*	0.17
BC213*	0.16
BC213L*	0.16
BC214*	0.18
BC214L*	0.18
BC225	0.42
BC237*	0.16
BC238*	0.15
BC239*	0.22
BC251*	0.25
BC252*	0.26
BC253*	0.38
BC261A*	0.28
BC262A*	0.28
BC263*	0.26
BC267*	0.20
BC268*	0.28
BC286	0.40
BC287	0.49
BC291	0.27
BC294	0.37
BC297	0.36
BC300	0.62
BC301	0.38
BC302	0.86
BC303	0.64
BC304	0.44
BC307*	0.17
BC308*	0.14
BC309*	0.18
BC317*	0.15
BC318*	0.15
BC319*	0.19
BC320	0.17
BC321A&B	0.18
BC322	0.28
BC323	1.15
BC327	0.16
BC328	0.18
BC337	0.17
BC338	0.17
BC340	0.19
BC347*	0.17
BC348A & B	0.17
BC349B	0.17
BC350*	0.24
BC351*	0.22
BC352A*	0.24
BC360	0.59

Type	Price (£)
BC377	0.29
BC394	0.39
BC440	0.52
BC441	0.59
BC461	0.78
BC477	0.30
BC478	0.25
BC479	0.33
BC547*	0.13
BC548*	0.13
BC549*	0.15
BC550	0.24
BC556	0.23
BC557*	0.16
BC558*	0.16
BC559*	0.17
BCY10	0.30
BCY30A	1.06
BCY32A	1.19
BCY34A	1.02
BCY72	0.27
BD115	1.35
BD123	1.50
BD124	1.85
BD130Y	1.56
BD131	0.58
BD132	0.68
BD133	0.70
BD135	0.37
BD136	0.38
BD137	0.40
BD138	0.42
BD139	0.46
BD140	0.50
BD144	2.24
BD145	0.75
BD150A*	0.51
BD155	0.90
BD157	0.51
BD158	0.75
BD159	0.68
BD160	2.69
BD163	0.67
BD165	0.66
BD166	0.88
BD175	0.90
BD177	0.58
BD178	0.92
BD181	1.94
BD182	2.10
BD183	1.34
BD184	2.30
BD187	1.20
BD188	1.25
BD189	0.71
BD222	0.91
BD225	0.91
BD232	0.91
BD233	0.62

Type	Price (£)
BD234	0.68
BD235	0.63
BD236	0.63
BD237	0.68
BD238	0.68
BD253	1.58
BD410	1.65
BD433	0.65
BD435	0.70
BD436	0.71
BD437	0.74
BD438	0.75
BD519	0.88
BD520	0.88
BD599	0.87
BD600	1.23
BD663BR	0.86
BDX18	1.55
BDX32	2.95
BDY16A	0.63
BDY18	1.55
BDY20	2.29
BDY38	1.38
BF115	0.48
BF117	0.45
BF120	0.55
BF121	0.85
BF123	0.48
BF125	0.55
BF127	0.51
BF137F	0.78
BF152	0.19
BF158	0.25
BF159	0.27
BF160	0.20
BF161	0.84
BF163	0.65
BF164	0.95
BF166	0.50
BF167	0.38
BF173	0.35
BF177	0.36
BF178	0.46
BF179	0.58
BF180	0.53
BF181	0.53
BF182	0.44
BF183	0.52
BF184	0.44
BF185	0.42
BF186	0.42
BF194*	0.14
BF195*	0.13
BF196	0.14
BF197	0.15
BF198	0.29
BF199	0.29
BF200	0.25
BF218	0.42

Type	Price (£)
BF222	0.51
BF224 & J	0.22
BF240	0.32
BF241	0.31
BF244*	0.51
BF245*	0.43
BF254	0.48
BF255	0.58
BF256L*	0.49
BF257	0.47
BF258	0.54
BF259	0.54
BF262	0.73
BF263	0.88
BF270	0.47
BF271	0.42
BF272A	0.80
BF273	0.33
BF274	0.34
BF336	0.63
BF337	0.65
BF338	0.68
BF355	0.72
BF362	0.49
BF363	0.49
BF367	0.43
BF451	0.43
BF457	0.46
BF458	0.49
BF459	0.52
BF594	0.46
BF596	0.17
BF597	0.27
BFR39	0.30
BFR40	0.29
BFR41	0.30
BFR50	0.29
BFR52	0.33
BFR61	0.29
BFR62	0.28
BFR79	0.30
BFR80	0.29
BFR81	0.30
BFR88	0.42
BFT41	0.48
BFT43	0.55
BFW11	1.02
BFW30	2.58
BFW59	0.19
BFW60	0.20
BFW90	1.65
BFX29	0.38
BFX84	0.42
BFY50	0.38
BFY51	0.37
BFY52	0.36
BFY53	0.36
BFY90	1.98
BPX25	1.62

Type	Price (£)
BPX29	1.62
BR101	0.53
BR103	0.64
BR303	1.06
BRC4443	1.76
BRY39	0.60
BRY56	0.44
BSS27	0.92
BT106	1.50
BT109	1.99
BT116	1.45
BT119	5.18
BU102	2.85
BU105	1.80
BU105/02	1.95
BU108	2.98
BU126	2.91
BU204	2.50
BU205	2.58
BU206	2.59
BU208	2.75
BU407	1.38
BUY77	2.50
C106D	0.80
C106F	0.43
C111E	0.46
D40N1	0.64
E300	0.42
E1222	0.47
E5024	0.19
GET872	0.46
ME0402	0.18
MF0404/02	0.18
ME6001	0.18
ME6002	0.18
MJ2955	1.30
MJ3000	1.58
MJE340	0.68
MJE341	0.72
MJE370	0.74
MJE371	0.78
MJE520	0.85
MJE521	0.95
MJE2955	1.20
MJE3000	1.95
MJE3055	1.22
MPF102	0.40
MPS3702	0.33
MPS3705	0.30
MPS6521	0.36
MPS6523	0.36
MPS6566	0.44
MPSA05	0.30
MPSA06	0.32
MPSA55	0.43
MPSA56	0.45
MPSA93	0.56
MPSL01	0.33
MPSU01	0.61

Type	Price (£)
MPSU05	0.66
MPSU06	0.76
MPSU55	1.26
MPSU56	1.32
MPSU60	0.82
MPU131	0.59
OC26	1.90
OC28	1.49
OC29	1.60
OC35	1.25
OC36	1.25
OC42	0.90
OC44	0.68
OC45	0.63
OC70	0.65
OC71	0.73
OC72	0.73
OC81	0.83
OC81D	0.95
OC139	1.30
OC140	1.35
OC170	0.80
OC171	0.82
OC200	3.90
OC201	3.95
OC202	2.40
OC205	3.95
OCP71	1.98
ON236A	0.94
R2008B	2.72
R2010B	2.79
R2322	0.75
R2323	0.85
ST2110	0.49
ST6120	0.48
TIC44	0.25
TIC46	0.35
TIC47	0.45
TIP29A	0.47
TIP30A	0.50
TIP31A	0.51
TIP31C	0.67
TIP32A	0.56
TIP32C	0.72
TIP33A	0.77
TIP34A	0.84
TIP41A	0.72
TIP42A	0.80
TIP2955	0.77
TIP3055	0.58
TIS43	0.44
TIS73	1.36
TIS90	0.23
TIS91	0.28
ZTX108	0.14
ZTX109	0.16
ZTX213	0.2
ZTX300	0.16
ZTX304	0.26

Type	Price (£)
ZTX500	0.18
ZTX502	0.22
ZTX504	0.28
2N404	1.30
2N696	0.46
2N697	0.46
2N706A	0.33
2N708	0.29
2N914	0.32
2N916	0.46
2N918	0.54
2N930	0.29
2N1164	10.29
2N1304	1.40
2N1305	1.29
2N1306	1.49
2N1307	1.32
2N1308	1.53
2N1711	0.47
2N1893	0.52
2N2102	0.71
2N2217	0.55
2N2218	0.38
2N2219	0.42
2N2221A	0.26
2N2222A	0.41
2N2369A	0.40
2N2401	0.80
2N2484	0.35
2N2570	0.74
2N2646	0.82
2N2784	1.15
2N2869	2.08
2N2894	0.45
2N2904*	0.40
2N2905*	0.39
2N2906*	0.36
2N2926G	0.15
2N29260	0.14
2N2926Y	0.14
2N2955	1.12
2N3053	0.48
2N3054	0.66
2N3055	0.72
2N3250	0.52
2N3254	0.58
2N3391A	0.38
2N3633	0.60
2N3703	0.17
2N3704	0.19
2N3705	0.17
2N3706	0.16
2N3707	0.18
2N3708	0.17
2N3715	1.70
2N3771	2.09
2N3772	2.08
2N3773	2.90
2N3794	0.40

Type	Price (£)
2N3819	0.47
2N3820	0.72
2N3866	1.08
2N3904	0.20
2N3905	0.20
2N3906	0.20
2N4036	0.94
2N4123	0.17
2N4124	0.17
2N4126	0.17
2N4236	2.20
2N4289	0.32
2N4292	0.32
2N4416	0.85
2N4444	1.90
2N4921	0.80
2N5042	1.65
2N5060	0.28
2N5061	0.30
2N5064	0.63
2N5086	0.49
2N5087	0.50
2N5208	0.59
2N5294	0.66
2N5296	0.68
2N5298	0.71
2N5322	1.16
2N5449	0.18
2N5457	0.46
2N5458	0.40
2N5459	0.58
2N5494	0.85
2N5496	1.05
2N6027	0.55
2N6107	0.71
2N6122	0.60
2N6178	1.07
2N6180	1.39
2N6211	2.74
2SB337BP	4.28
2SC458C	0.78
2SC643A	2.25
2SC930D	1.50
2SC1061	1.45
2SC1172Y	3.55
2SD234	1.48
3N128	1.60
40250	0.98
40251	1.14
40327	0.67
40361	0.48
40362	0.50
40410	0.94
40429	0.88
40530	0.79
40595	1.39
40603	1.13
40636	1.25
40654	0.89

Alternative gain versions available on items marked*.

For matched pairs add 20p per pair.

LINEAR IC's

Type	Price (£)
CAB10QM	2.44
CA3005	1.85
CA3012	1.45
CA3014	2.23
CA3018	0.71
CA3020	1.89
CA3028A	0.80
CA3028B	1.09
CA3045	3.75
CA3046	0.70
CA3065	1.74
CA3068	1.90
CA3130S	1.57
FCH161	2.40
FCJ101	3.32
LM309K	1.98
LM380N-14	1.65
LM1303N	1.03
MC1307P	1.82
MC1310P*	1.84
MC1312P	2.34
MC1327P*	1.86
MC1330P	0.83
MC1350P	1.22
MC1351P	1.42
MC1352P	1.42
MC1357P	2.92
MC1358P*	2.30
MC1458G	1.43
MC1496L	1.15
MC3051P	0.58
MFC400B	0.85
MFC4060A	0.98
MFC6040	1.11
MIC1P	1.10
ML231	3.57
ML232	3.57
NE555	0.72
NE556	1.34
NE566	1.95
SAA1024	5.70
SAA1025	10.35
SAS560A	2.01
SAS570	2.01
SC9503P	1.40
SC9504P	1.38
SL432A	2.52
SL450	5.10
SL901B	4.7[illegible]
SL917B	5.80
SL918A	5.95
SN72440N	2.21
SN76001N	1.67
SN76003N	2.20

Type	Price (£)
SN76003N	3.32
SN76013N	2.52
SN76023N	3.02
SN76023ND	2.52
SN76033N	3.32
SN76023ND	1.40
SN76033N	2.20
SN76110N	1.20
SN76115N	1.62
SN76116N	1.78
SN76131N	2.10
SN76226N	2.60
SN70227N	1.61
SN76228N	1.80
SN76502N	1.92
SN76530P	0.97
SN76533N	1.38
SN76544N	1.85
SN76546N	1.85
SN76570N	1.81
SN76620AN	0.99
SN76650N	1.48
SN76660N	0.64
SN76666N	0.96
TA7073P	3.51
TAA263	2.20
TAA300	3.8F
TAA320	1.10
TAA350A	2.48
TAA370A	3.18
TAA435	1.70
TAA450	3.39
TAA521	1.10
TAA522	2.09
TAA550	0.35
TAA560	1.93
TAA570	2.20
TAA611A	1.67
TAA611B	1.89
TAA621AXI	4.75
TAA630Q	3.91
TAA630S	4.18
TAA661A	2.39
TAA661B	1.75
TAA700*	2.80
TAA840	3.38
TAA861A	0.95
TAA930A	1.43
TAA930B	1.43
TAA960	3.20
TAA970	2.81
TAD100	2.66
TBA120A	0.90
TBA120S*	0.99
TBA120SA	1.02
TBA231	1.1[illegible]

Type	Price (£)
TBA240A	3.98
TBA281	2.07
TBA395*	2.58
TBA396	2.40
TBA400	2.20
TBA480Q	1.84
TBA500*	2.21
TBA510*	2.21
TBA520*	2.98
TBA530P	2.24
TBA540*	2.88
TBA550*	3.13
TBA560C*	3.18
TBA570*	1.29
TBA611B	2.68
TBA641	4.55
TBA641A12	4.55
TBA641BX1	4.60
TBA651	2.42
TBA673	2.31
TBA700*	2.50
TBA720AQ	2.38
TBA720Q	2.38
TBA750*	2.18
TBA800	2.05
TBA810AS	2.00
TBA920*	2.80
TBA940	3.52
TBA950	2.08
TBA990*	2.90
TCA270A*	3.55
TCA280A	1.43
TCA290A	3.46
TCA420A	2.10
TCA440	1.67
TCA640	4.26
TCA650	4.26
TCA660	4.26
TCA730	4.10
TCA740	4.04
TCA750	2.53
TCA760	1.52
TCA820	3.29
TDA440	4.16
TDA1003	1.68
TDA1004	3.85
TDA1005	3.04
TDA1022	6.89
TDA1024	0.97
TDA1034	2.98
TDA2610	2.86
TDA2640	2.86
ZN414	1.45

* Indicates Q version is also available.

DIODES

Type	Price (£)
AA113	0.17
AA119	0.21
AA129	0.28
AA143	0.18
AAY30	0.28
AAZ13	0.42
AAZ15	0.35
AAZ17	0.28
AY102	3.85
BA100	0.24
BA102	0.36
BA104	0.19
BA110	0.80
BA111	0.70
BA115	0.17
BA116	0.56
BA121	0.85
BA129	0.45
BA145	0.19
BA148	0.19
BA154	0.06
BA155	0.17
BA156	0.12
BA157	0.25
BA158	0.28
BA159	0.40
BA164	0.14
BA182	0.27
BA201	0.13
BA202	0.14
BA203	0.14
BA216	0.08
BA219	0.11
BA243	0.45
BA317	0.06
BA318	0.07
BAV10	0.10
BAV21	0.18
BAW62	0.06
BAX13	0.07
BAX16	0.10
BAX17	0.19
BAY72	0.16
BB104B	0.52
BB105B	0.33
BB105G	0.30
BR100	0.40
BY100	0.35
BY103	0.35

Type	Price (£)
BY114	0.60
BY118	1.10
BY126	0.20
BY127	0.21
BY133	0.35
BY140	1.40
BY164	0.75
BY176	2.80
BY179	0.83
BY182	1.14
BY184	0.44
BY189	5.30
BY190	4.90
BY206	0.26
BY238	0.25
BYX10	0.30
BYX38/600	0.70
BYX70/500	0.53
ITT44	0.08
ITT210	0.63
ITT827	0.80
MCR101	0.48
MR854	1.10
OA5	0.88
OA10	0.58
OA47	0.20
OA81	0.19
OA90	0.13
OA91	0.15
OA95	0.20
OA200	0.13
OA202	0.13
OA210	0.89
TIL209	0.14
TIL211	0.18
TV20	2.25
IN914	0.06
IN916	0.06
IN4001	0.06
IN4002	0.07
IN4003	0.08
IN4004	0.08
IN4005	0.09
IN4006	0.10
IN4007	0.12
IN5400	0.15
IN5401	0.17
IN5402	0.20
IS920	0.09
IS921	0.11

ZENER DIODES

400mW plastic	3.0-75V	14p each
1/1.3W plastic	3.3-200V	18p each
1.5W flange	4.7-75V	£1.26 each
2.5W plastic	7.5-75V	67p each
20W stud	7.5-75V	£1.31 each

VDR's, etc.

Type	Price (£)
E295ZZ	
/01	0.28
/02	0.28
E298CD	
/A258	0.25
E298ED	
/A258	0.22
/A260	0.22
/A262	0.22
/A265	0.22
/P268	0.22
E298ZZ	
/05	0.25
/06	0.22
E299DD/P116-P354	all 0.23
E299DH	
/P230	0.72
VA1015	0.92
VA1026	0.79
VA1033/34/38/39/40/53	all 0.20
VA1055s/56s/66s/67s	all 0.23
VA1074	0.20
VA1077	0.31
VA1091	0.29
VA1096/97/98	all 0.20
VA1103	0.32
VA1104	0.66
VA1108/09/10/11/12	all 0.24
VA8650	1.20
2322 554 02221	0.59
2322 662 98003	0.88

VALVES

Type	Price (£)
DY86/87	0.75
DY802	0.75
ECC81	0.78
ECC82	0.95
ECC83	0.78
ECH81	0.83
ECL80	0.82
EF80	0.60
EF183	0.75
EF184	0.75
EH90	0.94
EL34	3.08
EY51	1.20
EY86/87	0.67
PCC84	0.61
PCC85	0.79
PCC89	0.74
PCC189	0.94
PCF80	1.20
PCF86	0.87
PCF200	2.32
PCF801	0.74
PCF802	1.20
PCF805	3.37
PCF808	3.80
PCL82	0.93
PCL83	5.25
PCL84	0.65
PCL86	1.27
PCL805/85	1.00
PD500	3.75
PFL200	1.40
PL36	1.20
PL81	0.94
PL84	0.79
PL504	1.5[illegible]
PL508	1.85
PL509	4.75
PL519	4.75
PL802	5.60
PY81/P810	0.60

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Rating		Price (£)	Rating		Price (£)
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	100V	0.28		200V	0.40
	200V	0.32		400V	0.47
	400V	0.40		600V	0.53
	600V	0.50		800V	0.60
	800V	0.58		1000V	0.87
3A	100V	0.52	6A	100V	0.66
	200V	0.55		200V	0.68
	400V	0.61		400V	0.74
	600V	0.67		600V	0.80
	800V	0.80		800V	0.86
	1000V	1.20		1000V	0.95

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½W 10Ω-10MΩ (E24)	3p	25p	95p	£1.49	£6.40
1W 10Ω-10MΩ (E12)	5p	45p	£1.95	£3.40	£15.25
2W 10Ω-10MΩ (E6)	9p	80p	£3.60	£6.40	£26.90

Wirewound (5%)

2½W 0.22Ω-270Ω	18p
4W 1.0Ω-10kΩ	22p
7W 0.68Ω-22kΩ	24p
11W 1.0Ω-22kΩ	28p
17W 1.0Ω-22kΩ	33p
Vertical mounting pillars	3p

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4n7F	1500V DC	60p	100nF	1000V DC	46p
10nF	1000V DC	22p	470nF	1000V DC	60p

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Video glut?

1981 was certainly a boom year for VCRs. The following delivery figures speak for themselves:

	Japan	*USA*	*UK*
1980	925.000	805,000	400,000
1981	1,550.000	1,360,000	1,050,000

When other markets are taken into account, production must have been well in excess of five million machines, overwhelmingly in Japan. In fact VCR production accounted for over 70% in value of the production of the Japanese consumer electronics industry last year. Well done JVC, Sony, Hitachi, Toshiba et al, and their various agents and distributors world wide – especially as the sales were achieved against a background of international economic stagnation. It must nevertheless be cause for some concern in Japan. Excessive reliance on one particular product is never a healthy state of affairs, and mushroom growth can easily be followed by a disastrous collapse. Not that the Japanese would allow things to get out of hand to that extent: they pay attention to economic planning and are all too well aware of the pace of change, while MITI (the ministry of international trade and industry) acts as a powerful co-ordinating force.

In the UK, VCR market penetration is now around 9% and is expected to reach 12% next year. This leaves considerable market potential, though the point at which market saturation will occur is difficult to assess. Clearly VCRs do not fall into quite the same category as TV sets, vacuum cleaners, fridges, washing machines and cookers – things most people would not be without. A 50 per cent market penetration might seem reasonable – unless the machines become so cheap that anyone with a few idle pounds in his pocket decides that he might as well have one.

The economics of scale should certainly apply to the VCR. The machines are relatively complex as domestic equipment goes, and this in turn means high development costs and heavy expenditure in laying down production plant. Once these things have been done however the costs fall – especially when, as in Japan, the cost of borrowing is low.

There have nevertheless been awkward moments in recent months. Some Japanese VCR manufacturers have been operating below capacity, and stocks are understood to be high, particularly in the USA. Price cutting has been a feature of the US market this summer, with Sanyo Betamax machines for example being offered at a suggested retail price of well under £300 – and suggested prices don't carry much weight in the US, where many shops seem to run perpetual sales. Speaking at this summer's Chicago Consumer Electronics Show, William E. Boss of RCA Consumer Electronics commented "with . . . product availability no longer a retardant, the lack of stability in pricing has been an industry concern." Do they really talk like that? Anyway, one can see what he's getting at.

The world recession could well have bottomed this summer. As interest rates in the USA and UK fall, so consumer demand will increase. The beneficiaries will include Japanese VCR manufacturers. UK VCR production could also be assisted – we must hope that Thorn Newhaven, Sanyo Lowestoft and Fidelity get their timing right.

For the Japanese, the problem of over reliance on a particular product remains. One can't help but feel that the effort at present being put into the development of the next generation of computers in Japan is in some way their answer. As we all know, Japanese industry does not stand still: on the consumer side, it went into and moved out of transistor radio production, then followed mass production of CTVs, now overtaken by VCR production in both quantity and value. Something is bound to follow.

One thing that's unlikely to fulfil this role is the video disc. Both Europe (Philips) and the USA (RCA) got in first this time. It doesn't seem to be doing them all that much good so far, though it's early days yet. Could the Japanese VHD system be just that little bit too late now that RCA's CED system and Philip's LaserVision have been well and truly launched? RCA have found that CED players will sell at a certain price level – a reduction in the list price of the original machine to around £150 late last winter saw sales accelerate. LaserVision too now seems to be doing somewhat better in the states, ironically since disc production was moved to Japan. There were severe disc yield problems with US production, and all too many defective discs reached the public. "Second generation" LaserVision disc players are now on sale in the USA.

For the time being however the VCR reigns supreme in the video market, and by the time that market saturation has been reached one feels that MITI will have directed the Japanese electronics industry along an appropriate new course. Have you noticed that Japanese defence expenditure, for long so much less than that of comparable countries, is beginning to increase?

COVER PHOTO

Our thanks to Luxor who provided the cover photograph this month. Luxor have been particularly active in the development of satellite TV receiving terminals.

PCB SERVICE

The readers' PCB service continues in operation – it's just that we didn't have space to include the usual list of panels available this month. Regular readers should refer to last month's list which remains unaltered.

Routine TV Receiver Tests: The Philips G11 Chassis

S. Simon

THE Philips G11 chassis was produced in large quantities. It's to be found in Dynatron, Roberts Video and Pye sets as well as Philips models. There are some differences in the remote control versions, but the basic concept remains the same and the following notes apply to all.

The mains input panel is at the bottom centre (see Fig. 1), the a.c. output from this being connected to the lower right side power unit via plugs and sockets (see Fig. 2). There are two 3·15A anti-surge fuses on the mains input panel (except for very late production sets in which one fuse is replaced by a surge-limiting resistor). The condition of these fuses will indicate the nature of the fault in the event of one or both being open-circuit. If they are severely blown, i.e. discoloured, it's a fair bet that the trouble is on the lower right power supply panel – in fact it's likely that one or more of the small power diodes D4091-4 near the left-hand edge of this panel is short-circuit. This is an extremely common fault, and the defective diode(s) should be replaced with more beefy types. As a matter of fact it's as well to replace all four diodes at the same time, whether faulty or not, to save trouble later. The BY127 is a suitable replacement.

D4091-2 are the ones that usually fail. The reason for this may not be immediately obvious since they are connected as a bridge (see Fig. 3) and one would expect the load to be shared by all four equally. This is not so however. The diode bridge supplies the power supply control circuit (R4044, R4059 etc.) only. The rest of the receiver is supplied by a bridge which consists of the two controlled rectifiers Th4018 and Th4020 in conjunction with D4091/2. Hence the extra load imposed on these two diodes. The thyristors Th4018/20 themselves are fairly reliable and should not be the first suspects.

The output from the power unit is fed to the rest of the set via the 1A h.t. fuse FS4037, and this is the fuse that will have failed in the event of a fault elsewhere in the receiver, say in the top right line scan section (this is quite common). Thus we have a general initial guide line: if the mains fuses are intact but the 1A fuse at the top of the power supply board is open-circuit, the fault is likely to be on the upper right side panel. The supplies to most of the other parts of the set are derived from the line output stage via separate fuses.

Having checked the mains fuses at the bottom centre and found them to be intact, we know that the a.c. supply should be reaching the power unit and if you don't know the location of the 1A fuse you will have to swing open the right side "door" to find it. The door is secured by one screw at the bottom – it may or may not be present – and a swing latch at the top. With this released the whole right side unit, power supply and line driver/output stage, can be lifted and swung round for access. The 1A fuse can then be seen at the top of the lower power supply panel.

If the fuse has blown it's probable that D3133, which is located towards the top of the line scan panel, has failed. It's a BY223, with a plate and clip as heatsink, and is one of the EW modulator diodes. It goes short-circuit with monotonous regularity, blowing the 1A fuse as it does so. Once you have the location of these two items in mind they can be checked without having to swing the panels out.

The upper line scan panel is a hot bed of dry-joints, and it's well worthwhile examining the goodness of every soldered connection here, preferably under a strong light. It can be said that approximately three out of four complaints on this chassis are due to poor contacts on the line scan panel, ranging from complete non-operation to intermittent lack of width and bowed sides. These latter faults call for more detailed explanation, since they can lead one a merry dance if the facts are not fully appreciated.

