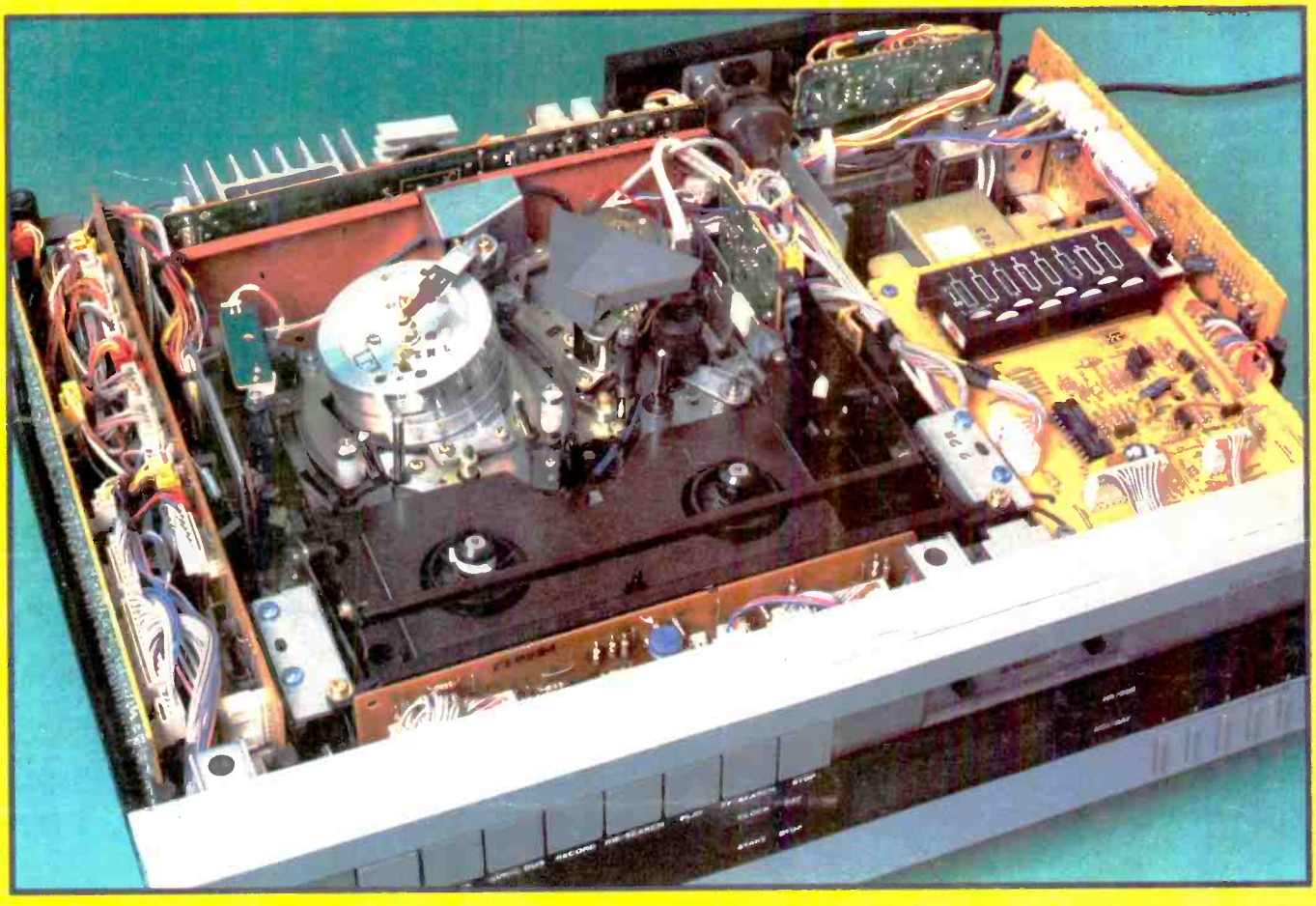
OCTOBER 1986

Australia $2, New Zealand $2·75 (inc. GST), Malaysia $5·75 £1·20

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



Servicing the JVC HR7300

Battery-operated CRT Tester

The Beam-indexed Colour Tube

VCR Clinic • TV Fault Finding

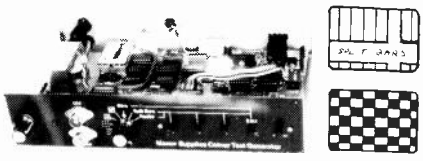
Servicing the Ferguson 3787

DX-TV • Satellite TV Details

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE



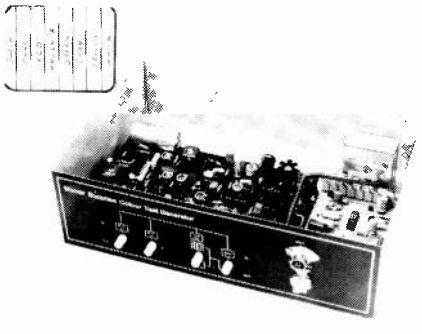
- ★ 40 different patterns and variations.
- ★ Broadcast transmission accuracy (fully interlaced sync pulses with correct picture blanking).
- ★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
- ★ 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, standard parts. Only 2 adjustments. No special test equipment required.
- ★ Mains operated with stabilised power supply.
- ★ All kits fully guaranteed with back-up service.
- ★ Also available with VHF Modulator.

Price of Kit	**£70.00**
Case (10″×6″×2¼″) app.	**£8.60**
Optional Sound Module (6MHz or 5.5MHz)	**£3.90**
Built & Tested in Case including Sound Module	**£108.00**

SPECIAL TEST REPORT 'TELEVISION' DEC. 1982

Post/Packing £2.50
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. CASE £8.60. BATT HOLDERS £4.20. MAINS SUPPLY KIT £4.20 (Combined P&P £2.20).

MK 4 (BATTERY) BUILT & TESTED £58.00 + £2.20 P & P.
MK 4 (MAINS) BUILT & TESTED £68.00 + £2.20 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD VAT 15%

THORN TX9 MK2/3, TX10, teletext
Mullard Decorder panel + Interface **£35.00** p.p. £1.80
THORN TX10, PHILIPS GII PRESTEL, TELETEXT
Mullard Units VM 6230, 6330 plus Line Coupler & Interface **£38.00** p.p. £2.50

EXTERNAL TELETEXT ADAPTOR
(RADOFIN) with cable remote control. Fully tested. **£150.00** p.p. £3.00. Plugs into aerial socket of any T.V.

TV SERVICE SPARES

BACKED BY TWENTY YEARS EXPERIENCE & STAFF OF TECHNICAL EXPERTS

LOPTs, TRIPLERS, PANELS, TUNERS, SELECTORS ETC.