The upper, left-hand timebase panel carries the sync/line oscillator i.c., the field timebase i.c. and the EW raster correction circuit, i.e. the circuit that drives the diode modulator on the line scan panel. Of the preset controls ranged along the top of the timebase panel, the two on the left-hand side are the width and EW shaping controls. The former varies the amount of correction applied to the line scan whilst the latter determines the shape of the correction. Adjust them using a test pattern.

The snag occurs when they don't have any effect, thus showing that the circuit is inoperative. Whilst the trouble could be due to a faulty component on this left side panel (the EW output transistor Tr2150, type BD238, is suspect), all too often the point of disconnection is on the right side line output section – a sharp tap on the panel will often produce a distinct spark to reveal where the faulty contact is hiding, probably in the area of the filter coil L3134.

Whilst in this neck of the woods, a prime cause of loss of line scan is the scan correction/coupling capacitor C3135 (0·91μF).

We have said that D3133 (the BY223) is a frequent offender. Quite often during its dying moments it feeds a high pulse voltage back into the EW correction circuit. It's not unusual therefore to find that the raster is a peculiar shape after this diode has been replaced, with the EW control having no effect. It is then necessary to check the correction circuit, particularly Tr2150 which will often be

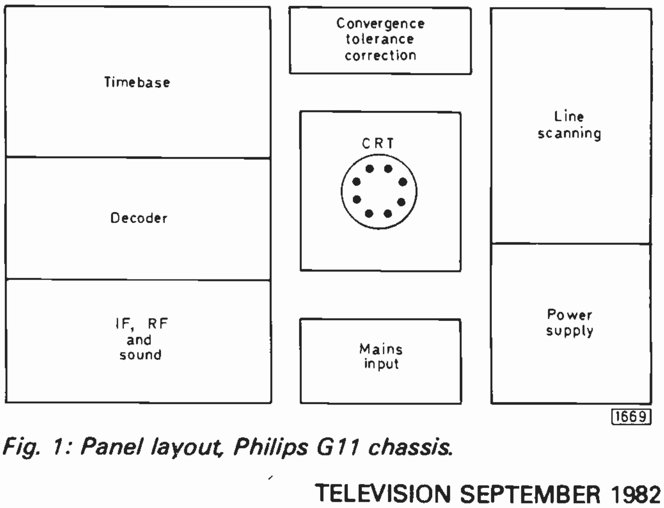

Fig. 1: Panel layout, Philips G11 chassis.

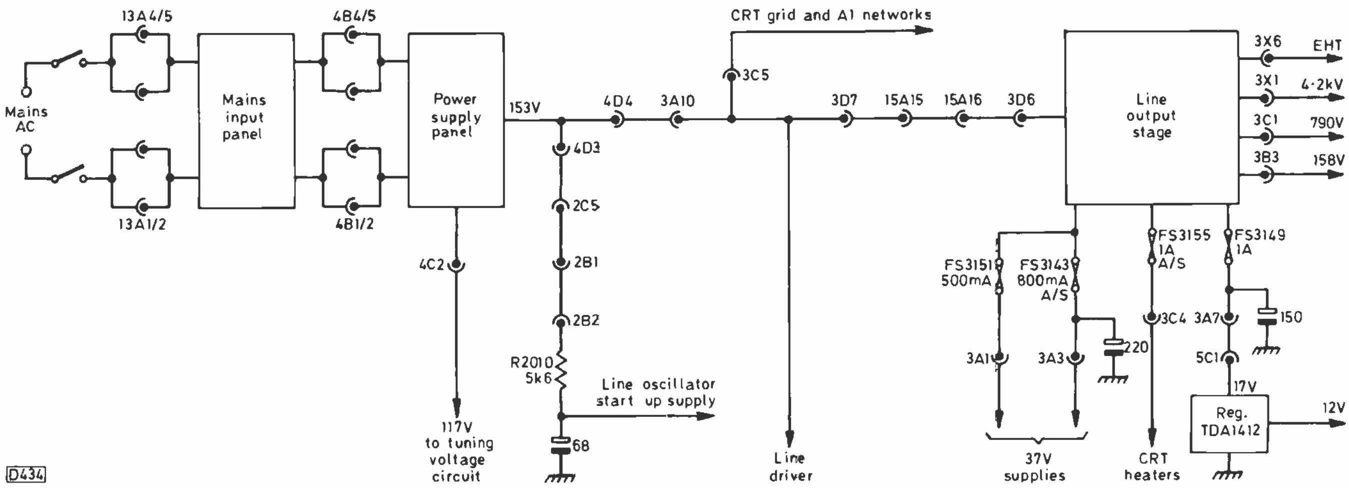

Fig. 2: Power supply paths. Connectors 15A15 and 15A16 are on the convergence correction panel.

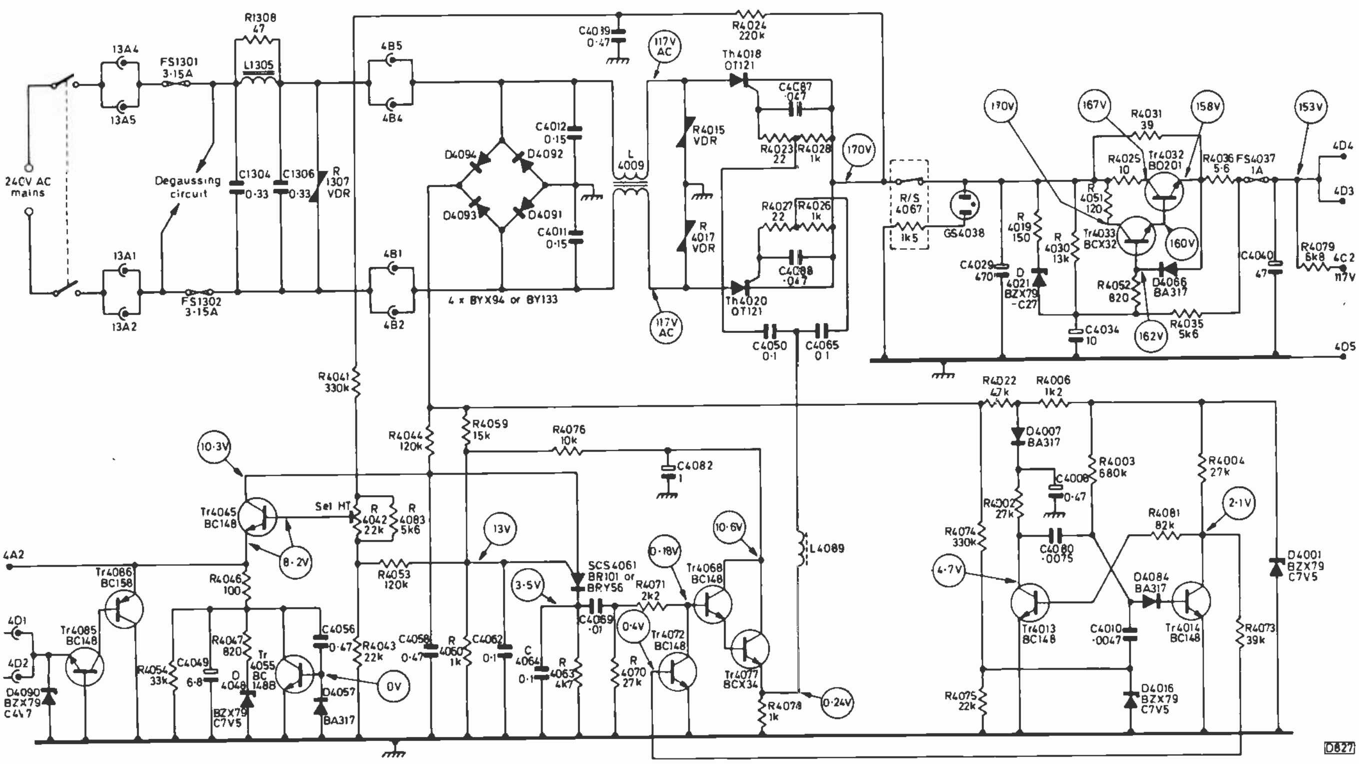

Fig. 3: H.T. supply circuit used in the G11 chassis.

found open-circuit. This is the pnp power transistor mounted on the left-hand heatsink. The collector is the centre pin, the connections being marked on the panel. Test with the red probe of the ohmmeter connected to the base and the black probe to the collector or emitter to get the low conductive reading. The readings with the probes reversed should be much higher, including collector (earthed) to emitter, but allowance must be made for the presence of D3132 on the line output panel when checking with the red probe to the emitter. If Tr2150 is in order, check back to Tr2149 (npn), Tr2140 (pnp) and for good measure Tr2119 (npn) – see Fig. 4.

A fairly common situation is that the power supply panel is properly supplied with a.c. but will not produce a d.c. output, i.e. there's no voltage at the h.t. fuse. One then turns attention to the control circuit, which includes a beam limiter arrangement. The transistors used for this purpose (Tr4085/6) are definite weak links. Check them both before taking any other action and you may save yourself a considerable amount of time. Then check the

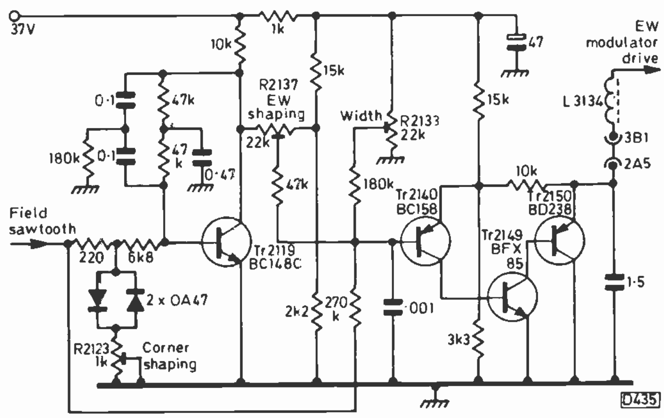

Fig. 4: EW modulator drive circuit.

other transistors in this area and their supply resistors. There are quite a few high-wattage resistors which can go open-circuit, and a simple finger check will soon verify whether they are performing their usual function or not, i.e. high-wattage resistors do not remain cold if they are working and being supplied. A regular offender is R4059 (15kΩ, 9W).

Failure to Start

There are several possibilities when there's h.t. at FS4037 but the set fails to start. The h.t. must reach the line output transformer and thence via the windings and R3120 (15Ω) the collector of the BU208A line output transistor. This can be speedily checked by applying the meter's probe to the body of the transistor. If h.t. is present, the circuit is intact. All too often it isn't present, generally due to a dry-joint at one of the interconnecting plugs and sockets – 3D7, 15A15, 15A16, 3D6. Time spent checking through these edge connectors may not only reveal the cause of the trouble but also uncover a possible source of future trouble. If you think we're being rather pessimistic about dry-joints on this chassis you are right, we are.

Whilst the hot bed is the top right panel, there are other areas prone to this trouble, mainly the top centre convergence correction panel and the top left timebase panel. Indeed the reason for the failure to start may well be found on this latter panel, since the line oscillator start-up resistor R2010 (5·6kΩ) is to be found here – it's a wirewound in a fairly obvious position at the lower centre of the board. Whilst it is unusual to find this resistor open-circuit, it does tend to develop a poor connection to the panel, thus causing intermittent operation with the complaint "once it starts it doesn't go off again – it's getting it to start that's the trouble".

Another cause of no results is failure of the line driver stage. Check its feed resistor R3106 which may be open-circuit.

Fault Summary

Suppose there's e.h.t. but no sound or raster. It's worth knowing that the 12V regulator IC5073 (TDA1412) on the bottom left i.f. panel can be responsible for this. With no 12V line the RGB output transistors will be without base bias and thus cut off, in turn biasing off the tube.

The BU208A line output transistor goes short-circuit from time to time, and there can be repeated failure for no apparent reason. In the latter event the recommendation from Philips is to replace the h.t. reservoir electrolytic C4029 – some types fitted during production have a tendency to develop a high internal resistance, resulting in damaging h.t. surges.

Such a surge can also kill the TDA2600 field timebase i.c., whose heatsink occupies a central position on the timebase panel. This is one of the items that is likely to require attention sooner or later. Trouble here is usually heralded by the unmistakable white line across the centre of the screen, i.e. field collapse. The 800mA LT3 supply fuse FS3143 on the line scan panel may or may not be blown, but the i.c. is nearly always to blame. Good contact with the heatsink and a smear of heatsink compound are necessary to avoid an early repeat performance.

So there we are then, a fairly reliable chassis but let down by the items mentioned above – and those dry-joints. In our experience the succeeding K30 chassis has proved to be 100 per cent reliable to date, so we won't be dealing with it in the present series of articles.

Service Notebook

George Wilding

The owner of a Pye hybrid colour set reported that the sound had suddenly gone and at the same time the picture had collapsed to a few bright horizontal lines. He'd then hurriedly switched off. Since the sound and field timebase circuits both depend on the presence of negative l.t. rails it seemed that the common cause of the faults was the absence of these supplies. On switching on however the fault we were presented with was a blank raster – though adequate e.h.t. soon developed. We then noticed that the tube's heaters were out, revealing the true cause of the fault – the fact that the primary winding of the mains transformer was open-circuit. The horizontal lines that had been seen briefly before switching off were due to the thermal lag of the c.r.t.'s heater/cathode assemblies.

A few days later we came across a similar case, though this time the cause was slightly different. The transformer, though electrically and physically similar, had a different tag arrangement and a miniature thermal fuse in series with the primary winding. This fuse was open-circuit.

Incidentally the mains transformer and h.t. smoothing choke in these sets are mounted in line, with a common centre securing screw which is particularly difficult to get at unless you have the correct size box spanner. The best way sometimes is to grip the base of this self-tapping screw with a pair of cutters and turn it clockwise. Replacing the screw is worse still. I've found that the best way is to lay the subchassis on its side, then use a two or three inch long machine screw, securing this with a nut on the outside. The excess screw length can then be broken or cut off.

Line Oscillator Trouble

We had an unusual fault the other day with an ITT hybrid monochrome set (VC200 chassis) that had been stored away for some months in a somewhat damp atmosphere. When we switched the set on we got the no results symptom, due to lack of drive at the control grid of the PL504 line output valve. A new PCF802 oscillator valve failed to restore the drive, so as the capacitors (C124-7) in this stage are often the cause of line oscillator failure they were replaced. This produced a first class picture, but after a short while a very pronounced quivering on the line developed, while at almost regular intervals the raster would greatly reduce in width – erratically – and then collapse to a thin vertical line before the screen blacked out. Within seconds there'd be a full sized raster, followed by the same symptoms.

There was no voltage at the PL504's control grid when the raster collapsed, so there was obviously a further fault in the line oscillator circuit. There's not much else here, so after checking resistor values we decided to replace the line oscillator coil. This resulted in completely stable operation of the line timebase. We've never before come across such symptoms due to a faulty oscillator coil, and can only assume that storage in the damp atmosphere greatly impaired its insulation.

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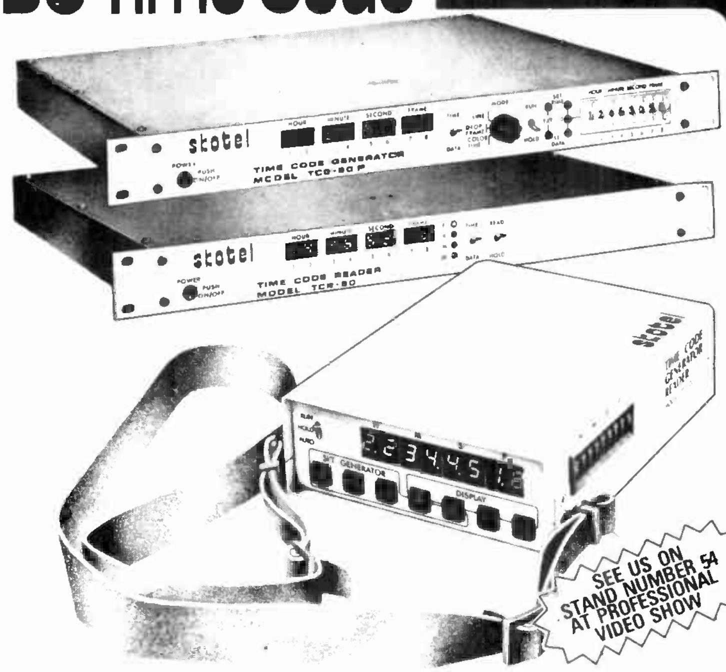

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Reception at 11·6GHz

Chris Wilson, G8ZCK and Grahame Harding, G3WRU

It should be made clear at the outset that the receiving equipment described in the following article is entirely experimental. We set out to receive signals from the OTS-2 satellite and achieved our aim, though the results in terms of a reasonable quality display leave much to be desired. Our experiments are continuing, and the next steps we will be taking are mentioned later.

The OTS-2 satellite was launched into geostationary orbit by the European Space Agency in May 1978. The purpose was to carry out propagation studies to provide experience prior to the start of DBS (Direct Broadcast Satellite) transmissions in the mid-eighties. A further satellite, the ECS (European Communications Satellite), is due to be launched next year as the life of OTS-2 approaches its end – OTS-2 has already been moved from its original position at 10°E to 5°E to make way for the ECS.

The uplink to OTS-2 is in the band 14·1-14·5GHz. The centre frequency for the spot-beam, i.e. high-gain aerial, downlink is 11·64GHz. Two 120MHz bandwidth transponders use this aerial. There are also two 40MHz bandwidth transponders which use a low-gain aerial and have a centre frequency of 11·51GHz and two beacons, for telemetry and propagation/alignment, which transmit at 11·786GHz (just inside the new DBS Band VI) with circular polarisation.

Of most interest to us were the two 120MHz channels as these carry TV signals, in particular the Satellite Television Ltd. transmissions during the evening between 7·30 and 9·00 p.m. and experimental programmes from the EBU. The spot-beam aerial has an e.r.p. of 35kW, either vertical or horizontal polarisation being used. Frequency modulation is used for the video signals, with a bandwidth of 27MHz (sometimes 38MHz) and a peak deviation of 13MHz (25MHz when the bandwidth is 38MHz). The path loss from the satellite is 206dB plus, and with a 3 metre dish orientated to receive the spot-beam carrier an output of −111dBW can be achieved. In reality this means that with a smaller (1·8m) dish and a simple amateur 10GHz receiver realigned for reception at around 11·6GHz recognisable pictures can be received, with fairly low noise in the grey parts of the picture rising towards white or black depending on whether the video modulation is positive- or negative-going. There is some scrambling, and a 25Hz triangular waveform is added to the signal to give energy dispersal – the idea of this is to prevent the video sidebands settling at any spot frequency that might interfere with terrestrial

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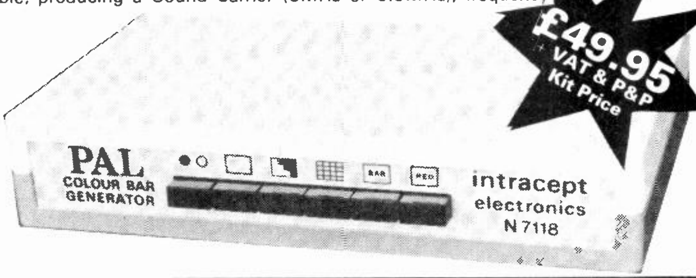

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The patterns available are colour bars, crosshatch, 8 step grey scale wedge, peak white plus many other combinations i.e., red raster, blue raster, yellow crosshatch etc., as defined by the three (red, green – blue) beam switches on the front panel. The generator is powered by an internal Ni-Cad battery and is supplied complete with the Charger/Power Unit.

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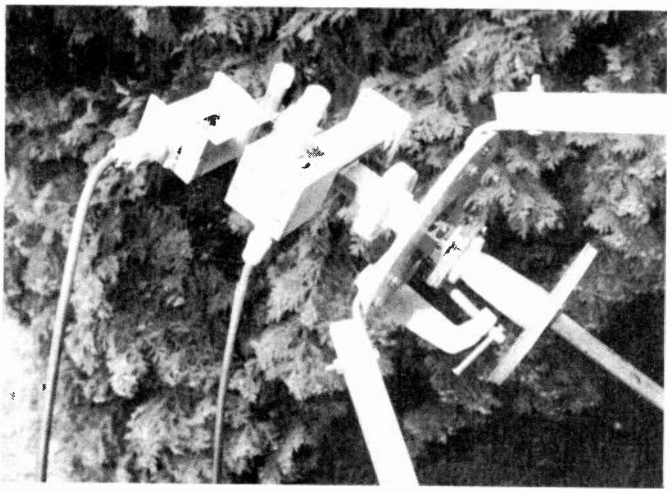


The head unit.

microwave links.

We approached the problem with experience of DX-TV reception but very little experience of microwave matters. It seemed logical to experiment with 10GHz amateur equipment, and the head unit we devised was based on a receiver we'd already used. The basic arrangement is shown in Fig. 1 and it will be seen that waveguide is used to carry all the s.h.f. signals. The waveguide is rectangular and conveys the signals with little attenuation, at the same time ensuring a fixed polarisation. For those new to s.h.f. work it should perhaps be mentioned that coaxial cable introduces unacceptable losses at such frequencies due to the series resistance and shunt capacitance present. A waveguide of appropriate dimensions enables an s.h.f. signal to be propagated from one point to another with little loss.

A feed horn at the focus of the dish collects the signal from the satellite and couples it to the waveguide. To change from one polarisation to another the whole unit is simply rotated through 90°. For initial checking of the signal the unit can be mounted at 45° to receive either polarisation. The signal travels along the waveguide and is picked up by a probe at the other end. A point-contact diode mixer (AEI type CS8B from Birkett of Lincoln) is also connected to this probe.

A second section of waveguide is mounted at 90° to the first and is coupled to it by means of two directional cross-coupling holes (see Fig. 2). The Gunn diode local oscillator is mounted at one end of this section of waveguide, the other end being terminated by a wedge of wood which forms a dummy load to prevent energy reflection. A small proportion (10dB) of the local oscillator's energy is thus directionally coupled to the first section of waveguide and travels along this towards the diode mixer. The mixer produces an i.f. output which we chose to be at 180MHz with the local oscillator operating at around 11·46GHz.

The Gunn diode is mounted in a resonant cavity and is tuned by a micrometer rod which screws into the cavity. A stabilised power source of 6-11V at 150mA is required for the diode. The i.f. output must be matched and coupled directly into the low-noise i.f. amplifier. This first i.f. amplifier uses a 3SK88 dual-gate MOSFET with an untuned output to preserve a fairly wide bandwidth. The noise factor of this stage should not exceed 1·5dB.

The accompanying photograph shows the complete head unit at present being used. The 180MHz output is conveyed to the indoor unit by means of standard coaxial cable. No attempt has been made to improve the image response at the head, whose overall noise figure is estimated to be around 8dB.

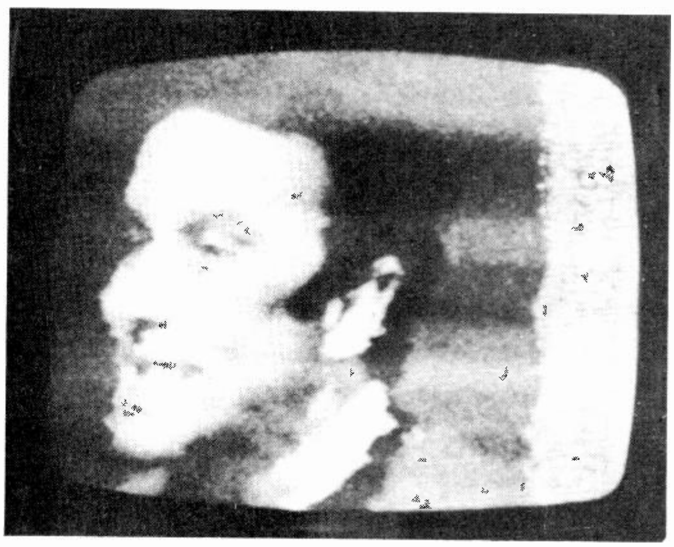
Fig. 3 shows a block diagram of the indoor unit – Fig. 4 shows some of the circuitry in more detail. The i.f. input is fed to an ELC2060 tuner unit, tuned to Band III, and then passes via a 6·5MHz filter (a Philips selectivity module tuned for maximum bandwidth) to an OM355 hybrid i.c. acting as a wideband amplifier. This in turn feeds an NE561 phase-locked loop i.c. that acts as the f.m. demodulator. TV people to whom this idea might appear novel should simply recall how a line sync phase-locked loop produces an output voltage proportional to frequency shift to control the line oscillator. The circuit used here was originally proposed by Steve Birkill (see *Television* June 1980, page 430).

The rest of the circuit consists of a two-transistor plus i.c. video amplifier, with a phase-splitter to cater for positive- or negative-going vision modulation. The TDA1034 operational amplifier provides a low-impedance output for feeding to a monitor or up-converter.

Results

Our initial attempts at receiving a signal were hampered by an unstable Gunn oscillator and the fact that we didn't know at the time that the satellite's position had been changed. Reception was finally achieved after several weeks of experiments. The results, after adjusting and aligning the system, can be seen from the accompanying photograph. We have not so far managed to receive the sound, though 5·5, 6 and 6·5MHz subcarriers have been tried. Weak colour has been noted on occasions.

At the moment we are both changing over to a Cassegrain feed system, i.e. the use of a small hyperbolic subreflector to reflect the signal back so that it can be taken from the rear of the dish, with some increase in the gain. We are also working on adding gallium-arsenide f.e.t. low-noise amplifiers to our systems. Further work is required to eliminate the effects of the energy dispersal – and to probe the signals for sound and colour.



Typical reception – STL on programme.

Setting Up the Head Unit

To set up such a head unit you will require a freshly calibrated cavity wavemeter and a Gunn oscillator source at 11·64GHz. The set-up shown in Fig. 5 is recommended

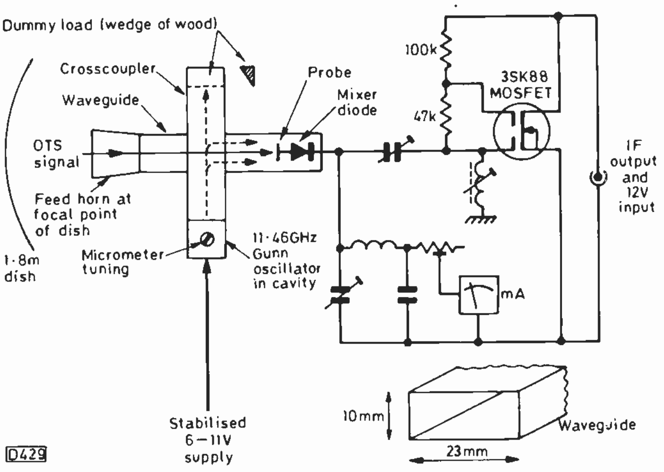


Fig. 1: The head unit. The waveguide dimensions given apply to standard X band (8·2-12·5GHz) waveguide type WG16, which is available new, with flanges, from Earth Stations Ltd., 22 Howie Street, London SW11 4AR. Type WG17, which handles 9·84-15GHz, would be suitable for Band VI DBS use. The lower cut-off frequency for waveguide occurs when the wider dimension is twice the free-space wavelength of the signal – the wave then bounces against the sides of the guide at too steep an angle to be propagated along the guide.

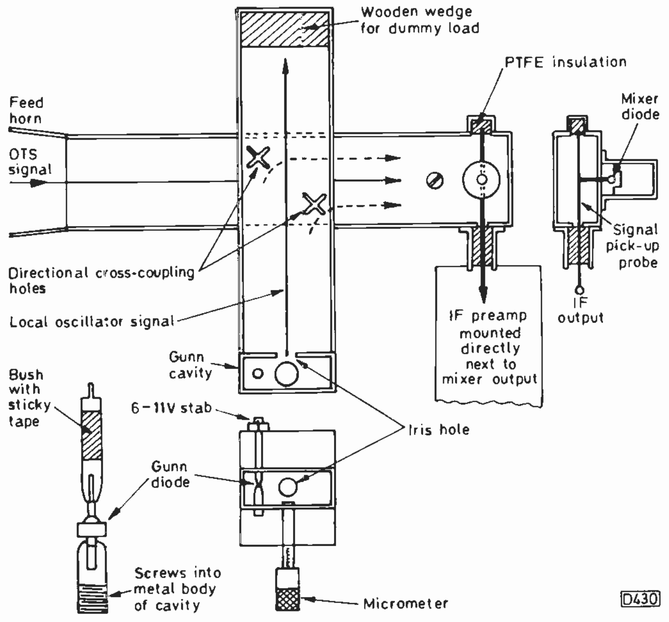


Fig. 2: Mechanical head unit arrangements in more detail. The configuration of the cross-coupling holes is such that the signal to be coupled cancels in one direction and is reinforced in the other, thus giving directional coupling.

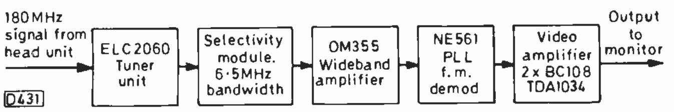


Fig. 3: Block diagram of the indoor unit.

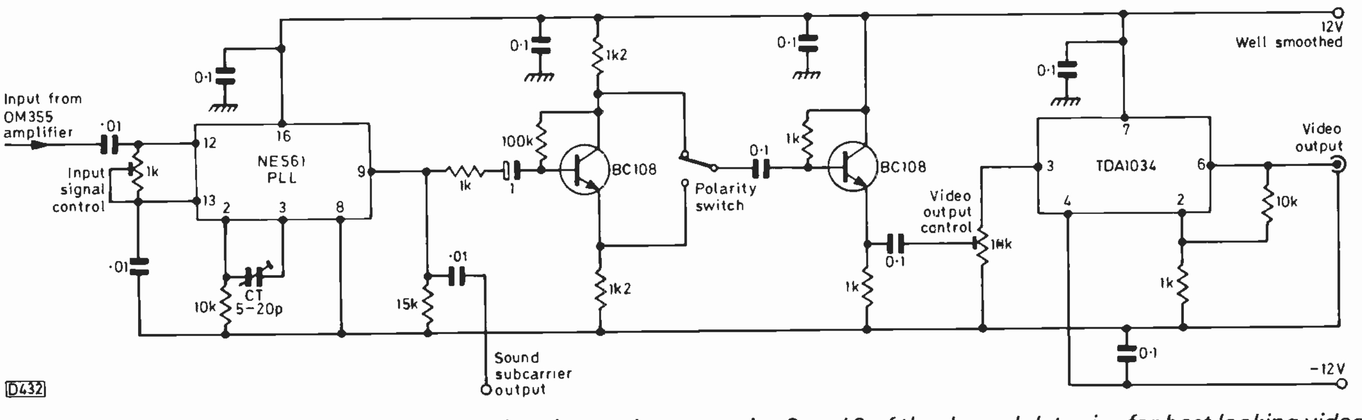


Fig. 4: Demodulator and video circuits. Tune the trimmer between pins 2 and 3 of the demodulator i.c. for best looking video and noise – the deviation of the voltage, which is negative- and positive-going, can be measured at pin 9 of the i.c.

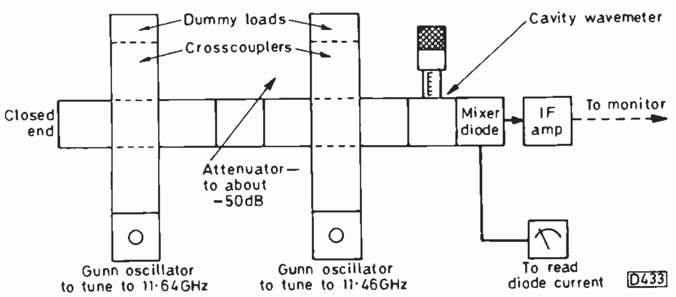


Fig. 5: Set up for aligning the head unit.

– note that an open Gunn waveguide is a health risk, especially to the eyes. Provision must be made for reading the mixer diode current.

Set the 11·64GHz reference signal source on frequency, using the cavity wavemeter and mixer diode current meter. The cavity wavemeter will show a dip as resonance is found in the diode current reading. Tune the local oscillator diode to 11·46GHz, using the same means except that the mixer diode current reading must be set between 200-1,500μA. Connect the indoor equipment and tune the first i.f. stage for maximum noise. Tuning either Gunn diode to obtain the chosen difference frequency (180MHz) will then remove the screen noise.

Advance the attenuator until noise creeps back, then adjust the first i.f. amplifier again, this time for lowest noise. The mixer tuning screw's position can be predetermined. At this stage the 11·64GHz Gunn source and the attenuator can be located at some distance and the adjustments rechecked. Once you've done this, attempts at OTS-2 reception can be made – with the dish correctly aligned of course.

The system at present being used by Grahame Harding differs in some respects to that described above. The i.f. is 430MHz, with a GaAs f.e.t. as the first i.f. stage feeding an amateur TV converter. The two systems have provided identical results so far, but after further work Grahame's system will have a better image response while the noise factor of the first i.f. stage is lower at 0·7dB. Special thanks are due to Glen Brunt who assisted with the construction of the system.

VCR Clinic

Reports from Steve Beeching, T.Eng. (C.E.I.), Derek Snelling and Mike Phelan

Toshiba V8600

Had a call from a school the other day, the complaint being that the remote control on a Toshiba V8600 didn't work. The playback of recorded information was fine, but if cue and review, slow motion or still frame was selected there was no picture. Well, that's to say that on the school's TV set, an old Pye valve receiver with a long time-constant in the line sync circuit, the screen was just black with a couple of large white horizontal bands.

On my test TV set it became clear that the output from one of the slow-motion heads B′1/B′2 was missing. The scope, triggered from the head switching pulses, was then linked up to display the slow-motion outputs from the heads. That from B′2 was a bit low whilst that from B′1 was very high, much higher than normal, as though there was instability. The preamplifiers were cleared of suspicion by swopping over the head connectors. The B′1/B′2 preamplifiers provided reasonable outputs when fed from the normal heads, though with multiple tracking errors of course.

So it was down to the heads, and the four-head assembly was removed for inspection. Close examination revealed that head B′2 had a chip missing from it. It was head B′1 that was the problem however – established fairly simply by inserting a small link across the head connections. With the link shorting out head B′2 there was no output at all, whereas with the link across the B′1 head connections a residual display could be seen. Now although the B′1 head produced the highest output this didn't contain any picture, so its output was noise.

A new head drum was fitted, with all the alignment this involves, but the result was the same. So it was necessary to remove all connections and check through the rotary transformer and interconnecting transformer windings, looking for an open-circuit. None was found. Eventually, a small amount of resistance was measured between the red B′1 connecting wire and chassis. The rotary transformer connecting wires enter the drum assembly via a hole which is blocked by a plastic plug, thereby securing the wires or in this case squashing them against the lower drum chassis and cutting through one of them. The cure was to throw away the plastic plug and sleeve the damaged cable. The new head assembly was then refitted and realigned. I say realigned – initially proper slow motion couldn't be obtained as one of the B′1/B′2 heads was out of alignment. The B′2 head is higher off the deck assembly reference than head B′1, and there's a complex dihedral adjustment which involves setting the heights of the heads. This should *not* be attempted without the supplementary information from Toshiba. **S.B.**

Panasonic NV8600

A dealer asked me to look at a Panasonic NV8600 which wouldn't record. It had been back to Panasonic several times and had run up a fair bill – also insinuations that the dealer had been "at it". When I took a look at it there were no signs of maladjustment, apart from the fact that the record f.m. carrier was way off frequency and was not being modulated by any video. The record colour-killer switching didn't function either.

Further checks were made around the f.m. modulator i.c. (IC301), and I couldn't find any output from the pre-emphasis section – there was no signal at the peak-white clipper or black clipper or pin 12 of the i.c. It was reasonable to assume that the i.c. was defective, so I sent for a new one and fitted it. All to no avail.

I decided to trace a grey-scale signal through the i.c. The signal levels were correct up to pin 18, which feeds Q301, a buffer transistor for a signal peaking network. The signal at TP304 was suspiciously low, and Q301 was found to be open-circuit base-to-collector. It was thus providing no amplification, whilst its low base impedance was attenuating the signal. After replacing Q301 full alignment of the f.m. carrier circuit was required – C320 for 3·8MHz corresponding to sync tips, and R316 for 4·8MHz corresponding to peak white. The white and dark clipper levels and the record colour-killer control were also reset. **S.B.**

Toshiba V8600

The fault with a Toshiba V8600 was "o.k. in fast forward or rewind, but won't play or record". We found that the tape slack detector (a magnet and reed switch, operated by tape tension) was energised, with the result that the stop solenoid was in operation. The slack tape was due to no tape take-up because the play solenoid was not pulling in. When given a slight push the core snapped home and the machine worked perfectly – unless stopped again.

Solenoids of this type have a tapped winding (see Fig. 1), with one section to pull the solenoid in and another added to hold it, using less current. A pulse is used to energise the start winding, and the cause of the fault was

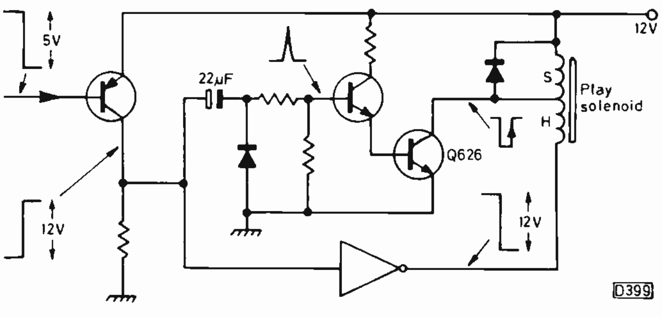


Fig. 1: Play solenoid circuit, Toshiba V8600.

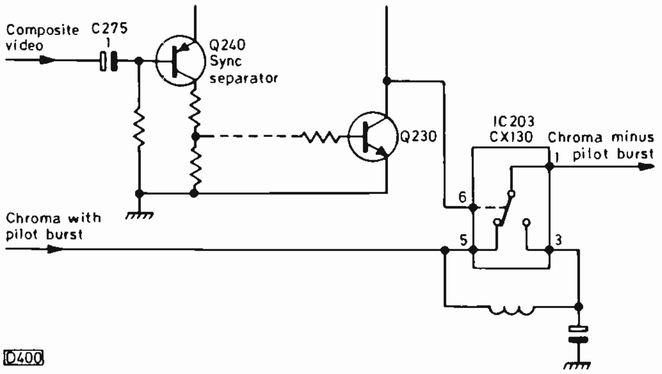


Fig. 2: Pilot burst switching, Toshiba V8600.

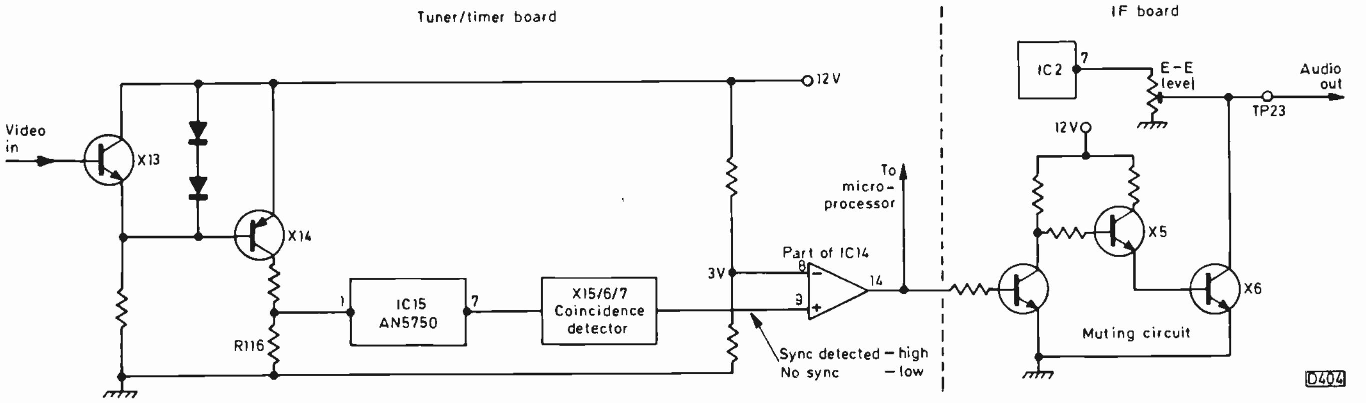


Fig. 3: Sound muting circuit, Ferguson 3V23.

simply the absence of this pulse due to Q626 being open-circuit.

A fairly common fault on this machine is no output from the r.f. modulator due to Q661 going open-circuit. This robs the modulator of its 12V supply.

There was a very strange fault on another V8600: the playback picture had a vertical black stripe in the centre and the colour at the top was broken up into horizontal bars. When we looked at the video waveform at the rear socket we could see a notch in the middle of each line, with no chroma and the pilot burst (inserted on record in the Beta system) still present on the line sync pulses. The pilot burst should be removed on play-back by the "cleaning" circuit. This consists of a switching i.c., type CX130, which "dumps" the pilot burst into an electrolytic (see Fig. 2). The switch drive pulse at pin 6 was far too wide and varied with the picture content. It's derived from the sync pulses in the composite video signal, so it appeared that the sync separator stage's bias was incorrect. On checking here, the coupling electrolytic C275 was found to be very leaky. **M.P.**

Ferguson 3V22

Two Ferguson 3V22s came in with clock faults: in both cases the tens of hours digit would show only 2 or 3, cycling from 20·00 hours to 39·59 hours. In neither case was the clock i.c. at fault, the two transistors X1 and X2 having to be replaced in both machines to cure the problem. Incidentally the clock/timer board uses double-sided print, making the removal of these transistors rather tricky. **D.S.**

Ferguson 3V23

Things are not always what they seem to be in the world of VCR servicing. The fault on a Ferguson 3V23 was no sound in the E-to-E mode, and we thought that this would be due to a simple i.f. or audio fault. Our first check was in the i.f. strip, to see if any audio output was coming from the detector i.c. (IC2, see Fig. 3). There was, but it was being muted by the conduction of X5 and X6. This was in turn due to the output from pin 14 of IC14 being low instead of high.

IC14 is on the tuner/timer board, the idea being to mute the sound during sweep tuning. Briefly, the sweep tuning system works by first detecting the presence of a sync signal. This slows down the sweep rate, via the microprocessor. The positive end of the a.f.c. S-curve is then met, slowing the sweep rate down further. The a.f.c. then crosses zero and goes negative. The sweep slows down and reverses, stopping at zero a.f.c.

IC14's output was stuck low, so that although the sweep tuning was apparently normal no sync detection was taking place. A standard AN5750 sync/line oscillator i.c. is used for sync detection, followed by a discrete component coincidence detector circuit. On checking back we found that there was no video signal at pin 1 of IC15 whilst X14 was cut off, both due to R116 being dry-jointed. **M.P.**

Hitachi VT8500

The problem with a Hitachi VT8500 was no stop when using the remote control. Use of another remote control unit confirmed that the fault was in the machine, and a quick look at the circuit showed that as the stop function only was affected the most likely suspects were Q23A and IC04A. A meter check showed that the gate in IC04A was not working, a replacement i.c. curing the problem. **D.S.**

Sanyo VTC9300

We've had several Sanyo VTC9300s with the complaint "intermittent recording". In each case the cause has been a noisy luminance record current potentiometer – VR1, on the left-hand (W1) panel. **M.P.**

Philips V2000

We had our first Philips V2000 type machine in for repair the other day. The complaint was noise in the top half of the picture, getting worse as the machine warmed up. Luckily we had a stock machine, so a quick go at panel swapping eliminated what seemed to be the most likely boards (tape servo, drum servo and dynamic tracking). The next step, replacing the head drum, cured the problem – I don't think that the drum is any easier to change than on a VHS machine. **D.S.**

Sanyo VTC9300

I've had another Sanyo VTC9300 with the problem that it would go into pause after half an hour, then switch off. Bearing in mind the previous case (June VCR Clinic), I immediately changed the diode (D817) across the pause solenoid coil. This failed to cure the fault however, as did changing the driver transistor. Freezer was used and it seemed that D819 was defective – sure enough it read short-circuit. Changing it still left us with the fault however, and we eventually had to replace D814 as well. **D.S.**

A Successful LOPT Transplant

Keith Hamer and Garry Smith

PERHAPS the most irritating fault that can occur on an ageing TV set is failure of the line output transformer – especially when the c.r.t. and the rest of the receiver are in good working order. Over the past decade we've been operating several Bush TV125 series dual-standard sets as DX-TV monitors. They were originally obtained as "scrap", but following renovation have given reliable service.

A couple of years ago the inevitable happened: the width on one of the sets suddenly decreased, with an accompanying dark patch in the centre of the screen. We'd had this fault many times on the later A640 and A774 chassis, and on nearly every occasion the cause had been the line output transformer. Other possibilities were checked, but it was obviously the line output transformer that was responsible. We had several salvaged transformers as spares, but each turned out to be defective – we fitted no fewer than seven before substituting one from a working set to prove the point. We could have obtained a replacement of course, but as one of the salvaged ones looked relatively new this was considered to be risky.

An alternative solution was sought therefore, and we decided to consider using a transformer from a completely different chassis. After careful consideration we decided to try the 15kV jelly-pot line output transformer, with its clip-on e.h.t. doubler, from the Thorn 1500 chassis. Line output transformer failure is rare in the 1500 chassis, though the doubler or tripler (high e.h.t. versions) sometimes fails, while the transformer is easy to fit with the minimum of mechanical ingenuity. The e.h.t. unit simply clips on to the transformer assembly – the fully-encapsulated type is preferable to the open-tray variety. There's no reason why a transformer and tripler from an earlier Thorn chassis should not be used, but it's important to bear in mind that 23 and 24in. models employ a tripler giving an e.h.t. of 20kV. When using a Thorn transformer as a replacement it's important to use the correct combination of transformer and e.h.t. unit. The 1500's 15kV transformer is identified by a pink or green stick-on disc, while the 20kV type has a white disc. The original e.h.t. units are similarly coded to match the transformers.

Wiring in the New LOPT

A look at the TV125's circuit diagram revealed a rather complex rat's nest of circuitry around the line output stage. The set operates on 405 and 625 lines however, and as only 625-line operation was required a certain amount of simplification was immediately possible. Our main concerns were whether the PL36 line output valve used in the TV125 would be suitable for use with the jelly-pot line output transformer, and whether the scan coils could still be used.

As a start, all the line timebase components associated with 405-line operation, including the system switch beneath the chassis, were removed and the wiring tidied as necessary. The vertically mounted subpanel carrying the scan-correction components (adjacent to the transformer's screen cover) was then dismantled and the existing line output transformer was removed from its mounting base. Rather surprisingly, the 1500 transformer fitted on to the base neatly, and we secured it with self-tapping screws. When in position the new transformer looked a little lost, and there was plenty of space for the voltage-doubling e.h.t. unit. The e.h.t. unit was clipped into place and the e.h.t. lead routed so that it was clear of any metalwork or high-temperature components. There are only seven connections to make to the jelly-pot transformer (see Fig. 1), and provided care is taken the wiring is straightforward. The 160pF 8kV fifth harmonic tuning capacitor (disc type) was mounted on the transformer and connected between tags B and E.

Testing

After a thorough check on the wiring, we switched the set on and allowed it to warm up. A back-to-front picture appeared, so the set was switched off and the line scan coil connections were reversed. This was simple, as the original plug and socket on the scan-correction panel had been retained. The set was then switched on again, but when the picture appeared its linearity was totally unacceptable. A set of Thorn scan coils was next tried, and as this gave only a marginal improvement we fitted a "paper" horizontal linearity correction sleeve between the tube's neck and the scan coils (a linearity inductor was used in the original circuit). This dramatically improved the linearity and width. The Thorn 1500 manual recommends positioning the sleeve with its moulded ring 3mm. from the edge of the deflection coil moulding, adjustment being within the tolerance limits of 0-5mm. Further improvement was obtained by increasing the value of the scan-correction capacitance – by adding a capacitor of approximately 0·022-0·05μF in parallel with the 0·1μF correction coupling capacitor. Also by adding a 180pF capacitor from the anode of the pentode section of the PCF80 line oscillator valve (pin 6) to chassis to modify the line drive waveform.

Results

This transformer transplant has been found to be worthwhile. Apart from a new lease of life, the receiver's warm-up time is appreciably quicker with the non-thermionic e.h.t. system. Anyone contemplating this particular modification to the TV125 is advised to have both circuit diagrams available for reference. Great care should be taken when making the soldered tag connections to the line output transformer – due to the construction, prolonged application of heat can cause damage.

Flywheel Sync Modification

An important point is that two opposite-polarity reference pulses are required by the flywheel sync discriminator used in the TV125, the 1500's transformer being intended to provide a single pulse (from tag D).

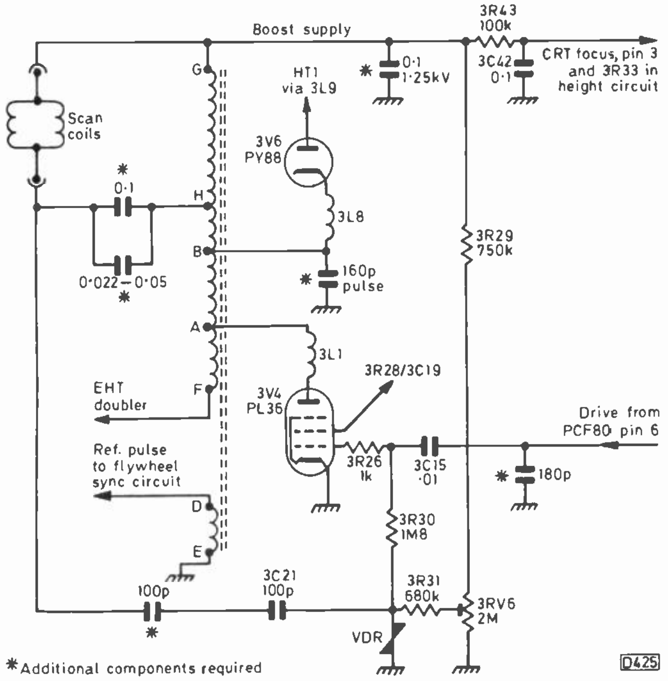


Fig. 1: The jelly-pot line output transformer used in the Thorn 1500 chassis installed in a Bush TV125 – components prefixed 3 are present in the original Bush circuit, those marked with an asterisk are additional.

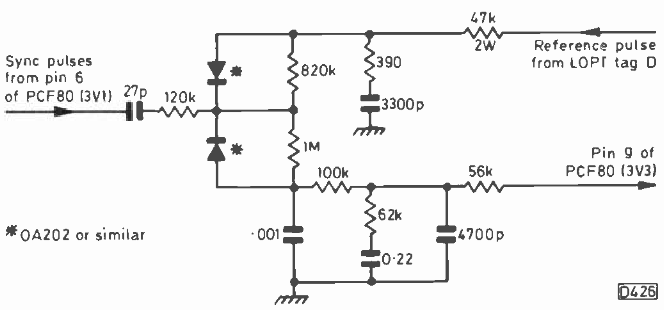


Fig. 2: Improved flywheel line sync circuit for the Bush Model TV125 (Murphy V849).

This was not a problem for us as we'd already fitted the improved flywheel sync circuit shown in Fig. 2, and this requires only one reference pulse feed. This modification should also be made therefore – the components can be grouped on a short length of tagstrip, which can be secured to the chassis in the space vacated when the original flywheel-sync components have been removed.

Other Sets

A similar approach to line output transformer substitution is feasible in other sets. Note that in some chassis the l.t. supply is derived from a winding on the transformer. This could possibly be derived from the mains via a small transformer, though additional smoothing would be required since the output from the rectifier would be at 50 or 100Hz instead of at line frequency.

We subsequently carried out the modification on another Bush TV125, and both sets have worked for over two years without problems. It should be pointed out however that when a major modification of this type has been carried out only the passing of time will tell whether it has been a success. Also that no such modifications should be carried out to more recently manufactured BEAB-approved receivers.

next month in TELEVISION

● FREQUENCY SYNTHESIS TUNING

The modern way to go about channel tuning in a TV set – no switches or potentiometers, everything done electronically instead. Basically, the local oscillator frequencies are stored in digital form in an i.c. memory. To tune in, the required programme is selected and the tuning system compares the actual local oscillator frequency with the required frequency. The local oscillator is then pulled in to tune to the required channel by the frequency synthesis control system.

● GARBLEDEGOOK

Last year saw a significant rise in sales/rentals of teletext equipped sets. This increase seems to be continuing. From the servicing viewpoint, this means a much greater chance of being called out to deal with a garbled text display. The basic problem is to decide whether the aerial, the receiver or the decoder is faulty – or maybe the customer is being over fussy. Eugene Trundle outlines the approach to adopt and some test procedures (eyeheight checking etc.).

● MICROCOMPUTER CONTROL OF VCRs

Microcomputer control is rapidly becoming the norm with VCRs, to cope with the increased number of modes of operation. Basically, it's necessary to ensure that a machine operates on the fail-safe principle, i.e. that no operation is authorised by the control system unless the conditions are correct. Specialised i.c.s could be devised to do the necessary monitoring, but it's simpler to use a microcomputer chip. Brian Dempster describes what happens and why.

● INTERNATIONAL TV SYSTEMS CHART

Most countries now have a TV service, in colour, but a variety of systems are in use, giving rise to many questions and problems. Time we thought to publish a list of these systems, country by country.

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Fault Report

Robin D. Smith

Rank A823 Chassis

On several occasions I've drawn attention to the fact that 6R8 (820kΩ) in the pulse feed network between the line output transformer overwinding and the e.h.t. tripler in the Rank A823 chassis can go open-circuit, the symptoms being a poor picture with flyback lines. A clue is given by the fact that the voltage at test point 4TP1 in the beam limiter circuit falls from −90V to typically −30V. I recently for the first time came across a case where 6R8 had decreased in value, causing very low brightness – the voltage at 4TP1 was in excess of −130V.

On another of these sets that suffered from low brightness I came to the conclusion, after making several tests, that the tube was faulty. The customer agreed to a replacement, but whilst dismantling the set I found that the earth strip from the tube base panel to chassis via the degaussing panel was disconnected. Reconnecting it restored normal brightness and in fact an excellent picture considering the set's age.

I was asked to modify one of these sets for VCR operation, and on checking found that it suffered from intermittent field roll. The field hold control was correctly set, and after thinking for a bit I remembered that there was a modification – it was one of the later versions fitted with the Z513 varicap tuner panel. The modification consists of adding a couple of 4·7μF electrolytics (1C54/5 when present) in series between the slider of the a.f.c. preset 1RV2 and its earthy end (the negative terminals of the electrolytics are connected together). The fault was completely cleared after fitting these capacitors – and the customer was happy with his TV set/VCR combination.

GEC C2110 Series

The set was one of the later ones in the GEC C2110 series – one of those with light-action touch-button tuning (Models C2001H/C2201H/C2601H). The channel selection circuit is on boards PC677/8, the former having four i.c.s on it. The problem we had was random channel changing, and on the advice of GEC technical we added 0·001μF capacitors between pins 5 and 15 of IC1 and IC3 to decouple the 12V supplies to these i.c.s. This cured the fault – also check whether the smoothing capacitor C9 (1μF) is open-circuit. Here are some other recommendations: if the tuner jumps to channel 8, suspect transistor TR1; for sticking on channel 1 when the set is warm, suspect C5; for sticking on any single channel, suspect C1-8 depending on the channel concerned.

An Off Day

We all have our off days. A 20AX GEC set – Model C2217H – was brought in the other day, the complaint being that the aerial socket was broken. My colleague proceeded to prove the point by connecting the aerial directly to the tuner unit. Switch on and bang! – smoke and fuse blowing. This is one of those chassis with a mains bridge rectifier and switch-mode power supply you see, the chassis being at half mains potential. Fortunately the only consequence of the mishap – apart from the blown fuse – was that the surge limiter resistor R502 (2·7Ω) in the power supply had gone open-circuit.

There were other sillies that day. First came an old Thorn monochrome set – one fitted with the 1400 chassis. The h.t. supply was only 20V, but why? – there were no shorts, and if there had been the fuse or a spring-off resistor would have opened. There was 240V a.c. at the mains fuse, but only 110V a.c. at the anode of the h.t. rectifier. The only thing between these points is the surge limiter section of the mains dropper – R125 (16Ω). Well, it transpired that some bodging had taken place. R125 had been replaced by a 6·8kΩ 17W resistor and a 22Ω 5W resistor in parallel, and the 22Ω resistor had gone open-circuit. At least they'd got the total resistance about right.

Next came a Thorn 1500 with a fault I can only describe as an inverted "wine glass" effect – severe lack of width at the top, hardly any width at the centre, widening out to almost full width at the bottom. We suspected the scan coils or the line output transformer, though the latter is very reliable in this chassis. Replacements were tried with no effect, then we did what we should have done to start off with – measure the h.t. This was way down at 160V instead of 295V. The 150μF h.t. reservoir capacitor C88 was open-circuit of course.

Finally a customer brought in a Philips portable (T8 chassis) with the complaint of intermittent field roll. He said he'd replaced the field hold control and this turned out to be so. Only he's used a 22kΩ potentiometer instead of 10kΩ. The correct value put matters right.

Rank Z179 Chassis

The fault on a Rank set fitted with the Z179 chassis (110° delta gun tube) was field jitter with poor field lock. The 25V supply for the field timebase comes from the EW diode modulator and was found to be correct, but a scope check revealed excessive ripple on the line. The reservoir capacitor 4C36 (4,700μF) was low in value.

Whose Responsibility?

The public has to get its sets repaired, but it seems to me that all too many dealers shirk their responsibilities in this respect. We keep getting people in the shop asking us to repair sets because the dealer or discount house from whom they bought the set doesn't want to know once the set is out of guarantee. Our view is that we're not these dealers' service department, and where possible we try to repair only the sets we ourselves have sold. On the other hand we're here to make money. So in walks this gent with a 16in. ITT CVC40, the complaint being that it's dead. The discount house didn't want to know, and it went wrong only when he connected his brand new VCR that he'd bought the day before from the same discount house. Well I thought, he's asked for it. The problem was simply that the mains fuse was open-circuit. It took us two minutes to put this right, but the charge we made was rather more than our usual one.

That same day we received a letter pleading with us to repair a CVC30 which we'd refused to look at previously. Again it wouldn't work with a brand new Sony C7 that its owner had bought from a discount house the week before. They didn't want to know of course. A detailed list of faults was enclosed, together with a cheque for £55 to cover our expenses. Oh well I thought, could be easy money. All the faults turned out to be due to one dry-joint on an earth connection and a faulty coaxial plug. Time taken, half an hour. We'd no conscience about putting the £55 in the till, and the customer was only too happy to have his set back in working order.

Rank Z718 Chassis

There were a couple of faults on a Rank set fitted with the Z718 chassis – very bad field linearity and very poor focus. The latter was the usual trouble on the tube base assembly (corrosion at the focus pin). For the field linearity fault we had to check back to the preamplifier transistor 4VT3, where 4R12 (390kΩ) in the base bias network was found to be open-circuit.

Pye Hybrid Colour Chassis

The fault we had on a Pye hybrid colour set with varicap tuning was very intermittent snow. In view of the intermittent nature of the fault we decided to replace the tuner. This failed to provide a cure, and after much probing around we found that R389 (3·9kΩ) on the CDA panel was dry-jointed – the h.t. supply to the tuning voltage circuit passes via this resistor.

GEC 3135

A GEC monochrome portable gave us a certain amount of trouble recently – it was a 3135, one of those sets with a transistor pump circuit. There was no operation on either the mains supply or a battery, and various checks suggested that the line output transformer was faulty. A replacement was obtained and fitted, and the set sprang to life. An hour later it died again. The drive waveform was correct at the base of the BU312 line output transistor (TR203), but there was no waveform at its collector. Disconnect the scan coils and a healthy waveform appeared. No, it wasn't the coils – disconnecting them had removed most of the load from the transformer. The line output transistor, efficiency diode (D205) and flyback tuning capacitor (C208) all seemed to be in order, so consult GEC. "Ah! – they may read all right, but change them anyway. The transistor can give some funny faults."

Obtain and fit correct replacement parts, switch on and bingo, everything o.k. Ten minutes later the picture disappeared, though the e.h.t. was still present. Tube heater out. This time is was simply a disconnected wire to the heater on the c.r.t. base.

Rank T20 etc.

Like other contributors, I'm finding a high failure rate for 4R16 (910Ω) in the 12V regulator circuit in the Rank T20/T22 chassis (4R77 in the Z718 chassis). I replace it with a 1W, 1kΩ resistor without any further problems.

Pye Hybrid Colour Chassis

R210 (100kΩ) which is in series with the line hold control in the Pye hybrid colour chassis has a certain notoriety. It's inclined to decrease in value, the usual result being hold control problems. A recent case we came across was somewhat different however. The fault for which the set was brought in was that the brightness decreased with time. We noticed that the line output valve glowed rather brightly when this happened. Well, there are two basic reasons for this sort of thing. Either loading on the line output stage, or insufficient drive to the line output valve. So we checked the line drive waveform. This was of the correct shape, but the amplitude was only 120V instead of 200V. We then checked back to the line oscillator stage, taking voltage readings around the PCF802. The voltage at pin 1 (triode anode) was only 100V instead of 227V. Clearly something was pulling down the h.t. supply to the stage, that something being R210 which had fallen in value to only 5kΩ! As you can see from Fig. 1, a value fall of this magnitude will have a considerable effect on the voltages in the stage due to the potential divider effect of R210 with R208. Replacing R210 improved the line hold as well of course.

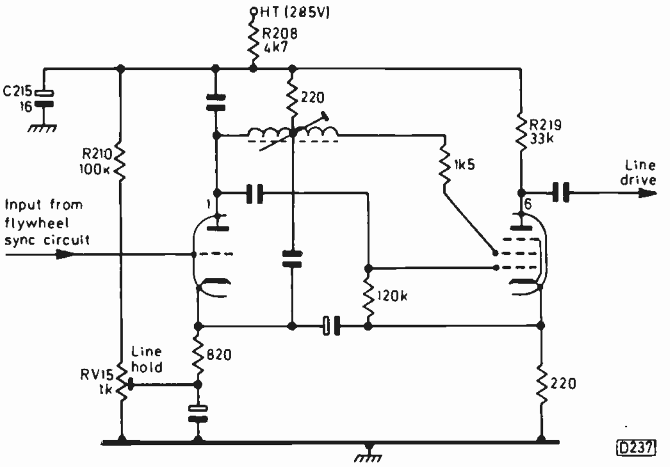


Fig. 1: Line oscillator circuit used in Pye hybrid colour sets.

GEC Teletext Model

The fault we had on a GEC teletext set (Model C2269) was no line or field sync. With a standard set you would follow through from a video stage to the sync separator, but on these sets the signal passes via the teletext decoder. A scope check revealed that there was video on the signals panel but no waveform at the input to the sync separator, so the fault had to be in the decoder panel. The signal is applied to Q2101/2/3/4/5 on this panel, and on making checks we found that Q2104 (BC548B) was short-circuit.

ITT CVC20

An old age pensioner enquired about renting a set, and on being given details asked whether I would be interested in her old set – she said it was an ITT CVC20, and that her usual engineer had told her it needed a new tube. On paying her a visit, she showed me a bill for £35 for work carried out the previous day. Apparently she'd recalled him to complain about the focus, and he'd tried to sell her a new set. On inspection I found that the focus control had been wound round to maximum – I could see that this had just been done, because the dust on the control had been disturbed. Resetting the control produced a perfectly focused picture – what a dirty trick! I lost a sale and couldn't very well make a charge, but at least I've gained a new customer. If you do get focus trouble with these sets, check the feed resistor R604 (2·2MΩ) on the c.r.t. base panel.

Letters

SANYO VTC9300 PROTECTION

I purchased a Sanyo VTC9300 VCR recently and knowing of the 12V regulator transistor's tendency to go short-circuit decided to provide protection by fitting a 13V, 400mW zener diode between the 12V line and chassis. Should the 12V rail attempt to rise to 17V, the 13V zener diode will clamp it at 13V and then go short-circuit, providing a crowbar action. This seems a simpler solution to that suggested by Keith Cummins in the June issue, though I'd be interested in any comments. The protection depends on the zener diode going short-circuit and not open-circuit of course, but I've never known a zener diode go open-circuit.
B. Webb,
Havant, Hants.

Keith Cummins comments: The zener diode would certainly provide useful protection, but would not be 100 per cent reliable. It would be most likely to go short-circuit in the event of a gross overload, but this cannot be guaranteed. There's a large amount of energy available from the 10,000μF reservoir capacitor, and this could blow the zener diode open-circuit. If you place a 6V zener diode across a 12V car battery it won't conduct for long! This is an extreme case of course, but the same principle applies – remember that the fuses are in series with the rectifier diodes, not the output from the reservoir capacitor.

Another point worth making is that whilst a fuse is designed to fail as a protective device a zener diode is designed to act as a voltage stabiliser and its characteristics when driven to the limit are not defined. It's my belief that circuits should be designed in a way that employs devices doing what they are supposed to do: you venture on to dubious ground when you expect a device to do something for which the manufacturer provides no performance specification.

GEC C2110 SERIES

S. Simon's series on routine TV receiver tests is a good idea – information like this is worth its weight in gold in terms of time and effort saved. In connection with the GEC C2110 series of CTVs (July) I'd like to add the following points. We've many of these sets still in service, doing quite nicely thank you despite their age.

(1) No sound or intermittent sound. Before anything else, check the soldering around C192 in the coupling network between the two i.c.s in the sound channel. The tracks from pin 11 of IC180 via C192 to pin 1 of IC181 run on both sides of the board, and as with all GEC boards the plating through from one side to the other can crack and give trouble.

(2) Loss of one colour – for some reason usually green. Check the connection at the end of the relevant output transistor's emitter resistor. As with the previous fault, the plating through gives trouble.

(3) The tuning button unit causes quite a lot of trouble, though it's easy enough to change. We've also found that the tuner in these sets is more prone to failure than others we know. Tuner faults we've encountered range from one channel noisy (the customer had a new aerial fitted before we found that this wasn't necessary) to patterning, tuning drift, low gain or nothing at all.

(4) Intermittent colour. This is almost always due to bad connections in the edge connectors on the small reference oscillator panel and/or the jumper board in front of it.

(5) The line hold preset, being mounted directly above the heat-producing line output stage, often develops a bad contact at its wiper. This causes the line speed to alter suddenly, the picture breaking up. Sometimes it will correct itself, sometimes not. We've found that cleaning the preset is not enough – replacement is the only cure. The field timebase presets higher up the chassis are also prone to this roblem – fluttering height or linearity should indicate which presets to replace.

(6) A blank raster and no sound usually means that the TCA270Q chip in the i.f. strip has lost its earth connection at pin 16. This is another case of plating through between tracks on the double-sided board.

(7) Finally, this is not a stock fault but knowing about the problem might help you to avoid the merry dance we were led. Question: why does a C2110 very occasionally fail to spring to life? Anyone answering that the line oscillator's start-up resistor R409 is going open-circuit gets five out of ten for effort. Anyone who said D401 (start-up isolation diode) was going leaky – where were you when we needed you!

I look forward to further articles in the series.
Richard Roscoe,
St. Austell, Cornwall.

RANK T22 CHASSIS

I was interested in the Rank T22 chassis servicing problem mentioned in the July Service Bureau (page 490), having had the identical problem myself. Instead of fitting a new line output transformer however I'd fitted new windings. I subsequently obtained new windings from a different source, and this time they came with a leaflet saying "replace small plastic spacers between both core poles". This solved the problem – when I fitted the first new windings I didn't notice any spacers. Since the mistake is an expensive one, I feel it's worth drawing to the attention of other readers.
J. Jordan,
Stroud, Glos.

THE BRIGHTER SIDE

I'm prompted to write following recent letters in the magazine from TV engineers moaning about pay and conditions. If like myself they'd spent some time on the dole after the small family firm they'd worked for had sold out to one of the big boys they might agree that the trade is not as black as some people tend to paint it. I was able to get a new job after five months, and this gave me a completely new outlook. The pay could of course be better, but at least most of us get the use of a car which is worth quite a bit these days.

In answer to K. Wells (July), although VCRs have been with us for some years it's only recently that the market for them has taken off. I personally find that it's a new and exciting challenge. On my first look inside a VCR I too thought that this was for geniuses only, but since the initial panic died down and I've had the chance to go on some good video courses I've come to wonder what I was worrying about. With a little patience and

study (the VCR Servicing articles in *Television* are most helpful) I think that VCR servicing is well within the capabilities of most of us. It certainly gives the job fresh interest, as I'm sure most TV men will agree.
Andrew Green, Tech. (C.E.I.),
North Walsham, Norfolk.

BACK INJURIES

May I thank all those who have written to me so far in support of the matter to which I drew attention in your June letters column – the problem of back injuries due to lifting TV sets. The point that a TV set should not be lifted by one person alone has now been proved, and I'd like to urge all those in the trade to refuse to do this. It's just not worth it in view of the injuries that can all too easily be sustained.

Installers, apprentices and everyone else must insist on having help. This will add to costs, but the important point is fewer injuries now or showing later in life. If there are any others who would like to let me know of injuries or occurrences, please do so – every bit of evidence will be helpful in trying to get action taken.
Harry J. Todd, Martins Bend,
Sunnyhill Lane, Oare, Marlborough, Wilts.

AUDIO SIGNAL SOURCE

Here's a handy trick I've used successfully for over a year now. The Sinclair portable scope has a 1kHz calibration squarewave output which can be used when checking audio circuits. Use a probe to inject the signal at various points in the audio channel, taking the squarewave via a series *RC* combination – say 47kΩ and 0·1μF.
G. Foster,
Newbury, Berks.

WHAT'S IN A "TRADE"?

How I agree with K. Wells (July) about the attitude of many in the TV business. I've worked in the industry for 21 years, have studied at college during the day and also at night during later years in order to improve my knowledge and qualifications – as no doubt have many other engineers – and yet at 37 I find myself redundant, for the second time and with very little prospect of a job in the immediate future.

I recall when starting in the trade in 1961 being warned that the money was poor and the prospects even worse, but the thing then was to have a "trade". It was considered that once you'd gone through the "slave labour" training period and got your qualifications you'd be o.k. for life. What rubbish! With the continual changes in TV technology any engineer who doesn't keep abreast of developments will be left behind to work on the older sets and will eventually find himself "phased out". I feel sympathy for the young of today who have great difficulty in finding work – at least there was a choice of jobs when I was younger.

Excessive discounting, cut-throat competition and "give away" rental charges are responsible for many of the problems in our trade today. Let's face it: if a trader doesn't make a reasonable profit he can't pay himself a proper wage let alone his service staff. Yet I heard of a dealer who sold colour sets at a gross profit of £20 each in order to compete with a large discount organisation. If the sets went wrong during guarantee he would have lost his "profit". This is the economics of the madhouse.
M. J. McHugh,
Hednesford, Staffs.

LINE OUTPUT TRANSISTOR FAILURE

I've also had the problem (Service Bureau, July) of a G11 that kept on blowing line output transistors – one a week. On fitting the third I discovered quite by chance that pulling the mains lead produced an arcing sound after which the line output transistor went short-circuit yet again. Checking the plug showed signs of arcing on the live pin – the wall socket turned out to be faulty. A similar thing could presumably happen if the leads were loose in the plug.
Derek Snelling,
Brownhills, Staffs.

LUXOR 90° HYBRID CTVs

I've established a routine for overhauling those 90° Luxor hybrid CTVs and find that with the aid of a handful of inexpensive components one can usually be sure of a most reliable and good quality receiver. As I don't believe in working in two inches of dust I first open up the chassis and, using a soft brush attachment, thoroughly vacuum the set, both the component and print sides of the boards, noting any damage as I go – mostly components falling apart that would have done so anyway.

Next, as Tony Thompson rightly says, these sets suffer from dry-joints. So I go over any suspicious looking joints, particularly around the valve bases – the bases in the line output stage often have to be removed and the pins cleaned with a file before fresh solder will take. Charred areas of the print in the power supply section should be cleaned and overlaid with tinned copper wire to the next pad on the board.

If the following items are not replaced they'll amost certainly give trouble before long: the field hold control R746 (250kΩ); the height control R753 (2·5MΩ), and its 2·2MΩ, 1W feed resistor R754; R909 (2·2MΩ, 1W) in the width circuit; the convergence potentiometers R827 (250Ω) and R801 (470Ω); the line linearity coil damping resistor R913 (1·5kΩ) to cure striations on the left-hand side of the screen; the blue and green drive presets R461 and R458 (both 500kΩ); R501-3 (1·5MΩ) in the first anode supply network; R609 in the line output stage's h.t. supply (replace with an 11W type); and C901 (0·015μF) in the NS correction circuit. Replacing the inexpensive PC92 valve can avoid having to replace the costly line output transformer at a future date. The e.h.t. setting is also important – adjust R911 for 685V between pin 11 of the line output transformer and the 285V h.t. line (B1).

The most common causes of no colour are: R125 (47Ω) which is mounted on the smoothing capacitor at the right, rear of the chassis and feeds the colour-difference output pentodes; the 4·43MHz crystal; and the emitter-follower transistor Q206 (BC147B) on the i.f. panel. The other common i.f. panel fault is failure of Q205 (BF271): this causes no picture and sometimes loss of sound.

Caption buzz can be reduced by adjusting the sound discriminator coils L219/220 and L205 (31·9MHz trap). Doing the VCR modification, i.e. changing R748 and

R749 to 680kΩ and the balance potentiometer R752 to 220kΩ, results in solid, stable line sync.

Now for some general comments. First, although I agree that a smoothing electrolytic can should be replaced complete I have on numerous occasions fitted separate 33μF, 470V electrolytic capacitors to decouple the 220V supply to the luminance output valve on the CDA panel and the 240V supply to the PCF802 line oscillator on the timebase panel without any problems.

Secondly, taking the earth off test equipment is not the answer to workshop safety – the aerials and many other things are earthed. All workshop benches, or at least the set being worked on, should be fed via an isolating transformer to remove any risk.

Thirdly, I've been covering these sets successfully for many years. If a few rules are followed the results are excellent. First remove all old polish using a foam cleanser, then give all the edges a thin coat of Evostik contact adhesive and allow it to go off – this will ensure no curling at the back and front. There's a contact material available that matches the wood perfectly.

A last but most important point. Many of these sets have been used on stands with the feet removed. If the set is then put on a flat surface without some type of replacement feet being fitted the result will be overheating due to poor ventilation.

Steven Howard,
Ashford, Middlesex.

Ripples on the Mill Pond

Les Lawry-Johns

IT'S been very quiet around here lately. Not many laughs, but quite a few headaches with some of the sets that have come in. The chief trouble maker at present seems to be the Rank Z718 chassis (Bush Model BC6100 etc.), closely followed by the Philips G11.

Mr Nosegrinder's Z718

Take for example the Z718 Mr Nosegrinder brought along.

"There's not much wrong" he said helpfully. "You're watching a good picture, when all of a sudden it goes down to a short, dark picture – mainly blue."

I closed my eyes in apprehension. Whenever someone tells you not much is wrong, you can bet your life you're in for a nightmare – albeit one probably helped by you not thinking carefully enough about the symptoms. This was a classic case, and I never seem to learn since I made the same mistake later with a G11.

I hooked up the Z718 and studied the picture it displayed. Not much to complain about. Ten minutes later it suddenly went dark and the height shrank to a little over half. My reaction was to assume (wrongly) that there was a fault in the field timebase, and that this was pulling down a supply line going to other sections of the set. The obvious step to take was to check out the field timebase circuit, preferably with a can of freezer since the fault seemed to be heat sensitive.

So I squirted away with the aerosol, first at this, then at that. Output transistors, drivers, amplifiers and oscillator transistors were all subjected to the freezing blast, until I began to feel cold myself. Needless to say it made no difference, so I started to make voltage checks on the output and driver transistors. The voltages didn't seem to be far from what was to be expected, so we moved over to the field scan generator department (another five transistors). The voltages here seemed to be a little on the low side, but the relationships between the base and emitter readings were right. I then switched off and checked every transistor, each one proclaiming its innocence. Switch on again and everything's back to normal, so the transistor checks had been inconclusive. Again the height shrank and the brightness went down.

In desperation I checked the voltages on everything in sight on the timebase panel – and found a wildly incorrect reading between the base and emitter of 4VT21. Take a look at the circuit and find that this transistor is part of the 12V regulator circuit. Bloody fool! All that mucking about and you didn't stop to think of a possible common cause for all the symptoms. Check both transistors in the circuit and find them to be o.k., though the reverse reading between the base and collector of the regulator transistor 4VT20 wasn't the expected 910Ω (4R77). The reading was very high in fact, gradually falling to something like 2kΩ as the set cooled. So out came 4R77 and as the nearest value we had was either 820Ω or 1kΩ, in went 820Ω. The set then worked very well, and continued to work for as long as it was left on.

I made a mental note of that one, but later discovered that everyone else in the world already knows about 4R77 going high in value. Funny that.

And the Next Gent Please!

A Philips G11 was next. Mr Dry Joint himself. The set, not the owner. The symptoms were that the picture would come on all right for about five minutes, then fade – at the same time losing colour. On the bench this was indeed what happened, and we noticed with our eagle eye that the picture also became grainy and the sound went down slightly. "Tuner or early in the i.f. strip" I said, so I checked the operating voltages in the i.f. unit and went over the joints carefully. No joy. Next fit a new tuner. The picture seemed to stay on longer, but faded nevertheless.

I looked hard at the suspect lower panel, and noted the sound output transistors on their heatsinks and the single power transistor below them. "I wonder what you do?" I thought. So I checked the voltages around it and found that they were wrong. Better look into this. It's not a transistor! It's an i.c., type TDA1412 – the 12V regulator. Oh no, not again.

Look around for a replacement, but none in stock. The stock book said no, but it sometimes lies. Anyway we didn't have one, so I carried out a check by bridging it with a 120Ω resistor and connecting a 12V zener diode from the low voltage end to chassis. The picture remained perfect, and the rail remained at less than 12V – so the zener diode wasn't being asked to do anything much, but it was comforting to have it there just in case of a sudden rise. It would have to remain there for only a couple of hours, until I could con someone into nipping out to the wholesalers for me – my friends didn't seem to have one either.

"Hallo Geoff. Have you a 1412?"

"A what?"

"You know. 1412 as in the French retreat from Moscow overture."

"That's 1812 you nuthead."

"Sorry Geoff. What I want is a TDA1412."

"Well I haven't got one and if I had you wouldn't get it. Not after telling that pretty redhead I was queer."

"I meant you were unwell, Geoff, honest."

The phone went down so I tried Raymondo who didn't have one either, which is why we have to go to the wholesalers. O.K., so what have we learnt from this time wasting exercise? Simply that to check voltages approximately is not enough. A fall of something like 2V on a 12V line is enough to affect the whole set badly. A drop of 2V in one stage would perhaps not be noticed, but when all the l.t. fed stages are affected equally a far more dramatic effect is to be expected.

In future I'll pay more attention to the exact readings, even if it means putting on my glasses and taking them off again more often than I do now. We don't want to make any more boobs, do we? Which reminds me that a pretty little redhead is expecting me to call and check her remote control.

The Pub in a Field

When Mr Piddlewell popped in we thought it was his Thorn 8000 that was giving trouble again.

"Has it gorn again?" we asked, with bitter memories of the set's history of intermittent starting.

"Na. It ain't mine this time. It's a customer of mine out in the sticks." He gave me directions on how to get there, "so that even a fool like you can't get lost." Nice fellow, Mr Piddlewell.

It turned out that our destination was a pub, and the directions sounded weird to me though I knew the locality well enough. It was just that I'd never seen a pub there.

I decided to make an evening call of it (for once), and since it was a pub several miles out H.B. said I wasn't going on my own or heaven knows what time I'd get back home. The truth is of course that she likes a drink and a natter in a strange pub once in a while. So that evening we loaded the van, taking everything we could think of since Mr Piddlewell hadn't bothered to ask his friend what sort of set it was. In went triplers and transformers, transistors and transductors, my case of "get you home" i.c.s, droppers, the lot.

Then down the yellow brick road we went, heading for the rainbow. Down the lower road, through the countryside, skirting the marshes, shouting obscenities a the cows and sheep, scattering the crows and rooks in the road, mile after mile. Over the bridge and straight down the road that doesn't go anywhere. Turn left at the end, down the lane that comes to an abrupt end in a field, or rather thick countryside where horses grazed and ducks splashed about on a reed filled pond, quacking at each other and I think at us.

There was no sign of a pub such as you might expect. Just a sort of outhouse – in the final throws of decay. A board on the front had been weathered away, but we could just make out some words, or part of them, that said "free house".

"Just look at that" I said to Honey Bunch. "They're so glad to see anyone here they give the booze away."

"You daft bugger" said H.B. shortly. "Free house means they can sell any brand they like – and charge what they like. Anyway, I'll have a Vat 19 and coke to start with."

So in we went and found a rather bare room with one customer at the bar or counter. It just had to be one of our own well known customers. He looked startled to see us.

"Hello Bert" I said. He didn't look happy.

"Of all the bars in all the world, you had to pick this one."

A door opened and closed and who should walk in and up to Bert but the pretty little redhead whose controls I'd played with earlier. I now appreciated Bert's discomfort. His wife is a rather handsome fifty or so. At the same time I had to play my cards right, so I turned my attention to the bar.

"Vat 19 please" I asked the robust landlady.

"Ain't no Vat 19. Only Bacardi. That do?"

O.K. love. With a coke and half a bitter please. And could you put some ice and a slice of lemon in the Bacardi?"

"Ain't got no ice yet. No lemon either."

"All right love. Just as it comes then. By the way, I've come to fix the TV, so I'll have a quick swig and then pop through to where it lives."

"He's watching it at the moment. Smoke and all. Mustn't miss his football."

I could see whisps of smoke coming from the back room, and there was a familiar smell. I went through, half expecting to see a hybrid ITT colour set – the ones that emit lots of smoke from the mains filter capacitor occasionally, whilst still working normally in all other respects. I was surprised to see a Philips G8 however, sitting in the corner emitting smoke from the rear while the landlord sat in front wearing a World War two gas mask.

"Switch the bloody thing off" I bawled.

"Any minute now. Wait for the whistle."

Much to my relief the whistle sounded and I knocked the switch off, at the same time trying to wave away the choking smoke. When I'd taken the back off I immediately saw a black hole in the top winding of the line output transformer, with whisps of smoke still issuing from it.

By this time the old boy (I should talk) had taken his mask off and started on about how quickly the job could be done. "About half an hour at normal rate plus fifteen mintes at double time" I told him. "Don't hurry" he said, "I've some cellar work to do before the next match comes on."

He didn't look much like a publican, any more than his wife did, so I asked him how long he'd had the place? The answer was "four hundred years", which surprised me since I'd have thought three hundred a more realistic estimate. I nipped back to the bar to finish off my bitter before getting the transformer, and found Bert long gone.

"His niece seemed a nice girl" said Honey Bunch.

"Er yes, very nice" I replied, wondering whether I'd misjudged poor old Bert. "I thought it was his daughter."

The landlady put me right. "He came in with his daughter last week. A pretty blond girl."

How does he do it?

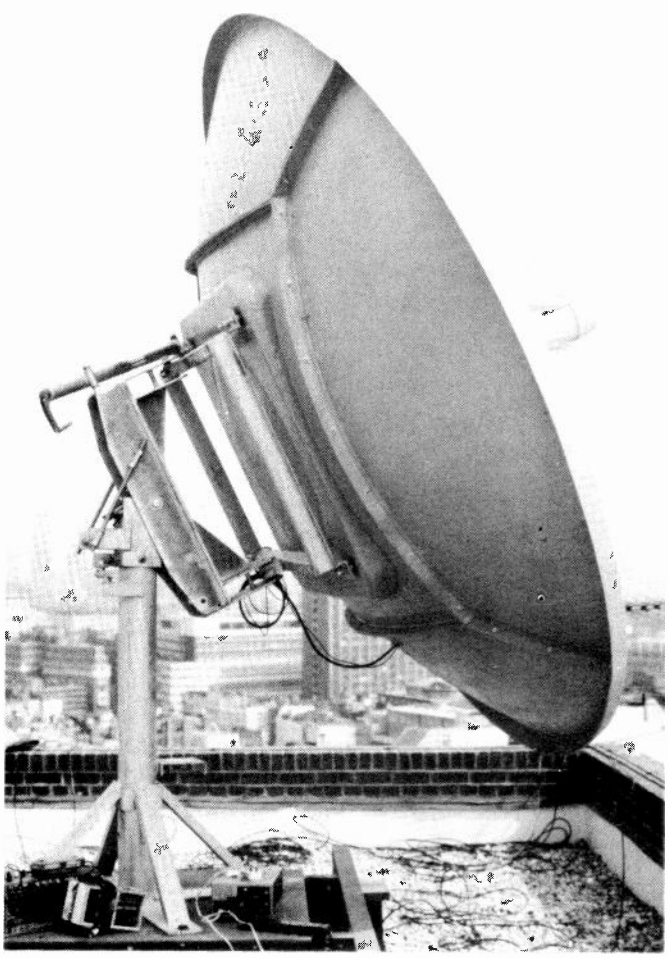
A Satellite TV Installation

Part 2

Steve Birkill

THE 14°W Atlantic geostationary satellite position is known by the Russians as Statsionar-4. Their first satellite here was Gorizont-2, which began life in July 1979 with one telephony and five TV channels, dropping over the course of a year to three TV channels and eventually one. Its replacement, Gorizont-4, was launched in time for the 1980 the Moscow Summer Olympic Games, and during that event operated five TV channels. Afterwards the beams were reconfigured to inaugurate the Moskva service. By early 1982 the spot-beam transponder was looking decidedly sick, the power level having fallen by something like 6dB, and the handful of two-metre terminals in Western Europe were in serious trouble.

It's likely that the Russian Moskva terminals were struggling as well, and when it was announced on March 14th that a new satellite, Gorizont-5, had been launched we assumed that this would be a replacement for Gorizont-4. The assumption was reinforced when on March 26th it became apparent that the 3·675GHz spot-beam's EIRP had increased by at least 6dB since the previous day. Six dB may not sound a lot to those who deal with terrestrial a.m. broadcast signals, but in an f.m. system with a hard threshold it's almost the difference between no signal and no noise!



The assembled aerial: time to begin alignment of the mount.

Pictures could now be resolved with a 12in. square pyramidal horn attached to an LNA looking out of the window, and I knew we would achieve a 50dB plus video signal-to-noise ratio using the three-metre dish. It was subsequently announced that Gorizont-5 was on its way to 53°E to replace Gorizont-3 at Statsionar-5, so we can only infer that spare equipment on board Gorizont-4 was brought into operation on March 26th, accounting for the restored EIRP.

As soon as the structural contractors had fixed the steel girderwork that would form the foundation for the aerial on the roof of the Thorn-EMI building, and the aerial contractors had laid the necessary cables through the building's warren of ducts, we arranged a day for the installation.

April 22nd dawned a warm, dry day with light winds and hazy sunshine. During the morning the mount and the aerial were assembled on the prepared base, under the supervision of Michael Aarons who was to become Sonic Sound's satellite division director. Meanwhile I drove down from my home near Sheffield with the receiver, LNA, feed horn and test gear. When I arrived I was told that the aerial was assembled in place and that the cables were laid but not terminated. After a cup of tea we went to the rooftop, fifteen storeys up, and surveyed a skyline dominated by the American aerial standing proudly on its raised dais. We had only to make it work.

Two other rooftop satellite receiving aerials were within view nearby, Satellite Television PLC's dish for monitoring their 11GHz test transmissions to Europe via the OTS (Orbital Test Satellite), and a British Telecom data communications terminal at London University. The latter dish was also looking at OTS, which coincidentally was that week in the course of moving station from 10°E to 5°E to make way for its operational replacement ECS (European Communications Satellite).

First a check on the mount's alignment. The contractors had marked a north/south line on the base, but a quick solar transit check at local noon showed it to be a massive fifteen degrees in error. Perhaps they'd left BST out of their calculations. This was no problem however, due to the excellent orientation adjustments provided on the SatFinder aerial. With the aid of an ordnance survey map and a makeshift theodolite a bearing was taken on the Crystal Palace TV tower, which was just visible through the haze, and the mount was adjusted for true north/south alignment.

Setting the polar axis was less straightforward, as it was not possible with the unmodified SatFinder to achieve the required declination offset of 6·78° between the aerial plane and the polar axis as required for optimum tracking at latitude 51·52°N. So a compromise setting was reached, with some 4° offset and the polar axis inclined to a value between true polar and modified polar. This was nevertheless to prove acceptable.

The aerial's actuator arm was attached in the "eastern sky" position while the LNA and feed horn were fitted, but we decided to look at our primary target first. Crank-

Saudi Arabia's full-time Intelsat lease TV channel put in a good showing during our orbital scan.

ing hard against the westerly stop, I figured we should be close to the 14°W look angle. The LNA was then powered and a spectrum analyser connected.

The extent of the opposition was now revealed. At 30MHz intervals throughout the upper four fifths of the band there were carriers 80dB above noise, with a 1MHz bandwidth. Intermodulation products extended outside this range, and with the downconverter in circuit there were image carriers tuning through in the opposite direction, revealing a response in the 2GHz band despite bandpass filtering in the LNA and the converter. Switching over to demodulation revealed that most of the interfering signals were f.m./f.d.m. telephony and data carriers, plus some TV. But wait – here's a TV signal with SECAM ident . . . and here's another! The "ten green bottles" in the SECAM field blanking period were clearly visible, and we realised that the aerial was indeed aligned directly with the Soviet satellite. There were the familiar three channels battling through the terrestrial garbage, despite being 50dB lower in level at this look angle. And the Moskva spot-beam channel sat right in the centre of the only clear section on the dial, its slow dispersal unmistakeably revealing its identity.

Clearly any serious Intelsat work would be out of the question here, even with a bank of notch filters, but out of curiosity – having confirmed that the channel we were after was interference free – we set out to scan the rest of the sky. First back over east to the Indian Ocean, where the dispersed telephony carriers from transponders one and two of Intelsat IVA F3 at 60°E came in low over the city. No TV though, as the three leases operate higher up the band and were completely lost in the interference at this low elevation angle. Climbing up the eastern sky, the next bird was the Indian Ocean Gorizont-3 at 53°E, again with a 3·675MHz TV channel – "Orbita-III Vostok" well clear, the others difficult. Raduga-9 at 35°E, Statsionar-2, suffered a similar fate, its 3·875GHz TV "II Programma, Dubl'-IV" resolvable close by a terrestrial signal at 3·87GHz while its telephony at 3·655GHz and below was in the clear.

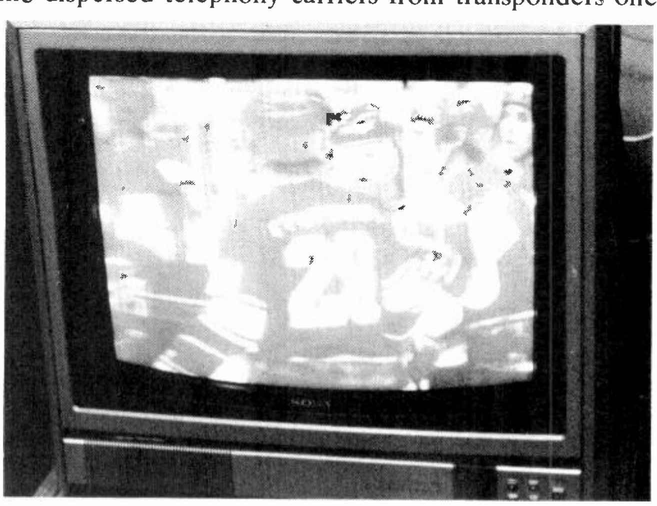
The actuator arm was transferred to the opposite side of the frame and we now cranked west from 14°W. At 18°W, up came the big telephony carriers of Intelsat IVA F1, the Major Path 2 Atlantic bird. No TV on that one this afternoon. On westward to Intelsat IVA F2 at 21·5°W and there was the familiar Saudi Arabian announcer in his robe and head-dress, out in the clear on transponder 1E hemispheric, the JVC monitor just resolving the SECAM colour from the narrow-band receiver.

The team of helpers were quite taken with these results. No luck though with the other three TV leases on this satellite, in amongst the terrestrials. Then at 24·5°W to the Atlantic Primary satellite Intelsat V F3, with a transatlantic report on the situation in Argentina on global-beam transponder 12, more than a little noisy on our three-metre terminal. Farther westward to Major Path 1, Intelsat IVA F4 at 34·5°W, the home of the Spanish lease and much transatlantic TV traffic, though there was no TV at the time.

At this point the Telecom Tower was just 90° off to the side of our dish and the rooftop was becoming quite cool and windy. So after an unsuccessful attempt to find TV signals on the 53°W special lease Intelsat (IV F3) we decided to lock the aerial on to the Soviet satellite and adjourn to the shop premises below.

By the time we'd carried all the gear (including TV camera and U-matic as well as triple-standard Betamax recorders) down a ladder, two flights of stairs and twelve floors by lift to street level and round to the retail shop entrance it was well into the evening. So we were spared the attentions of the public. The two cable ends were dragged across the showroom floor to the vicinity of a 27in. Sony three-standard monitor. BNC plugs were fitted, everything was connected up, and the receiver was switched on. A touch on the tuning knob and at 2300 Moscow time Russia's coverage of the ice hockey championships from Finland came up on the screen – in full colour with crisp audio and no trace of noise or residual dispersal. The moment had come for congratulations all round: the pictures were as good as the store could display from any source, live or recorded.

The hemi/zone and global-beam channels, sitting respectively directly between and hard up against terrestrial carriers, required a further small modification to the receiver. A switch was fitted to disable the a.f.c., which otherwise "snatched" the receiver's tuning away from the wanted signal and locked it on to the adjacent interference (some 50dB higher in level). All now worked satisfactorily, and we went off to celebrate our achievement in bringing a high quality satellite TV demonstration to London.



A successful conclusion: 2000 in London, 2300 in Moscow.

Editorial note: Sonic Sound Audio have ceased to trade since publication of these two articles commenced. We understand that their problems were due to excessive stocks at a time of severe depression in the audio/hi-fi market.

Servicing the Rank Z718 Chassis

Part 2

John Coombes

THE field driver/output stage circuit in this chassis (see Fig. 5) is one of the most complex ever to have been used in a mass-produced receiver, so a few words on its operation may help. The basic idea of the circuit is to avoid the centre screen crossover effect that can be a problem with simple class B circuits. The circuit is certainly capable of providing a very linear field scan.

Field Driver/Output Stage Operation

The output transistors are 4VT7 and 4VT8: 4VT7 conducts throughout the scanning cycle while 4VT8 starts to conduct towards the centre of the forward scan and remains on during the second half of the scan.

The drive at the base of 4VT5 consists of a negative-going sawtooth. 4VT5/6 form an npn/pnp Darlington driver stage, producing a negative-going sawtooth across 4R25. During the first part of the scan, current flows via 4R24, the scan coupling capacitor 4C10, the NS correction circuit (transductor 5T4 and phase coil 5L11), the field scan coils, 4D3, 4VT7 and the network 4R30/4D4/4D5. The scan current falls to zero at the centre of the scan.

During the first part of the scan 4VT9, which is the driver for 4VT8, is cut off – since the conduction of 4D4/5 and 4D4/7 mean that its base and emitter voltages are the same. Towards the centre of the screen the voltage across 4R30 falls below 1·4V and 4D5 cuts off. The emitter of 4VT9 is then driven positively with respect to its base, producing a positive-going output across 4R28 to drive 4VT8. The current path reverses, with 4C10 discharging via the scan coils, 4VT8 and the other series-connected components.

At the end of the forward scan 4VT7 is driven hard on and 4VT8 is cut off (via 4VT9 which is also cut off). At this point 4C12 and the scan coils form a resonant circuit which provides the flyback action, the positive-going pulse at the junction of these items switching off diode 4D3. 4D6 clamps the voltage at the upper plate of 4C12 to the supply rail voltage. When the oscillation tries to swing negatively, 4D3 switches on again and 4VT7 takes over to produce a linear scan current flow under the control of the drive waveform. The feedback via 4R24 assists with scan linearisation.

Field Faults

Field collapse is a fairly common fault and the cause may not be in the field timebase at all – check for dry-joints on the NS transductor 5T4, which is on the line output panel. In the field timebase itself, the first things to check are the supply feed/decoupling components 4R32/4C14 and the condition of 4R30 which may be burnt or open-circuit. Then check 4D4/5/7, which often give trouble and may well be the cause of 4R30's discomfort. Make sure that they are not leaky. Check 4D6 as well. Check whether 4R33, 4R24 or 4R25 is open-circuit, then turn to the transistors. The output transistors 4VT7/8 may be short-circuit – 4VT8 short-circuit emitter-to-collector may be the cause of the overload trip operating. 4VT6

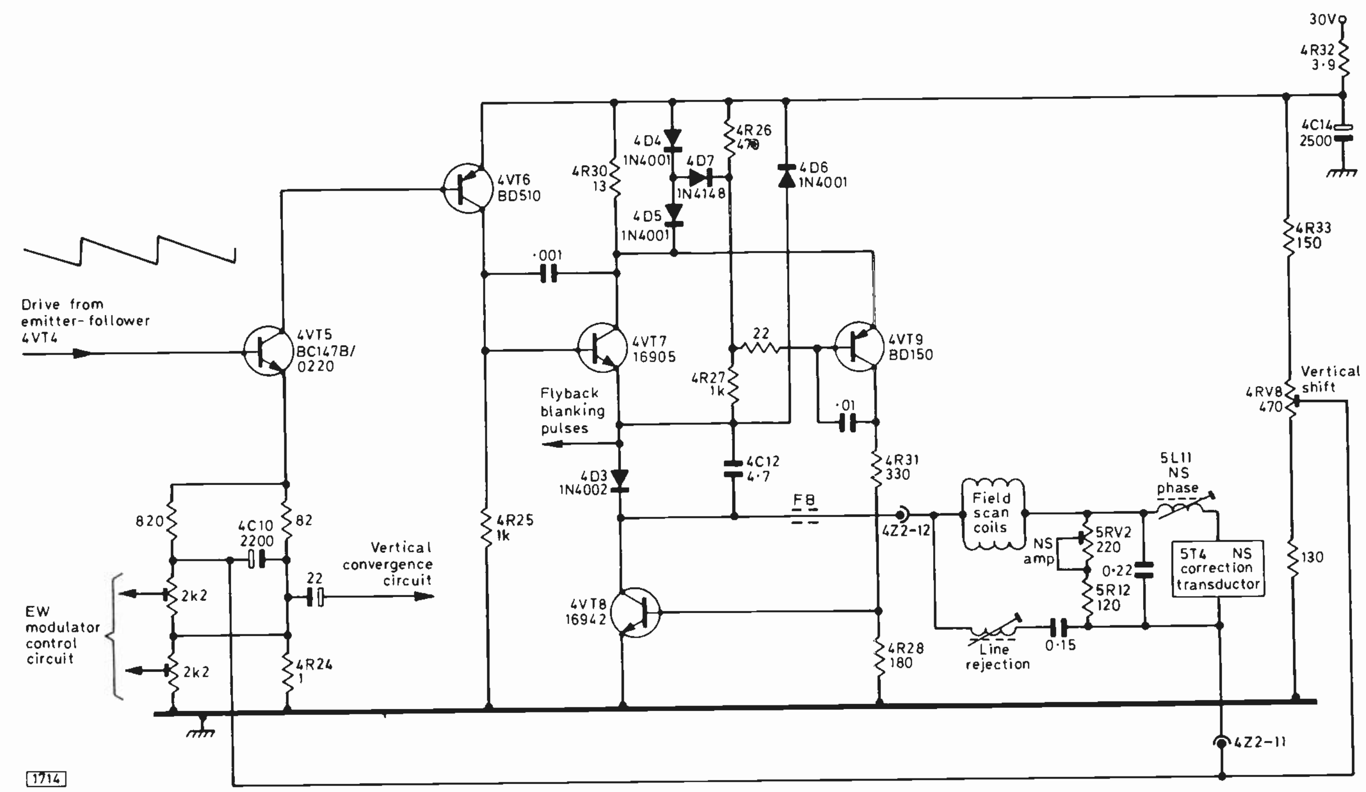


Fig. 5: Field driver and output stage circuits. In 20-26in. models 5RV2 is 470Ω and 5R12 200Ω.

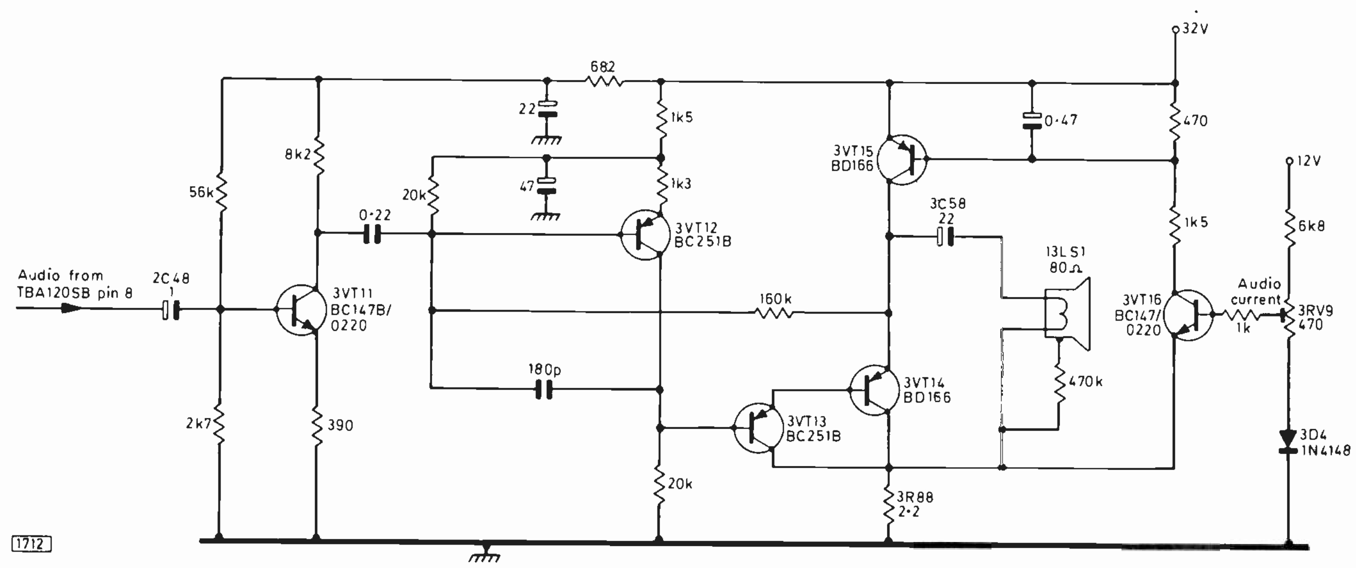


Fig. 6: The audio circuit.

may be short- or open-circuit while 4VT5 may be open-circuit. Make sure that 4VT8's emitter connection is good. Another possibility is 4C10 open-circuit.

Less likely possibilities are the linearity transistors 4VT3 (BC158) and/or 4VT4 (BC148) – they tend to go short-circuit – and open-circuit field scan coils. Also check pins 11 and 12 of plug/socket 4Z2 for dry-joints.

Lack of height is another fault whose cause can lie in the line rather than the field timebase – check the setting of the fifth harmonic tuning coil 5L3. This is done with a scope – couple the probe loosely to the focus adjustment access hole and tune for minimum ringing at minimum brightness. This should be consistent with minimum change of raster size as the brightness control setting is varied. The usual cause of lack of height in the field timebase is 4R9 which is in series with the height control. This resistor was 2·7MΩ in earlier sets and was subsequently changed to 470kΩ. Use this latter value in all cases.

In the event of field jitter, check that the field hold control 4RV1 (470kΩ) is set correctly in the centre of its track. If this is all right, check the safety resistor 4R33 in the vertical shift circuit. The metal rings at the ends of this resistor tend to crack – they can be soldered as a temporary measure, but replacement is the correct course. Later resistors are wirewound ones, eliminating the problem.

A fault which occasionally occurs is a bright line two inches from the top of the screen with incorrect pincushion correction at the top. The usual cause is the pincushion amplitude control 5RV2 (on the line output panel) going open-circuit or burning up. Its value is 220Ω or 470Ω depending on screen size. Also check 5R12 which is in series with it and sometimes goes open-circuit.

The field convergence circuit has a driver (4VT10) and class B output stage (4VT11/12). The usual cause of field convergence faults is the pnp output transistor 4VT12 (BD510) going short-circuit. As a result, the bias resistor 4R39 (56Ω) will burn. If 4VT12 is in order but 4R39 is cooking, the npn transistor 4VT11 (BD509) is probably open-circuit.

Sync Faults

In the event of loss of sync it's worth starting by checking the adjustment of the field and line hold controls (4RV1 and 4RV13 respectively). The next suspect is the sync separator/line oscillator i.c. 4SIC1 (TBA950). If this proves to be in order the fault is almost certainly over on the i.f. strip, where replacement of the TCA270Q demodulator i.c (2SIC1) will usually restore normal operation. 2SIC1 can also be responsible for poor field sync only.

First Anode Presets

We've now covered all the usual timebase faults. The first anode presets 4R10/1/2 are mounted on the timebase panel and can be responsible for too much or too little of one colour – due to dirt on the tracks or changed values respectively. They were 10MΩ in early models and 2·2MΩ in later versions, with changed value resistors in the associated network.

Audio Output Stage

Moving over to the signals side of the set, the only power handling section is the audio output stage, which is again a little unusual (see Fig. 6). The Darlington pair 3VT13/14 provide the output, driving the loudspeaker via the coupling capacitor 3C58. 3VT15 provides a constant-current supply, its base being driven by 3VT16 which senses the voltage across 3R88, with 3RV9 setting the standing current.

Sound Faults

In the event of no sound, first check 3VT15 and 3VT16. If these are in order, check 3VT16, the speaker 13LS1 (80Ω), 3C58 and 3R88. The connection to the negative side of 3C58 can break if the panel has had much handling, giving rise to intermittent sound. Possible causes of loss of sound on the i.f. panel are the coupling capacitor 2C48, the intercarrier sound chip 2SIC2 (TBA120SB) and the latter's supply feed/decoupling components 2R25 (100Ω) and 2C45 (100μF).

For sound distortion, first check whether 3RV9 can be set for a reading of 0·44V across 3R88. If this cannot be set correctly, suspect 3VT14/15/16, 3R88, and 3RV9 (check the condition of its carbon track). Displacement of the loudspeaker's cone is another cause of distortion.

VCR Servicing

Part 11

Mike Phelan

OUR subject this time is servo faults. Let's start by summarizing the basic requirements. In the VHS and Betamax systems the speeds of the drum and capstan motors are kept constant during record, using fixed frequency references, and control pulses are recorded on the control track. During playback, the control pulses provide the reference for either the drum or capstan servo, the other servo being controlled by a fixed frequency reference.

As usual, we'll take as our basic example the Ferguson 3V00 (JVC HR3330) and its equivalents. In these machines the off-tape control pulses control the drum servo on playback, so we'll start off with the capstan servo which is simply a circuit to drive the capstan motor at a constant speed compatible with the VHS system – there is no difference in the servo's operation on record and playback.

The Capstan Servo

Pulses from magnets on the capstan flywheel are compared with a reference consisting of pulses which are divided down from the output of a crystal oscillator (see Fig. 49). The error voltage thus obtained is used to control the capstan motor drive amplifier.

As with any phase-locked loop of this type, faults are of two basic sorts – either no control is exercised on the motor, or the control results in incorrect speed. With this particular system, using an i.c. for comparison followed by a d.c. coupled amplifier, it's unusual for the control loop to fail and the speed to remain correct. If the i.c. or either input to the comparator (from the oscillator or the capstan pick-up head) fails, the speed will be far enough out to affect the sound. So what do we get?

If we record on the faulty machine and then play the tape back, things will probably seem fairly normal – the picture may be slightly impaired due to the relative head-to-tape speed (writing speed) being incorrect. Also the tracking control may require adjustment. As the motor speed will be reasonably constant, albeit incorrect, the machine will play back its own tapes with passable results – provided the speed is not too far out. The true story will emerge when we try to play back a prerecorded tape. Any appreciable speed error will be immediately obvious from the sound, while the picture will display bars of noise moving up or down. The reason for the latter condition is that if the tape speed is incorrect the angle at which the video heads scan the tape will also be incorrect. As a result, the heads will cross the video tracks, producing noise bars when one head scans a track that should be scanned by the other track (remember the slant azimuth mounting of the heads). If the speed is nearly correct, the sound will be normal but the picture will go into total noise every few seconds or so. If the picture has one or more stationary noise bars, the fault is not in the servos – wait till we come to mechanical faults and tape path adjustments.

When confronted with a capstan servo problem the first check should be at TP11, where a 3·71Hz trapezoid of about 7V peak-to-peak should be present. Note the frequency – a scope with fairly good triggering is needed to display this waveform.

Absence of the trapezoid is likely to be due to the pulse at TP12 being absent or of low amplitude. Although IC3 could be defective, the most likely cause is that the capstan pick-up head is open-circuit (sometimes intermittently). A resistance reading of greater than 1kΩ between pins 1 and 2 of plug 6 will confirm this. If the pulse is present but of low amplitude, check for excessive end-float in the capstan flywheel assembly – anything more than 1·5mm is suspect, and may be the result of the machine being dropped or put down heavily, the inertia of the flywheel bending the bottom bracket. The latter can be removed and carefully straightened, a little at a time.

With the trapezoid present but no servo action, check for a waveform at pin 3 of IC4 to prove that the oscillator is running. Absence of this would bring the i.c. and the crystal under suspicion.

If there is a gross speed error, it's as well to see whether or not the servo is trying to provide correction. This means breaking into the vicious circle that goes with this type of fault – you get the same problem with flywheel sync, a.g.c. and numerous other things. A good starting point is pin 16 (the control voltage) of the i.c. This will speed up the motor if high and vice versa. If the servo is working normally, an increase in capstan speed will result in the control voltage falling in an effort to provide compensation. Thus a check on this voltage should show whether the servo is trying to correct speed errors or the voltage here is the cause of the incorrect speed.

To provide an example, suppose that the capstan is obviously running too fast and a voltage check at pin 16 produces a reading of say 3V. This indicates that the servo is working but cannot control the motor's speed. Slowing the flywheel down by hand will result in the control voltage rising, thus proving the point. In this case the fault will be in the motor drive amplifier – probably transistor X2 short-circuit. Had the voltage at pin 16 been high on the other hand, the motor drive amplifier would have been working correctly, the high voltage being due to a servo fault – probably the i.c.

If the control voltage is high but the motor runs slow, there's probably some resistance to its turning. Apart from the motor itself, which sometimes gives trouble, we must leave this point until we get to mechanical faults – any mechanical resistance to the passage of the tape will result in the servo producing a high error voltage in an effort to overcome the resistance.

The Drum Servo

Next to the drum servo. Once again we'll first consider what happens when the speed is incorrect. If there is much of an error the picture will look as if the line hold needs adjusting – because the number of lines per second being picked up by a head depends on its speed. As each track is one field, there will also be regular noise bars due to the error in the relative head-to-tape speed. If the error is not too severe, the picture will float from side to

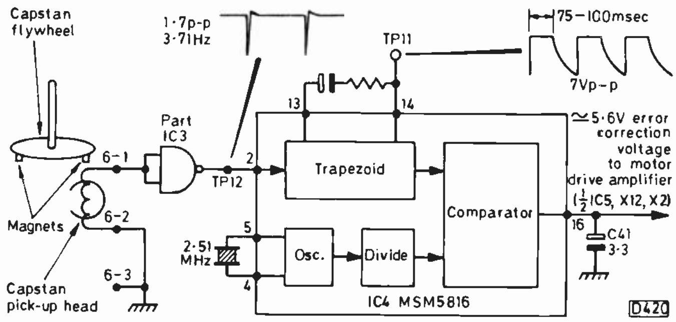


Fig. 49: The capstan servo.

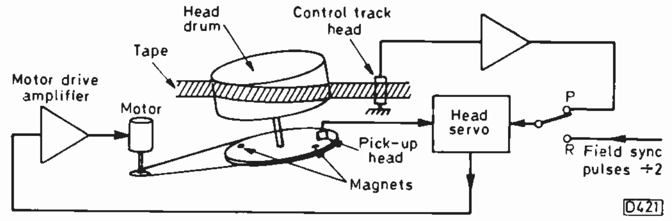


Fig. 50: The drum servo.

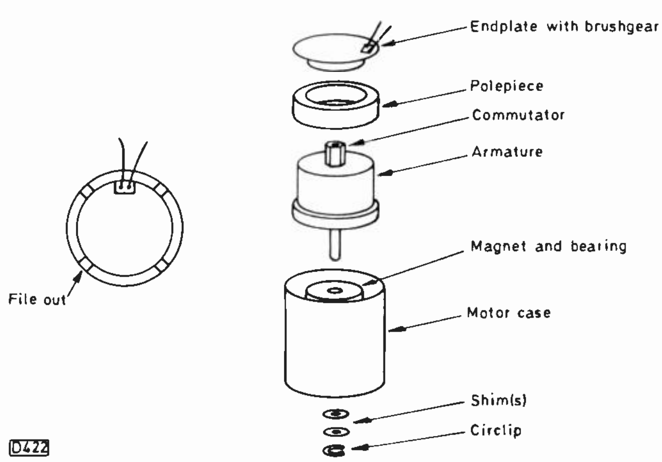


Fig. 51: Drum motor assembly.

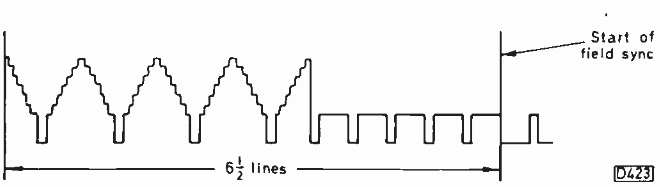


Fig. 52: Head switching adjustment.

side, probably with no colour. If the servo is attempting to correct the speed there'll be a rhythmic change from a still picture to lines. Anything that affects the tape speed or causes wrinkles on the lower edge of the tape will result in variations in the frequency of the control pulses which in these machines form the reference pulses for the drum servo. We'll discuss these latter faults in more detail when we deal with the mechanics.

When confronted with a drum servo fault the first thing to do is to attempt adjustment. R49 and R52 are the two presets concerned in this machine. R52 must be adjusted first: it alters the loop gain and must be set so that the servo's gain is at maximum without oscillation. The easiest way to carry out the adjustment is to damp the motor by connecting a 100Ω, 1W resistor between TP16 and TP13, then put the machine in play and pause: scope the waveform at the collector of transistor X9, turn R52 clockwise until the trace becomes unstable with negative-going spikes, and finally back off until the spikes only just disappear (don't give the customary 10° for luck!).

If this adjustment is out, the servo will "hunt", the picture shifting sideways and the colour becoming displaced rhythmically. It's interesting to consider why. If R52 is turned too far anticlockwise, the motor drive amplifier will have insufficient gain to stabilise the servo: if it's turned too far the other way, the loop gain will be too great and the system will oscillate. Both effects give similar results.

The other preset (R49) sets the free running speed. The easiest way to adjust it is to put the machine in record, switched to the "camera" input. This ensures that no sync pulses are produced and the drum servo runs free. When the speed is correct, the drum will appear to be stationary when viewed under a 50Hz mains fluorescent light. When the free running speed is not correct, the drum will take a long time to lock up – if it does so at all. As the trapezoid's slope is steeper on record, the machine may work on playback.

If you find that it's necessary to carry out these adjustments frequently, the head drum motor is probably defective. To check this, look at the waveform at TP16 with the machine in play and the pause key depressed. This will remove the control pulses by stopping the tape, with the result that the output voltage from the comparator circuit should be constant. Provided the motor drive amplifier is correctly set up (R52), the ripple at TP16 should be less than 1V. If it's more than this, the motor is drawing excessive current and in consequence there's ripple in the feedback loop.

In this case you might think that the only cure is to fit a new motor. It's possible to repair these motors quite successfully however. There are various causes of excessive current demand, but the most common one is that the gaps between the commutator segments have filled with copper dust, shorting out the armature windings. If you remove the belt and spin the motor pulley it should feel smooth: if any roughness is detectable the armature is distorted and fouling the polepiece – there is no cure for this.

If the motor feels smooth, proceed as follows. Remove and disconnect the motor and remove the circlip and shims from the shaft (if fitted). Earlier motors did not have the circlip. File out the parts where the case is staked over the endplate, at the opposite end to the shaft (see Fig. 51). The endplate can then be carefully levered out, taking care not to damage the brushes. The armature cannot be removed until the annular polepiece has been taken out – provided the case has not been burred, the polepiece will slide out without difficulty. Once the armature is out, the gaps in the commutator can be cleaned, using a fine needle or a scalpel blade. Take care not to cut the copper. Wash off, using switch cleaner or alcohol, and clean the brushes with the same solution. When reassembling, don't try to stake the case over: if it's not a tight fit, a few spots of epoxy adhesive should do the trick. The motor should now work.

Head Switching

The only point left to cover is adjustment of the head switching (refer back to Fig. 15 to see what's involved). There are three adjustments, two (R21 and R24) for playback and one (R8) for record. Those for playback must be adjusted first, using a known good tape (preferably the manufacturer's alignment tape). A double-beam scope is required, with one channel connected to TP7 and the other to TP2 (both on the servo board). Adjust for the condition shown in Fig. 52, using the scope's positive trigger for R21 and the negative trigger for R24. Then adjust R8 on record. In each case adjust for six and a half lines between the bistable's changeover point (TP7) and the start of the field sync pulse at TP2.

A quick word on the effect of incorrect adjustment. If the switching occurs too late, it may obliterate the field sync pulse, causing jitter or rolling, or may even appear at the top of the picture. If the switching occurs too soon, it will appear at the bottom of the picture area as a few displaced lines.

Preset Tracking Control

One final adjustment – the preset tracking control R10. To adjust this, make a recording and play it back with the front tracking control in its click position. Connect the scope to TP7 on the pre-rec board and adjust R10 *slowly* for maximum level f.m.

Servicing Luxor 90° Hybrid CTVs

Part 2

Tony Thompson

THIS final instalment deals with the sync and timebase sections of the receiver.

In the event of lack of sync – field, line or both – check the sync separator transistor Q701 (BC134) and the attendant noise inverter transistor Q702 (BC148). Weak sync shows up first on the field scan. If the sync fault is confined to one of the timebases only, note that there's a pulse amplifier stage in each sync pulse feed. Check the appropriate transistors – Q704 (BC153) in the field sync circuit, and Q703 (BF178) which is transformer coupled to the flywheel line sync discriminator circuit. Fig. 3 shows the sync circuitry.

The Field Timebase

The field timebase consists of a PCL805 in a fairly straightforward circuit. Note that the triode section is used as a blocking oscillator rather than being cross-coupled with the pentode section. The hold control setting is critical, but little drift should be experienced.

The PCL805 works hard and is a regular offender. Lazy opening, field slip, jitter – all the usual tricks. If lack of height can be cured by adjusting the height control R753 (2·5MΩ – you may find it labelled "hold") it's likely that the control is in need of replacement. Don't rely on switch cleaner – the effect of this won't last. Some sets were fitted with a PL508 on an adaptor. This gives much wider hold control and is an altogether more acceptable arrangement. The hold control itself (R746, 250kΩ) is vulnerable to damage since it has a spindle that sticks through the back of the cabinet. I've used a standard volume control as a replacement in several sets.

If almost complete field collapse cannot be cured by changing the valve, check the 2·2MΩ resistor R754 that's in series with the height control. There should be 530V at the feed end of this resistor. If you find a pulse voltage instead – check with your meter on the 1kV a.c. range – the rectifier that provides the 530V supply is short-circuit.

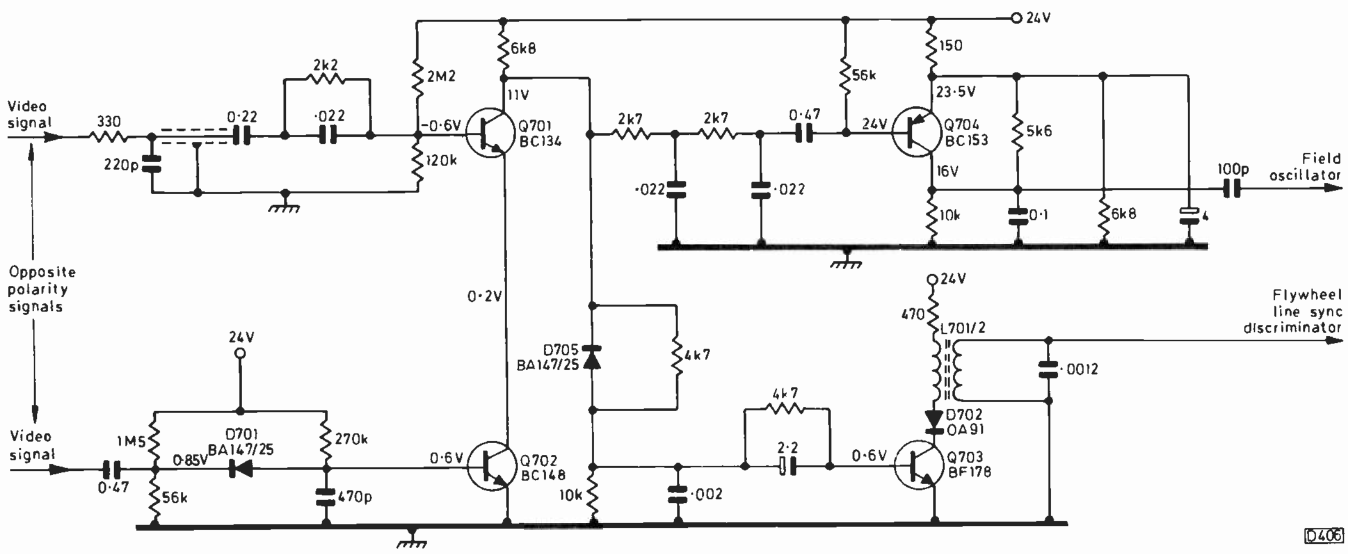


Fig. 3: The sync circuit used in Luxor 90° hybrid colour sets. This must be one of the most complex discrete component sync circuits to have been used in a production chassis. Q701 is a conventional sync separator, producing negative-going sync pulses at its collector (positive-going sync at its base). Q702 is normally forward biased at its base, but a negative-going noise spike (which will be positive-going at the base of Q701) will pass to its base via D701, thus preventing conduction of Q702 and Q701. The field sync pulses are passed via a two-section integrating network and coupling capacitor to the base of the amplifier/clipper transistor Q704, which produces constant-amplitude pulses to synchronise the field oscillator. The line sync pulses pass via D705 to the base of Q703, cutting it off and thus applying a pulse to the tuned circuit coupled to its collector. The tuned circuit provides a sinewave (one complete cycle per sync pulse) to drive the flywheel sync diodes – the flywheel sync discriminator circuit is of the type used in early versions of the Rank A823 chassis.

It's D902, type E250C10, over in the line output stage. Replace it and R754 which will have suffered, and check the reservoir capacitor C911 ($\cdot 001\mu F$) – a high-voltage type should be used in this position.

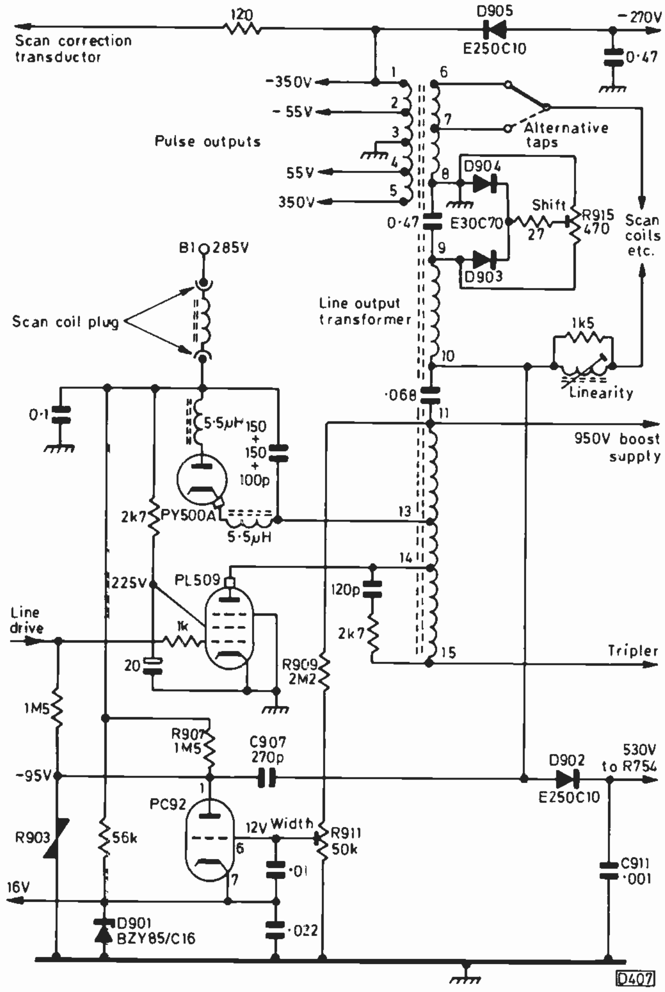


Fig. 4: The line output stage circuit used in Luxor 90° hybrid colour receivers. Width/e.h.t. stabilisation is carried out by the PC92 triode and its associated components – "active" stabiliser circuits were popular amongst Scandinavian set designers at that time. The triode acts as a pulsed amplifier, conducting when a positive-going line flyback pulse is applied to its anode via C907. The triode's conduction depends on the pulse amplitude and the bias applied to its grid via R911. When the triode conducts, C907 acquires a negative charge to add to the bias developed at the control grid of the PL509 line output valve. This charge leaks away via R907 between pulses. The conventional stabilising element R903 is included to ensure that a degree of stabilisation continues in the event of failure of the PC92 triode. Note that the height control is fed (via R754) from a separate rectifier circuit (D902/C911) instead of from the 950V boost rail.

Line Timebase Faults

There are four valves in the line timebase. A PCF802 line oscillator drives the PL509 (or PL519) line output valve, the unusual feature of the line output stage being the use of a miniature PC92 triode in the width/e.h.t. stabilising circuit (see Fig. 4). This triode is mounted on the upright panel but is buried inside the line output stage screened compartment, beneath the line output transformer. It's consequently difficult to locate and replace, causing much head-scratching if it's late in the day and you've the problem of a seemingly impossible open-circuit heater chain. The other line output stage valve is the PY500A boost diode.

Preset line hold control is provided by the line oscillator coil L703, which is behind the PCF802. Because of its position, the chassis should be withdrawn should adjustment be necessary. The use of a screwdriver-ended plastic knitting needle also helps. Unless you're brave enough to reach in with your hand . . . Cases of line drift will nearly always respond to a new PCF802. Get a good brand. Lack of or weak line sync can be caused by the high-value ($2\cdot 7M\Omega$) resistors R748/9 in the flywheel sync discriminator circuit.

Difficulty in setting the width should lead to investigation of the PC92 valve. Check particularly for 16V positive at its cathode. If this is not present, the chances are that the 16V zener diode D901 (BZY85/C16) is short-circuit. R911 is the width/set e.h.t. potentiometer – it's adjustable from the print side of the line output stage panel. The other troublesome item here is the high-value ($2\cdot 2M\Omega$) resistor R909. Though rated at only 1W, it's a big, imposing looking component and tends to be overlooked in the quest for why the e.h.t. is excessive and the action of the width/set e.h.t. control is limited or non-existent. I find that resistance measurement is inconclusive, the best course being replacement. Using two resistors in series to make up the value approximately is worthwhile, since the cause of failure seems to be the high pulse voltage developed across R909.

You may well find a number of dry-joints on the line output panel, particularly around the valve bases and the high-wattage wirewound resistors. But check the entire panel carefully: this can save early failure. The connections from the valve caps to the line output transformer are particularly suspect, as metal strips are used instead of wire. Flexing of the Paxolin tag panel on the line output transformer here can cause cracked or dry-joints.

The focus control itself is reliable, apart from the unfortunate tendency for its centre spindle to push through when provoked – handle with care. Focus variations are much more likely to be due to moisture in or around the tube's cavity connector, especially if this is of the older type. Fit a moisture resistant type if possible, especially if the set's working location is likely to be dampish. Unfortunately another cause of focus variation is the tube itself. Soft boosting helps for a while.

Black, flickering lines accompanied by picture tinting will be caused by one of the many spark gaps on the c.r.t. base arcing: listen for the faint ticking if you can't see the offender. A good brushing may clear this, or gentle needle filing. I've found lots of these spark gaps simply cut out of circuit: can't be good, yet the sets have probably run for years without this protection.

The e.h.t. tripler is as reliable as any I've come across: the occasional failure is easily put right by using a universal tray.

Finally, just to show that fault-finding can at times be confusing, here's a recent example. The customer's complaint was of a slowish field collapse followed by a blank screen (no raster). Investigation showed that the supply to the anode of the field oscillator was missing, and I caught sight of a sprung-open wirewound resistor on the power supply panel. Resoldering this produced a different set of symptoms however – low field scan, a rolling picture and what looked shockingly like a worn-out tube. Only I knew that it wasn't! Then I twigged it – the line output valve was glowing dimly red at its anode. Hasty replacement of the PCF802 restored everything to normal.

Teletopics

HIGH-DEFINITION TV DEMONSTRATED

This year's annual meeting of the EBU General Assembly, held at Killarney under the auspices of Radio Telefis Éireann, was the occasion for the first European demonstration of the Japanese NHK high-definition TV system. The system uses 1,125 lines and an aspect ratio of 5:3, giving an improvement in definition of some five times in comparison with present TV standards. The main problem of course is the extra bandwidth required (20 MHz): NHK are carrying out a programme of band compression technology studies, whilst bandwidth is less of a problem with DBS transmission. A report on the demonstration says that coverage of American football displayed on a 100in. projection TV screen enabled the stitches on the leather football to be clearly seen, whilst a scan of the stadium enabled the seat numbers to be identified. This material was provided by CBS, whose head of engineering and development Joe Flaherty commented "somewhere during the period 1986–90 a high-definition television system is going to do to the current generation of domestic TV systems what colour did to black-and-white in the sixties." The Japanese Broadcasting Corporation (NHK) is clearly determined that should this happen the system that will be adopted as an international standard will be theirs. Work on the system has been continuing since 1970, with various Japanese manufacturers (including Sony, Ikegami, Panasonic and Hitachi) contributing by developing suitable equipment.

Some of the steps in the development of the system are as follows, in chronological order. 1972 saw the development of a 22in., high-definition shadowmask tube. A 2in. RBS (return beam saticon) pickup tube with high resolution and signal-to-noise ratio was developed for high-definition TV use in 1974, and an experimental camera was built. In 1978 a 30in. high-definition tube with 5:3 apect ratio was developed, along with a convergence system using a digital memory – this system was subsequently used in projection TV displays. 1978 also saw the first test transmission of high-definition TV via satellite, using the BSE satellite: because of the satellite's low output power, the luminance and chrominance signals were transmitted separately, using f.m. with bandwidths of 75MHz and 25MHz respectively. Reception was achieved with a 1·6m dish.

A camera using a DIS (diode-operation impregnated cathode saticon) tube was developed in 1980, also a telecine capable of converting 70mm movie film to high-definition TV using a laser flying-spot scanner, and a high-speed analogue-to-digital converter for high-definition TV use. The development of digital high-definition TV equipment started, including a VTR timebase corrector and image enhancer. A series of experiments were conducted in the 38GHz band.

A VTR for high-definition TV use was developed in 1981, using high-speed, high-density recording technology. Developments this year include a DIS tube with improved signal-to-noise ratio (achieved by taking the signal from the faceplate end of the tube) and a 220in. projection system.

Whilst this is all very commendable, we are left a little concerned by NHK's comment that the system "will be acceptable and most suitable for an imaging system in the future post industrial society."

STATION NEWS

The following relay transmitters are now in operation:
Afon Dyfi (Powys) BBC-Wales ch. 22, HTV-Wales ch. 25, BBC-2 ch. 28, Sianel 4 Cymru (future) ch. 32.
Boscastle (Cornwall) Television South West ch. 23, BBC-2 ch. 26, TV4 (future) ch. 29, BBC-1 ch. 33.
Chipping Norton (Oxfordshire) BBC-2 ch. 48, Central Independent Television ch. 55, BBC-1 ch. 65, TV4 (future) ch. 67.
Hartland (N. Devon) BBC-1 ch. 48, Television South West ch. 52, BBC-2 ch. 56, TV4 (future) ch. 66.
Holmfield (W. Yorkshire) BBC-1 ch. 55, Yorkshire Television ch. 59, BBC-2 ch. 62, TV4 (future) ch. 65.
Mevagissey (Cornwall) BBC-1 ch. 40, Television South West ch. 43, BBC-2 ch. 46, TV4 (future) ch. 50.
Ogbournes (Wiltshire) BBC-1 ch. 40, HTV-West ch. 43, BBC-2 ch. 46, TV4 (future) ch. 50.
Swimbridge (N. Devon) Television South West ch. 23, BBC-2 ch. 26, TV4 (future) ch. 29, BBC-1 ch. 33.

The above transmissions are all vertically polarised.

All new BBC transmitter openings are now being announced on Ceefax – by selecting page 196 a series of rotating pages giving details of new transmitters, low-power working at existing stations, BBC survey work and other news is obtained. The Thursday morning BBC-2 service information programme now simply presents information about reduced-power working and off-air periods, as on the other weekday mornings.

Channel 4 trade test transmissions from many of the high-power transmitters have now commenced. These are from 9 a.m. to 8 p.m. daily (including Sundays) and are subject to interruption or power reduction to enable engineering work to be carried out. Since many recently installed relay stations are already equipped for C4/S4C transmission, these too will be carrying the trade test transmissions – provided a programme feed is available.

NEW TV ICs

Five new TV i.c.s are now available from Mullard. The TDA3540 and TDA3541 are direct replacements for the TDA2540 and TDA2541 i.f. i.c.s, with a much improved specification. The synchronous demodulator has been redesigned to give 10-20dB less intermodulation than before with about 3dB higher sensitivity. The video bandwidth is now 7MHz, and the performance of the a.g.c. and a.f.c. circuits has been improved. Other features include a white spot inverter, video preamplifier with noise protection, a.f.c. with on/off switching, a.g.c. with noise gating and provision for external switching to enable a VCR playback signal for example to be inserted. The i.c.s are available in 16-lead plastic DIL or QIL packs.

There are three i.c.s for use in the sync and timebase sections of the receiver. The TDA2578 combines the sync operations with line and field oscillators – the flywheel line sync circuit has two control loops. It also supplies a three-level sandcastle pulse, with continuous blanking in the event of a field fault being detected. The TDA3651 and TDA3652 provide the field output to drive 90° and 110° tubes respectively. Whilst the power and current ratings of the field output chips differ the pin connections are the same, enabling the same board to be used in both 90° and 110° sets. The TDA3651 will drive various deflection coils at currents up to 2A peak-to-peak, the TDA3652 providing a drive at up to 4A peak-to-peak. The maximum flyback voltage is in each case 50V. Use of a TDA2578 plus TDA3651/TDA3652 combination results in a slightly simpler circuit than with the TDA3576A plus TDA3650 combination as a result of the omission of the field sync count-down circuit. The TDA2578 comes in an 18-pin plastic DIL pack: the TDA3651/TDA3652 are available in 9-lead plastic power SIL or SIL bent to DIL configurations.

INDUSTRIAL GLOOM

The failure of the oft-promised economic recovery to show any signs of starting is affecting much of the radio/audio/TV industry. Excessive stocks are blamed by GEC-Hitachi for plans to reduce the workforce at their Hirwaun, S. Wales plant from 1,900 to 1,070. The plant is working at about half its production capacity of 300,000 colour sets a year – a three-day week was implemented last April. The consequences for Alba and loudspeaker manufacturer Wharfedale have been more drastic: Alba have called in the receivers while Rank have closed the Wharfedale factory. Alba continues to trade – the receivers hope to be able to offer parts of the business for sale as going concerns – but Rank's action seems final after failure to find a buyer for the Wharfedale business.

Alba is one of the oldest firms in the UK radio/TV industry, having been started by Alfred Balcombe in 1917. The firm produced its own TV chassis until 1966, when it started to use Philips chassis and later Thorn chassis. In 1960 they were the first firm to offer a printed panel exchange scheme. Wharfedale were 50 years old this year, having been started by Gilbert Briggs in 1932. The story goes that he bought a couple of old German loudspeakers in a junk shop and decided he could produce a better product. Wharfedale became well known for extension speakers before the war. In the early fifties Gilbert Briggs did much to get the cult of hi-fi started – his book entitled "Sound Reproduction" was the bible for many of us in those days, and his demonstrations at the Royal Festival Hall and elsewhere will long be remembered. The firm was sold to Rank in 1959, with G.A. Briggs remaining in charge until his retirement in 1963.

EUROPEAN VCR PRODUCTION

Production of VHS VCRs has now started in Europe, at the J2T joint-venture plant in W. Berlin. The plant is expected to produce some 300,000 standard machines next year whilst the Newhaven plant in the UK, due to commence operations this October, will be able to produce up-market models at a rate of some 200,000 a year.

Sony have been assembling Betamax machines at Fellbach, near Stuttgart, W. Germany since this May and hope to have a fully fledged production plant in operation there by 1984. Philips are planning to start manufacture of V2000 system VCRs in France by the end of the year, with a sales target of 250,000 machines in 1984. Thomson-Brandt, who have signed a separate agreement with JVC, expect to produce 100,000 VHS machines at Moulins, central France, next year.

GRUNDIG-TELEFUNKEN DEAL

An announcement of plans for Grundig to take over control of AEG-Telefunken's consumer electronics operations has been made. AEG-Telefunken have been making heavy losses for several years now and GEC are interested in the heavy electrical and telecommunications side. Because of the need for approval by the W. German cartel office, the complex deal between Grundig and Telefunken is awaiting finalisation as we go to press.

CINEVISION 200

The bright display provided by the ITT CineVision 200 projection TV system received favourable comment at CETEX – no need to view under darkened ambient lighting conditions. This superior performance is obtained by using Novabeam projection tubes and a parabolic, silvered screen – both manufactured by the Kloss Video Corporation in the USA. The Novabeam tube incorporates the c.r.t. plus Schmidt mirror and lens in a single unit – in fact it's a form of lightguide tube (see Developments in Projection TV, June 1981).

TV COURSES

The South London College's annual autumn practical colour television servicing course starts on September 30th. The 16 lecture/practical class meetings will be held on consecutive Thursday evenings from 6·15-9·15. An examination is held at the end of the course, which is intended for those already having some qualifications and experience. The examination is conducted by the RTEEB and a recognised certificate is awarded. Details can be obtained from the Senior Administrative Officer, South London College, Knights Hill, London SE27 0TX.

The Southern Centre of the Royal Television Society is sponsoring a course of nine evening lectures to be held at the Southampton Technical College, starting on October 19th. The title of the course is "An Introduction to Broadcast Television": it's intended for those interested in the engineering side of studio work. Details are available from C. Terry, Educational Television Unit, Southampton Technical College, St. Mary Street, Southampton SO9 4WX.

NEW VCRs FROM HITACHI

The latest VCRs from Hitachi are the VT9300 and VT9500 which supersede the VT8300 and VT8500 respectively. Derek Snelling reports that they represent a complete redesign from the previous models, even down to different mechanics in some areas, particularly the brakes. The VT9300 is a basic, budget-priced machine designed to sell to the first time VCR buyer at around £460. The mechanical tape counter used in the previous model has been superseded by an electronic digital readout which doubles as the timer display indicator for set-

COLOUR PORTABLE PROJECT

Some constructors have had difficulty with teletext lines superimposed on the picture. On investigation, this has been found to be the result of slight foldover due to the field deflection coils being used having a different *LR* ratio to those on the sample tube on which our original development work was done. The solution is simple – change the values of the stabilising components associated with the field timebase i.c. The new recommended values are 150kΩ for R30 and 100pF for C25. These changes also improve the field linearity, especially at the top of the picture. Where they are made to a set that has already been built the field linearity control will need to be reset.

ting the current time and for timing recordings. The visual search facility now runs at nine times the normal speed, and there's microcomputer function control. A ten day, one programme timer which is particularly simple to set is used. The audio dub and frame advance facilities have been dropped.

The VT9500 is a more sophisticated version of the machine, offering in addition Dolby sound, still frame and frame advance, audio dub and a ten day, three programme timer. The tape index and half/double speed features have been dropped. A retail price of around £565 is suggested.

An interesting feature tucked away inside these machines where the customer can't get at it is an "auto replay switch": when this is in the on position, the machine goes straight back into play after rewinding at the end of a tape. Useful for demonstrations – or for servicing in the event of an intermittent fault.

SUBSCRIPTION TV

Most of the two-year trial subscription TV services authorised by the Home Secretary in 1981 have now been in operation long enough for those running them to be able to make a preliminary assessment of the response. Under the trial scheme, cable operators serving some 110,000 homes are permitted to offer their customers an extra channel, at an additional charge of around £6-£12 a month, carrying mainly feature films.

A shortage of decoders has hampered the services in some areas, but that apart the response seems to have been quite variable from place to place. Radio Rentals for example report that the response to their Cinematel service in the Medway towns was considerably more successful than in Swindon, while Rediffusion report a success rate of 28 per cent in Hull compared to an average of 13 per cent overall in the five towns where their Starview service is available. Rediffusion also report that there is a degree of resistance to charges in excess of £8 a month: they have recently reduced the charges in three towns. Visionhire report an "encouragingly high" response from subscribers to their Showcable service in N.E. London.

It's difficult to know quite what to make of all this. At £8 a month for say 15-20 titles you're getting a limited choice rather more cheaply than by hiring cassettes, especially since you don't have to acquire a VCR. The quality should also be better, but the fact is that the amount of material now available in cassette form is vast. Cheap discs will add further to the complications in coming to an eventual conclusion.

Inside the Philips VR2020

Part 5

Brian Dempster

POWER supply panels P30/P80 were modified at production code WD53: the outputs remain about the same, but the method of derivation changes somewhat. The various rails provided are suffixed a or b. Those suffixed a are available continuously (assuming a mains input of course) whilst those suffixed b appear only when an instruction is received from the microcomputer on panel U20. This instruction arrives when the machine is switched on or any tape transport button is pressed. A guide to the presence of the instruction to activate the b lines is the tape counter and channel displays, since these are enabled by the same signal. A simplified circuit of the earlier version of the power supply is shown in Fig. 35.

The primary winding of the mains transformer is energised all the time, there being no mains on/off switch. Two thermal fuses, TF1 and TF2, are incorporated, one in each limb. The three secondary windings feed bridge rectifiers via anti-surge fuses.

The +12a, +15a and +35a lines are produced by bridge rectifier BR1. The +12a supply feeds the sync and motor control panels U140 and U180 and the aerial amplifier U300. The series regulator REG1 is mounted on subpanel P80 at the rear of the machine and is of the three-terminal type. It embodies both excess current (short-circuit) and thermal protection.

Over-voltage protection for the +12a line is provided by zener diode Z1 in conjunction with thyristor TH1 and relay R. If the voltage on the line exceeds 13V, zener diode Z1 conducts, the voltage at its anode in turn triggering thyristor TH1 which turns on and latches via relay R. The relay's normally-closed contacts then open, disabling all three supply lines. The same situation occurs when a switch-off signal arrives from the motor control panel (see Fig. 34). These supply lines remain disabled until the mains input has been removed for thirty seconds or so. A switch-off signal does not occur when there's no tape in the machine, thus assisting with fault-finding.

The +15a line feeds the wind and rewind motors and, on earlier machines, the pressure roller and brake solenoids. The +35a line feeds the position sensing switches for the brake, pressure roller and eject solenoids and the drum servo driver transistors, also the circuit that produces the "+11" supply for the wind and rewind motors (see Fig. 33). These two lines do not need to be stabilised.

The +5a supply goes to the microcomputer panel U20 and the control/display panel. A high degree of stability and smoothing is required here, so a switch-mode system is used (chopper transistor T1, inductive reservoir L1, plus D1 and C2).

Bridge rectifier BR2 charges the high-value (4,700μF) reservoir capacitor C1, the resultant voltage being applied via the 2A quick-blow fuse to the emitter of T1 which is switched on and off by the variable mark-space ratio drive waveform at its base – the circuit is a conventional series chopper arrangement. The greater the ratio of the transistor's on time to its off time, the higher the voltage developed across C2. To achieve stabilisation, a sample of the output voltage is obtained from the potential divider R1/2 and fed to control circuit.

The latter contains a sawtooth generator, whose frequency is set at about 30kHz by an *RC* network, and a voltage comparator circuit – the principle was illustrated in Fig. 6 on page 546 last month. The sample voltage from R1/2 is compared to a reference voltage, the output from the comparator and the sawtooth being the two inputs to a pulse-width modulator. When the sawtooth voltage exceeds the voltage from the comparator, the modulator's output goes high – and vice versa. The net

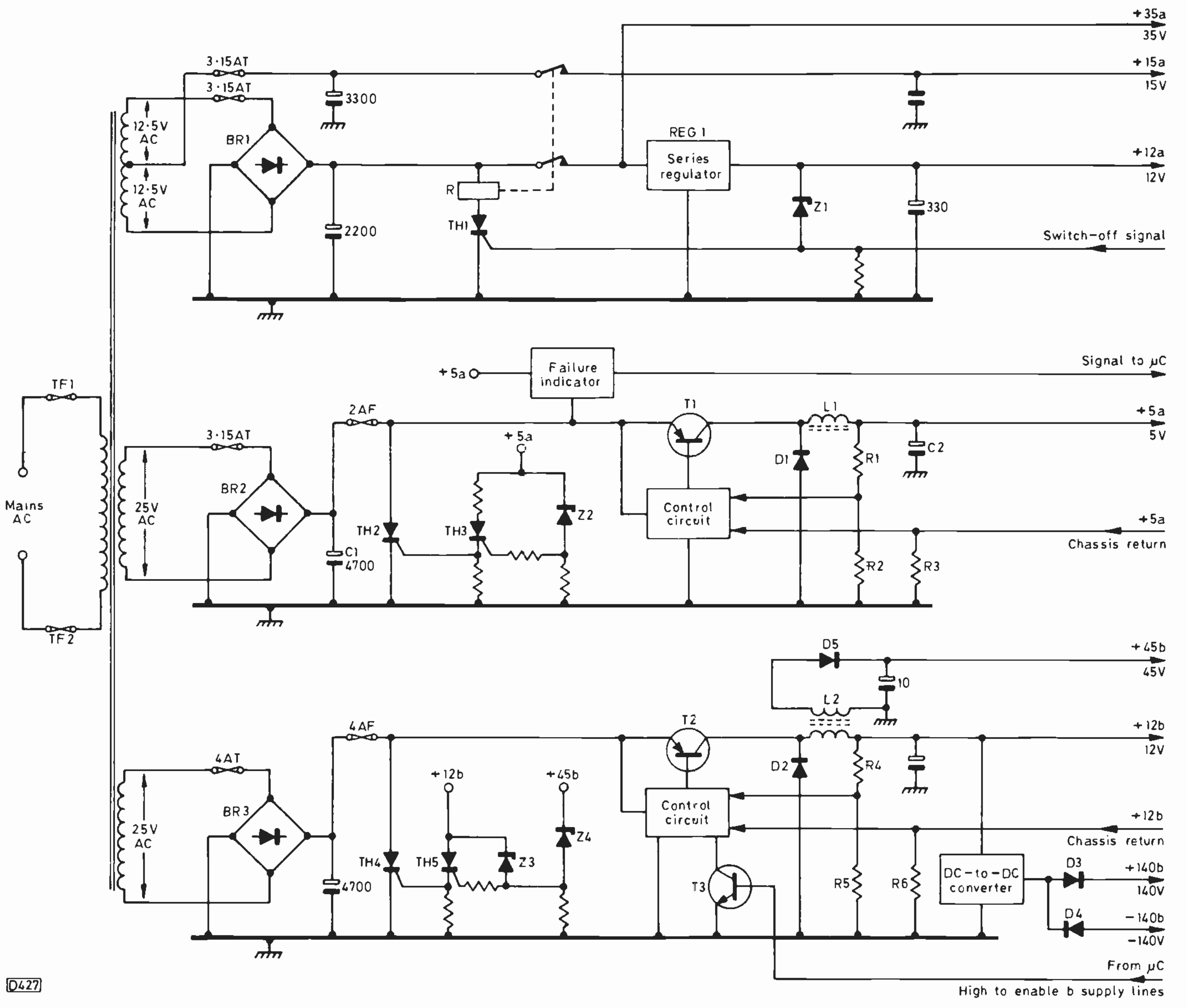


Fig. 35: Power supply circuitry – original version.

result is a squarewave output whose mark-space ratio is determined by the sample voltage from R1/2. After current amplification in the control i.c., this squarewave output is used to drive T1. To avoid excessive dissipation, T1 is over-driven so that it's either saturated or cut-off.

When T1 switches on, current flows via L1 and D1 is switched off. As a result, energy in the form of a magnetic field is stored in the reservoir inductor. When T1 switches off, the collapsing field around L1 switches D1 on, clamping the left-hand side of L1 to chassis. Current continues to flow therefore, T1 eventually switching on again to begin a new cycle.

The +5a supply current flows via R3, thus producing a voltage proportional to the current flow. This voltage is applied to another comparator in the control i.c. When the +5a current reaches about 600mA limiting commences, any attempt to increase the current flow resulting in reduced output voltage.

Over-voltage protection is provided by Z2, TH3 and TH2 in conjunction with the 2A quick-blow fuse. If the voltage on the +5a line exceeds 5·6V, zener diode D2 conducts, triggering TH3. The latter's cathode current turns on and latches TH2, blowing the fuse to isolate the supply.

The failure indicator output is normally 5V and feeds one of the microcomputer's test inputs, T0. If a mains failure occurs or the voltage at the emitter of T1 falls below 14V, the failure indicator's output goes to zero. The microcomputer checks T0 very frequently and when it detects a zero input it brings about a sequence of data dumping. This sequence lasts for a very short time and is completed well before the +5a line decays. The failure indicator's output also provides the microcomputer reset command when the mains supply is restored. The failure indicator is a very simple two transistor configuration.

Another, similar chopper circuit produces the +12b and +45b lines. Its operation, stabilisation and the current limiting are the same as with the +5a supply except for the following differences. Over-voltage protection is again of the crowbar type, but both the 45V and 12V lines are sampled, via Z4 and Z3 respectively, so that the 4A fuse will blow if either line goes high. The current at which limiting occurs is this time 3·5A.

The b lines are available only when the microcomputer sends a logic high to the base of T3 to switch it on. The +45b line is used for the varicap tuning supply and is obtained from an auxiliary winding on L2, via D5 and its associated reservoir capacitor.

The actuators require ±140V supplies. These are derived from the 12V rail via a d.c.-to-d.c. push-pull con-

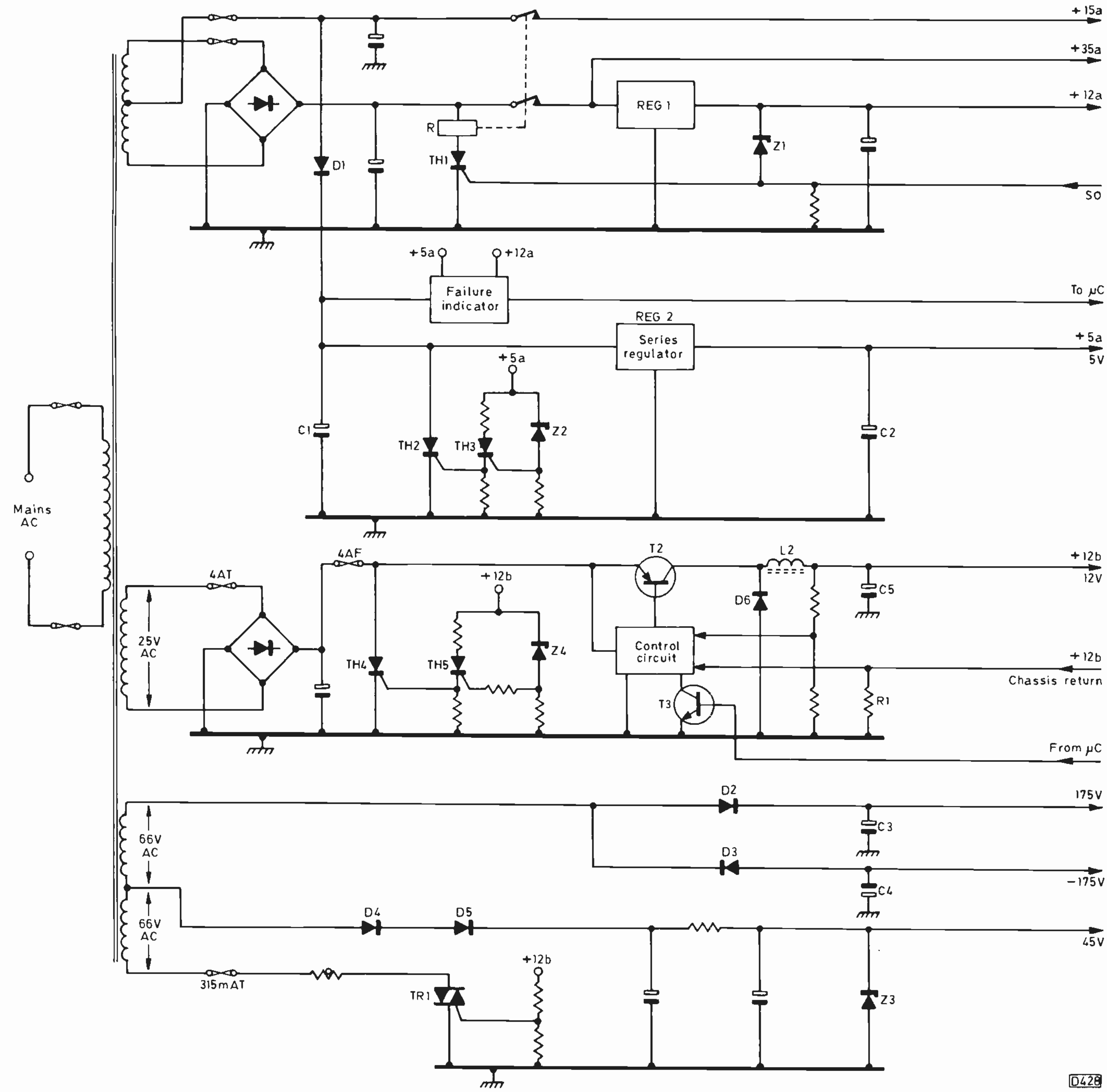


Fig. 36: Power supply circuitry – later version.

verter – a couple of transistors oscillating in push-pull at about 30kHz, with a small transformer to step up the voltage to the required level and diodes to rectify the output.

Later Version.

A simplified circuit of the later version of the power supply is shown in Fig. 36. The +12a, +15a and +35a supplies remain as in the earlier version.

The +5a line is now derived via D1 from the +15a rail before the protection relay (to ensure continuing operation of the microcomputer). A series regulator is used, mounted on panel U80. The over-voltage protection remains the same, and though the failure indicator serves the same purpose there are now four operational amplifiers instead of two transistors.

The +12a supply is also as in the earlier version, but without the auxiliary winding on L2 and the push-pull converter.

45V, 175V and −175V supplies are produced by half-wave rectification from 66V secondary windings. The h.t. supplies are for the actuators and the 45V supply for the tuning voltage. Initially the 45V line was not stabilised, and as a result it could under no load conditions, i.e. when the tuning panel U60 is removed, rise to 80V. Damage to the U60 panel could occur when it was subsequently replaced. To avoid this a 47V zener diode (Z3) was added – the manufacturers recommend that a BZX61/C47 diode is fitted to any unmodified panels.

Since these three supplies are required only when the +12b supply has been activated by the microcomputer, the earthy end of the transformer's secondary windings is taken to chassis via a triac (TR1). When switched on this device is a virtual short-circuit; when it's off it presents a very high resistance.

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·00 postal order (made out to IPC Magazines Ltd.), the query coupon from page 605 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.

ASA CT5004

There's lack of width, two-three inches at each side of the screen. The line output stage valves – PL509, PY500A and ECC81 – have been replaced and the panel checked for any obvious faults but nothing has come to light. If I fit a faulty ECC81 valve there's excessive width with flyback lines!

The section of the ECC81 used in the line output stage provides width stabilisation. It acts in conjunction with the 20V zener diode D45 which could well be faulty. The next thing to check is R386 (2·2MΩ) which links the valve's grid to the boost rail. If necessary, go on to check the other high-value resistors in this area – R383 (1·5MΩ), R381 (1·5MΩ) and R384 (470kΩ).

ITT CVC32 CHASSIS

The colour went, leaving a monochrome picture. The TBA560C and TBA540 i.c.s in the decoder have been replaced without curing the fault, but disconnecting R536 from pin 7 (colour-killer output) of IC502 restores the colour. Pin 9 of this i.c. (a.c.c./ident output) is at 5V instead of 1·5V.

We suggest you check D507 and C524 (4·7μF) in the colour-killer bias feed line, preferably by substitution. It's possible that a fault in IC503 could be pulling up the voltage at pin 14 and hence at pin 9 of IC502.

THORN 9000 CHASSIS

When the set is switched on the picture is split by horizontal lines an eighth to a quarter of an inch apart. There is also a slight high-pitched hum. Switching off and on clears this. When the channel is changed the set switches itself off for one-two seconds. After about five hours use the horizontal lines keep coming back for about twenty seconds and the set will switch itself off for one-two seconds.

This symptom can be caused by a discharge at the focus spark gap on the c.r.t. base – associated with pin 1. It should be possible to see this in darkness. Either widen the spark gap by filing or fit a new one. Then adjust the focus control for best definition.

RANK A823 CHASSIS

The line output transistors have been replaced but voltage balancing can be brought down to 0V for only about a minute. The voltage then rises and the transistors start to overheat. The colour is also very weak, with the colour control having no effect.

Imbalance between the two line output transistors or failure of one of them upsets the colour in this chassis because of the low amplitude pulses fed to the decoder. Concentrate on the line output stage, replacing the transistors if they seem to have been damaged. Before switching on, check (preferably by substitution) the resistors in the line output transistor base drive circuits – 6R1/2/3/4 – also the flyback tuning capacitors 6C5/6. Finally, ensure that you carry out the balancing procedure at a low setting of the h.t. control.

ITT CVC5 CHASSIS

There's no raster or sound. A new line output transformer was fitted, producing a fair amount of e.h.t. The transformer's field gives a healthy glow in a neon screwdriver, but after a short time the windings begin to smoke. F4 has blown, removing the 20V line and hence the raster, but the bridge rectifier and 20V stabiliser circuit seem to be o.k. The l.t. current is nearly 2A, but if the vertical shift circuit is disconnected the current is normal.

Disconnect the vertical shift circuit from the l.t. department then check with an ohmmeter whether it's earthed – it should be floating. If it's earthed, a sliver of solder on the component side of the board or a blob on the print side will probably be responsible. Both problems could be due to the raster correction transductor's insulation having broken down. Whenever we've seen smoke coming from a newly fitted line output transformer on one of these sets it's been due to the pulse lead to the decoder having been accidentally earthed – often trapped between the tuner bracket and chassis. Disconnect pin 4 of the line output transformer to prove the point.

PYE 731 CHASSIS

The h.t. fuse blew and the line output transistor and the 30V zener diode in series with it were found to be short-circuit. These items were replaced, as was the c.r.t. first anode reservoir capacitor C563 as a precaution. Unfortunately the fuse promptly blew again. The tripler was then disconnected, but another fuse blew. With all circuits connected the h.t. current reads 2·5A and the h.t. feed resistors R972/3 glow visibly red hot within a matter of seconds.

Unfortunately a chain-reaction fault can occur – the focus potentiometer goes low in value, destroying the tripler, then the line output transformer, followed by the line output transistor and the thyristor in the h.t. supply – the latter goes into the diode mode. Progressive disconnection of these items is the only way of handling this situation.

THORN 9000 CHASSIS

There is no pincushion or width control on this set. W712 in the diode modulator circuit has been replaced, also the associated l.t. reservoir capacitor. The only clue is lack of voltage on the diode modulator driver transistor VT702.

Make sure that VT702 and its driver VT654 are not leaky or short-circuit. Then check C728 (4·7μF), the other diode (W711) in the modulator circuit and the continuity of L715. Make sure that there are no bad joints around the modulator transformer T705.

ITT VC300 CHASSIS

The problem with this monochrome portable is top foldover. The voltages on all the transistors (T6-T12) in the field timebase are correct however.

Check the field flyback diode D14, the flyback tuning capacitor C70 and the scan coil coupling capacitor C71. If these are in order it's likely that either the scan coils or the thermistor within them (R93A) is faulty.

Long-distance Television

Roger Bunney

THE Sporadic E season is now well established, with many signals from the south and east – especially the USSR – though reception from Scandinavia has unfortunately been rather limited. The openings during June were "patchy", with excellent periods followed by lulls lasting for several days. Most days produced at least something for someone, though many openings were sudden to arrive – and as quick to depart! To save space, the following log lists sources only, not channels:

3/6/82 RTVE (Spain).
4/6/82 RTP (Portugal); RTVE; RAI (Italy); TSS (USSR); MTV (Hungary). Also improved tropospheric reception at u.h.f.
5/6/82 A very intense opening from the late afternoon. NRK (Norway); TSS; MTV; TVP (Poland); RAI; RTP; RTVE; TDF (France); ARD (W. Germany). Band III SpE signals in chs. E5/R6 were noted at 1936, with Hugh Cocks logging reception in ch. R7.
6/6/82 TSS; NRK; TVP; ORF (Austria); RTVE.
7/6/82 RTP; RTVE. Also improved tropospheric reception in eastern UK, with signals from DR (Denmark) and ARD (in Band III and at u.h.f.).
8/6/82 RTVE; RTP; RAI; JRT (Yugoslavia); CST (Czechoslovakia); TVP; DFF (E. Germany); TSS; YLE (Finland); MTV; SR (Sweden). Improved tropospherics as on the previous day, with TDF stations in addition.
9/6/82 TSS; TVP; CST; MTV; TVR (Rumania) – a rare visitor this year, on ch. R3; RAI; DFF. Plus tropospheric reception, both normal and via ducting from W. Germany to central UK at u.h.f.
10/6/82 RTVE; RAI; TDF; DFF.
11/6/82 TVR; TVP; DFF; CST; MTV; ORF; ARD.
12/6/82 RTVE; JRT; MTV; TSS; NCT (Italian Udine free station, ch. E3).
14/6/82 SR; RUV (Iceland); RAI; TSS; Switzerland.
15/6/82 RUV; SR; TSS; TVP; ORF; TVP; CST.
16/6/82 MTV; TSS; JRT; RTVE; lunchtime Band I F2 and possible double hop SpE; RTVE/Canary Islands.
17/6/82 NRK; SR; TSS; RTVE.
18/6/82 RTVE; TDF; RAI; SR; NRK; YLE; RTM (Morocco) ch. E4 with PM5544 pattern at 1845 BST.
19/6/82 ARD.
20/6/82 RTVE.
21/6/82 ORF; TSS; MTV; RTVE; RAI.
23/6/82 RTVE; RTP; RTVE/Canary Islands ch. E3; TSS.
24/6/82 RTVE; RAI; RTP; JRT; MTV; ARD; TSS; SR; NRK.
25/6/82 TSS; SR; JRT; MTV; ORF.
26/6/82 TSS; NRK; RAI; RTVE; JRT.
27/6/82 RTVE; RAI; JRT; NRK.
28/6/82 SR; TSS; YLE; RTVE.
29/6/82 RTVE; RAI; RTP.
30/6/82 RTP; RTVE; NRK.

There were several small SpE openings up to July 5th.

Those experienced in double-hop SpE and F2/TE reception received some interesting signals. ZTV (Gwelo, Zimbabwe ch. E2) was present on the 9th, 13th and 21st, Dubai ch. E2 on the 16th, and GBC (Ghana) ch. E2 on the 24th – all via F2. Cyril Willis had suspected Syrian double-hop SpE reception on the 9th, Ryn Muntjewerff (Holland) receiving JTV Amman ch. E3 on the same day. There was similar reception on the 24th.

To the west, two Dutch enthusiasts logged lunchtime F2 reception of a ch. A2 system M (525 lines) signal on the 4th. Hugh had night-time double-hop SpE reception from N. America on the 5th (ch. A3 at after 2300), 23rd (Mash on ch. A2 at 2300), 24th (ch. A2 at 2315) and 29th (ch. A2 with Spanish sound). To the south Brian Renforth logged NTV (Nigeria – Sokoto) ch. E3 on May 27th; Hugh also had Sokoto on June 27th, with a clear identification at 1500.

Altogether then a varied and active month. My thanks to the following for their reception reports: Hugh Cocks (E. Sussex), Brian Renforth (Chippenham), Cyril Willis (Cambridge), Arthur Milliken (Wigan), Iain Menzies (Aberdeen) and our Dutch correspondents Ryn Muntjewerff, Gosta van der Linden and Henny Demming.

News Items

India: A third Insat TV satellite (2·5GHz band) may be required since the 1A craft has run into problems – the on-board fuel stocks are depleted and a solar sail is jammed, giving the craft an expected life of two and a half years.

W. Germany: The second chain (ZDF) is inserting an identification in the top corner for several seconds at intervals. ARD does so less frequently and AFN inserts the identification at the bottom corner. It's assumed that this measure is for copyright/anti video piracy purposes. TVP-1 has been noted in W. Berlin, converted to PAL on ch. E25: the FUBK test pattern is used, with the identification "FuuStBLN-Funk-uber tragungs Stelle Berlin".

E. Germany: The Helpterberg ch. E3 transmitter has apparently been closed, though it was received in the UK as recently as June.

New EBU Listings

Denmark: Vendsyssel ch. E51 22kW e.r.p. horizontal – a must for the next tropospheric opening.

Spain: Monreal chs. E23/29 RTVE1/2 158kW e.r.p. horizontal.

Finland: Tervola ch. E22 YLE-2 1,000kW e.r.p. horizontal.

France: Bergerac/Addrix ch. E37 TDF-1 250/100kW e.r.p. horizontal.

Greece: Saitas-Achaia ch. E4 ERT-1 200W – possible during a good SpE opening.

Portugal: Foia ch. E47 RTP-2 550kW e.r.p. horizontal.

From our Correspondents . . .

Anthony Mann (Perth, Western Australia) reports an unusually active period for SpE during June (these are their winter months), with multiple-hop signals from New Zealand and Malaysia. A PM5544 test card was received with the identification "RTM ?AR?A" at the bottom – can any Malaysian reader help identify this? Another overseas reader is seeking a penfriend with interests in technical matters – and football. Write to John Cromwell, Box 475, Sekondi, Ghana – he's a 16-year old technical student.

A recent series of articles (see February/March/April) described a DX receiving system in which the signal was tuned in, converted to i.f. and processed, then up-converted to u.h.f. for feeding to a standard receiver – the idea being to provide selectivity switching without having to modify the receiver. Paul Barton has constructed a similar system that apparently works very well. The output from an ET021 tuner unit is fed to a Philips G8 selectivity module and a further BF195 amplifier, after which there's another switchable (in/out of circuit) G8 selectivity module giving – once alignment is complete – switchable dual i.f. bandwidth working. The first G8 module is aligned for the best/narrowest response. The cores of the second one are tuned to give further bandwidth reduction by providing a "notch-like" effect. Despite the local ch. B2 transmissions, Paul can now receive clear signals on ch. R1. His next project is the construction of a Band I TV spectrum analyser. We wish him good luck with this!

I'm told that the Radioshack Patrolman 50 is available at £24·95 in the Tandy summer sale – it's a mains-operated transistor portable with the useful 30-50MHz band (amongst others). This highly recommended unit enables one to monitor chs. E2/R1 audibly without having to switch on a TV set: it's also useful for general F2 checking in the spectrum below ch. B1.

Italian Free Stations

Neil Carnegie has sent us a detailed report on the present situation in Italy. In the mid-1970s, the Constitutional Court ruled that private radio/TV stations could provide local services via realistically powered transmitters, with each station independently owned, i.e. no one could own more than one station. To be able to purchase better quality programmes, groups of station operators subsequently got together to obtain overseas programmes for simultaneous showing. Such transmissions were given a common identification, i.e. "Canale 5", though the stations themselves remain independent. There are five main programme networks of this type at present. Many small rural stations continue to provide wholly local services, with quiz shows and other home-made programmes. A complete list of stations can be obtained from Dario Monferrini, Via Davanzati 8, I-20158, Milano, Italy for ten IRC.

Other Independents

Back in the UK a "porno pirate" is reported to be setting up in South London under the name "South London Independent TV". It has apparently already been seen testing. The Dutch Ranstad group are rumoured to be involved – they are well known for their pirate VTA-Ranstad TV activities in Amsterdam.

"Gothab TV" was mentioned recently in this column. It seems that there is a form of pirate TV in the Faroes, with a hotelier in the capital transmitting from video cassettes. Since the Danish authorities don't seem to regard the start of TV services in these remote parts as particularly pressing, the locals are apparently being left to provide their own entertainment.

Meanwhile to the good ship Odelia which at the time of writing is in Limassol harbour. This ship has a 3kW e.r.p. u.h.f. TV transmitter which for a time broadcast to the Israeli mainland. It was badly received and the project

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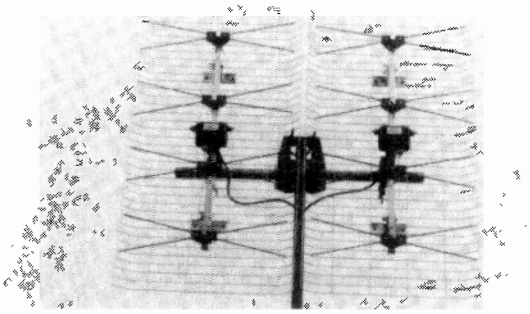

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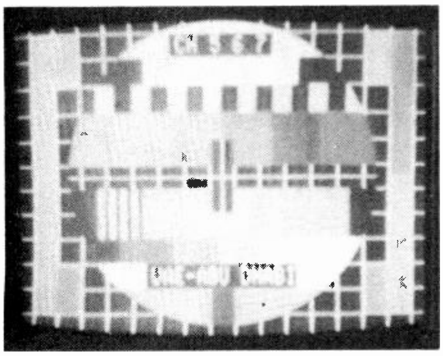
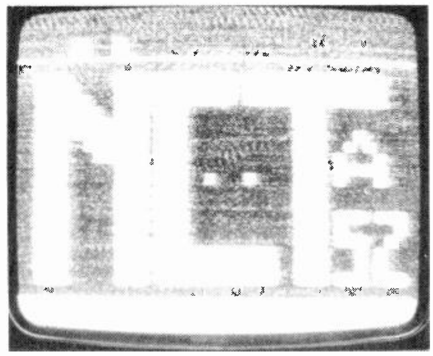
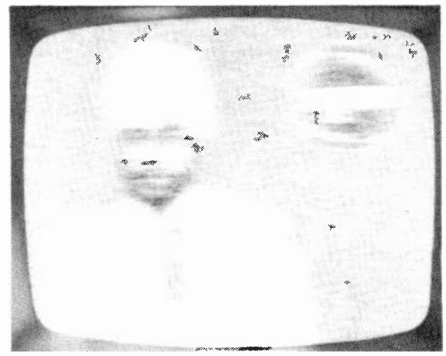


The Philips PM5544 pattern with Abu Dhabi identification. Photo from H. Lloyd-Bennett, Saudi Arabia.



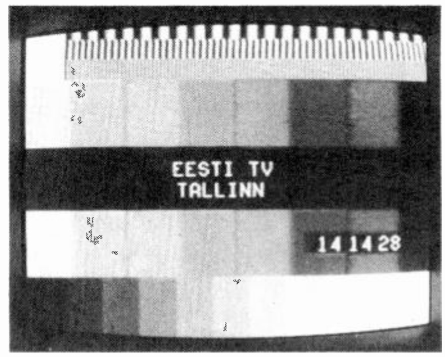
NCT Udine station logo, ch. E3 north Italy. Photo courtesy of Jan Pluimers, Holland.



Malayan news announcer, received by Anthony Mann in Perth, Australia via SpE on ch. E2.

Logo used by the TV ship Odelia, which has a 3kW e.r.p. transmitter. The ship is at present in Limassol, Cyprus.

Cuban TV received by Steve Birkill via the Gorizont satellite at 4GHz. System M in monochrome.



Colour blockboard with digital clock insert used by TSS-1, Tallin. Photo from Petri Pöppönen, Finland.

was something of a financial and technical disaster. A report suggests that an Iranian is negotiating purchase of the ship to start transmitting in the Arabian Gulf. An earlier attempt had been made to buy the "Voice of Peace", but the ship was in no fit state to travel. It's generally felt that Iran will be less than tolerant if the Odelia actually arrives to start broadcasting in the Gulf.

My thanks to Neil for the above information.

Satellite TV

Following details in recent columns of dishes suitable for satellite reception, readers may find the graph shown in Fig. 1 of interest – it gives an indication of typical gains for a 60 per cent (the usual figure) efficient dish. The diagram is based on details provided by the Luly Telecommunications Corporation of San Bernardino, California, to whom our thanks are due. Their UK agents are

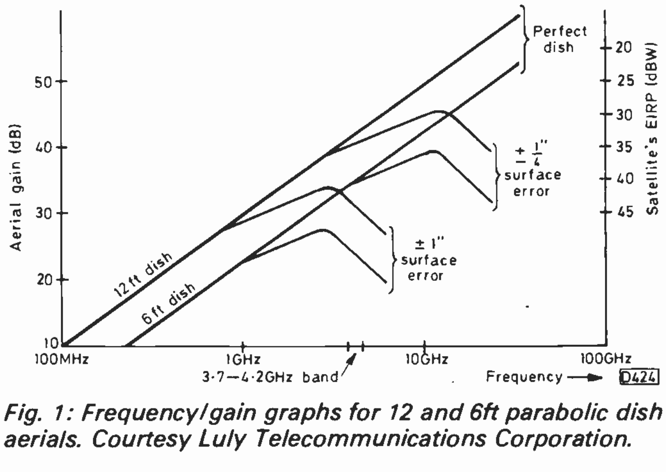


Fig. 1: Frequency/gain graphs for 12 and 6ft parabolic dish aerials. Courtesy Luly Telecommunications Corporation.

Satellite TV Antenna Systems Ltd., Elm House, Green Man Lane, Hatton, Feltham, Middx. Luly point out that dish gain must exceed satellite EIRP.

Further details of OTS reception by Chris Wilson and Grahame Harding are given elsewhere in this issue.

Satellite Television Ltd., the UK company providing the first 12GHz TV service, commenced transmissions from the OTS satellite on Easter Monday. There are about two hours of programmes a night, using mainly ITV network material, intended for the Scandinavian audience. The advertising slots are understood to be 75 per cent booked. Programmes are uplinked to the OTS craft from Martelsham, Suffolk. The Dutch government hasn't been too enthusiastic about allowing cable networks to distribute STL programmes, since commercial material of this type is not supposed to be fed down the cables. The Gorizont (Soviet TV Channel 1) transmissions at 3·7GHz are now allowed down the cables however. The government originally objected to this on the grounds that the transmissions were point-to-point for telecommunications use only, but has since agreed provided the originators don't object – and Russia hasn't complained about its increased audience! Several Dutch networks now relay TSS-1 down their cables, in the form originally transmitted – TSS has no plans for subtitling.

The European Large Telecommunications Satellite (L-SAT) has been given the go ahead, with British Aerospace the prime contractor. A 12GHz DBS payload will be included. Eight countries in all are to participate in the project, with a planned launch in early 1986.

The Russian Stat-T satellite at 99°E, with "Orbita III" identification, is transmitting with programme times of 1145-1430 and 1445-2030 Madras time, with rare extensions to 2230. The transmissions are at 714MHz.

TEST CASE

237

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

The rate at which VCR technology is advancing seems to us quite extraordinary. Four or five years ago we were wondering at the VCRs of the period, with their piano-key controls and what in retrospect seems relatively simple circuitry. Now here we are in the era of microprocessor control, trick-speed replay and goodness knows what else – and we're not sure that we're wholly familiar with the clunk-and-twang types of machines yet!

An example of the latest generation of VCRs is the Toshiba V8600B, a Betamax machine with remote control, a microprocessor brainbox and a four-head drum. The still-frame reproduction this machine provides is the best we've seen yet, and for all its sophisticated electronics and mechanics it doesn't look too forbidding with the covers removed – another Betamax machine we know is quite otherwise! So the first V8600B to come along for repair didn't panic us unduly, even though the symptom reported was intermittent failure to record when the machine was under the control of the timer.

We found that the fault was easy to reproduce when the machine had been standing for some hours. We would set the timer and at the appointed time the machine would whirr into life with the pilot and recording lamps on. A second or two later the machine would shut down, with the record light extinguished and the tape at a standstill. It seemed that the control system was telling the machine to stop – but why? Everything appeared to be in order, the manual playback and record functions worked normally, and both the machine and the tape were almost new. With the covers off, we studied the mechanical sequence of events when the fault arose. We noted that the head drum was running up to normal speed quickly, so the head rotation detector would be satisfied. Hmm.

When the fault next occurred we observed the slack sensor arm closely and saw that it gently moved over to the point where its reed switch closed. This was why the machine was shutting down then. We next found that the machine never failed to get under way when the slack sensor was restrained by fingertip pressure, and that the initial tape slackness was soon taken up as the mechanics got going. The fault was fairly easily diagnosed then, and we were subsequently able to return the machine to its owner with the certainty that the fault would not recur. What did we do? See next month.

ANSWER TO TEST CASE 236
– page 544 last month –

In explaining the operation of the slightly unusual l.t. regulator circuit used in the ITT VC400/1/2 series of monochrome portables last month we almost gave away the answer. If you recall, we were faced with a VC402 in which the series regulator transistor's driver transistor was without forward bias once the start-up capacitor C101 had fully charged.

In the usual type of regulator circuit used in monochrome portables the base and emitter of the driver/error sensing transistor are both fed from the regulator's stabilised output. In this design however T101's emitter is connected to the output directly while its base is fed from a preset which is linked to the 24V boost line generated in the line output stage. A 12V zener diode (D201) stabilises the supply to the preset, so that T101's base is provided with a stable reference while its emitter does the error sensing.

The advantage of this arrangement is that an excessive load on the line output transformer will shut down the power supply. The action is as follows. The overload will reduce the boost voltage to the point where the current flowing via R204 and D202 is insufficient to keep D201 conductive. As the voltage at the slider of the preset drops, D107 cuts off followed by T101 and T1. The circuit was in fact working as it was designed to do. Once C101 has charged, the set has to be switched off for a few seconds to allow it to discharge via R101. Then, on switching the set on again, the start-up action occurs, followed in our case by shut-down due to an overloaded line output stage.

Any of the various rectifier diodes/reservoir capacitors associated with the line output transformer, or indeed the transformer itself, could have been responsible for the overload, but we found that the e.h.t. stick D15 (type TV11) was the cause, being very leaky. We could have tackled the problem by sequential load shedding with repeated start-ups to see when the set finally got going, but found it easier to connect a 25kΩ potentiometer across C101 temporarily, thus driving a suitable "diagnostic" current through the faulty line output stage.

What are all those diodes for? D106/7 are included to isolate the start-up and normal bias at T101's base. D202 compensates for the voltage drop across D107.

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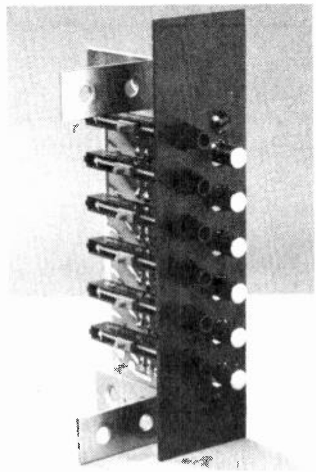

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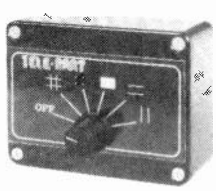

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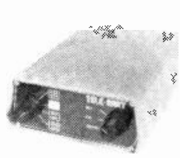

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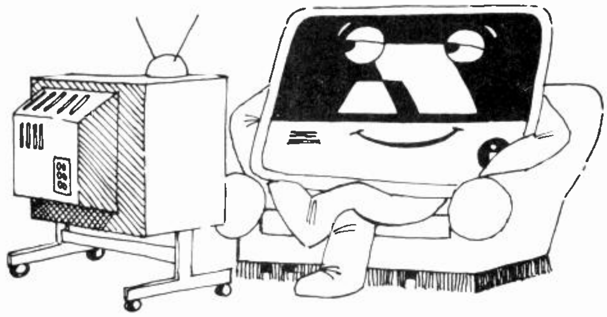

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BC182L	7p
BC183	7p
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