SPECIAL OFFER Mullard/Philips quality UHF modulator (audio & video input) ex new equipment **£5.00** p.p. £1.00.
PHILIPS GII 6 position touch tune channel selector units **£16.00** p.p. £1.80 (can replace earlier mechanical selector unit).
PHILIPS GII PANELS (tested).
Power, frame, IF, decoder **£18.00** each p.p. £2.00. Scan Panel **£28.00** p.p. £2.80.
PHILIPS GII PANELS ex rental (untested).
Power, frame, IF, decoder **£10.00** each p.p. £2.00.
PHILIPS HANDSETS Ex rental, Teletext, Untested, KT3, K30, CTX, KT4, K35 etc. **£3.50** p.p. £1.00.
THORN 9800 Manual **£2.00** p.p. 50p.
THORN REMOTE CONTROL HANDSETS
TX9 ULTRASONIC (3-button) **£15.00; TX9, TX10** Infra red **£18.00; TX9, TX10** Infra red Teletext **£20.00**, p.p. £1.20.
THORN ex rental handsets untested 9600, TX9, TX10 **£5.00** p.p. £1.00.
TX9 Ultrasonic remote handset transducer **£2.00**, switches 3 for **£1.50** p.p. 50p.
TX9/TX10 Teletext interface panel (1524) **£5.00** p.p. 80p.
THORN TX9 Ultrasonic Remote/Control/Receiver panels. **£8.50** p.p. £1.50.
THORN TX10 Series Facia Control Panel with 8 position Channel Selector **£6.50** p.p. £1.50.
TX9, TX10 Facia control panel incl. infra-red remote control receiver **£8.50** p.p. £1.80.
TX9, TX10 Remote & tuning control panel (1515) **£10.50** p.p. £1.80.
SAW FILTER IF AMPLIFIER PLUS TUNER complete and tested for T.V. Sound & Vision. **£28.50** p.p. £1.20.
THORN TX9, TX10 Saw Filter IF Panel. **£5.00** p.p. 80p.
PAL DECODER EIT (Video to RGB) for Monitors **£27.00** p.p. £1.00.
PAL ENCODER EIT (RGB to Video) **£18.50** p.p. £1.30.
TELETEXT DECODERS New & Tested Mullard VM 6101 **£30.00**, Texas XM11 **£28.00**, KT3 Tested **£30.00**, Untested **£5.00** p.p. £1.60
CROSS HATCH UNIT KIT, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£12.00** p.p. 80p. (Alum. Case **£2.90**, De Luxe Case **£6.80** p.p. £1.40.) **ADDITIONAL GREY SCALE** Kit **£2.90** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £22.00 Alum. Case **£2.90**, De Luxe Case **£8.60** (Built & Tested **£48.00**) p.p. £2.30.
CRT TESTER & REACTIVATOR KIT For Colour & Mono complete with Case, Panel Meter Indicator – can be adapted for latest CRTs **£29.50** p.p. £2.80.
BUSH A823 Convergence, Time Base Panels **£5.00** each. p.p. £1.80.
BUSH Z718 BC610 series IF Panel **£5.00** p.p. 90p.
BUSH A816 IF Panel (Surplus) **£1.00** p.p. 90p, 5 for **£4.00** p.p. £1.40.
GEC 2040 Decoder Panels. **£1.50** p.p. £1.80.
GEC 2110 PANELS Sound **£2.50** (tested) p.p. 80p.
GEC 20AX Line Time Base **£18.00** p.p. £2.00.
PYE 691-7 CDA Panels. Makers tested stock. **£6.00** p.p. £1.45.
THORN TX9 Panels ex factory for small spares. Includes I.Cs & Semiconductors etc. **£3.00** p.p. £1.80.
THORN TX9 Panels salvaged ex factory for spares incl. LOPT & Mains Transformers. **£10.00** p.p. £2.80.
THORN TX9 Panels ex factory salvaged complete cond. **£20.00** p.p. £2.80.
THORN 8000, 8500, 8800 IF Decoder Panels Tested **£10.00** p.p. £2.30.
THORN 8000/8500 IF/Decoder Panels salvaged **£3.20** p.p. £1.80.
THORN 9000 IF/Decoder Panels Salvaged. For spares **£2.50** p.p. £1.80.
THORN 9000 Frame Time Base **£8.50** p.p. £1.80.
PHILIPS G8/G9 IF/Decoder Panels for small spares incl ICs **£2.50** p.p. £1.60.
PHILIPS G8 Line Driver Panel incl. Equalizing Coil. **£1.00** p.p. 60p.
GII PANELS, Ex Rental SCAN (incl LOPT) **£28.00** p.p. £2.50 (tested).
GII PANELS, Power, Frame, IF, Decoder. **£18.00** each. p.p. £2.00 (tested).
GRUNDIG 8630 Series Varicap Tuners **£5.00** p.p. £1.00.
U321. ELC1043/5 **£7.80** p.p. 80p. Makers Controls PYE CT200 4PSN **£7.50**, BUSH 4PSN **£4.80**, DECCA 4PSN **£5.80**, 6PSN **£6.80** p.p. 80p. etc.
BUSH "TOUCH TUNE" Varicap Control Z585, 710 **£3.80** p.p. £1.00.
VARICAP UHF-VHF ELC 2000S **£9.80** p.p. £1.00.
UHF/625 TUNERS, many different types in stock. DECCA Bradford 5 position, MULLARD 4 position **£2.50**, JAP Rotary **£4.80** p.p. £1.80.
TV SOUND IF Panels **£6.80** p.p. £1.00.
LOPTS New and guar. P/P Mono **£1.35**, Colour **£1.50**, Bobbins **80p.**

BUSH, MURPHY 774 series	£9.80	R.B.M. 120, T22	£9.80
BUSH, MURPHY A816 series	£9.80	R.B.M. 120, T22 Bobbin	£5.60
FERG., HMV, MARCONI, ULTRA 1500,1590,1591,1612,1613 1712	£4.80	DECCA Bradford (state Mod No)	£8.80
THORN 1600, 1615, 1690 1691	£9.15	DECCA 80, 100	£8.80
GEC series 1 & 2	£8.00	FERGUSON 3787	£9.80
INDESIT 20/24EGB	£7.65	FIDELITY ZX2000, 3000	£16.00
ITT/KB VC200, 300	£7.90	GEC 2110 series	£10.60
PHILIPS 170, 210, 300 series	£7.65	ITT CVC 5 to 9, CVC 20	£9.80
SPECIAL OFFER		ITT CVC25, CVC30 series	£8.80
DECCA 1700, 2001, 2020, 2401, 2420	£3.80	ITT CVC45	£9.80
GEC 2114J Junior Timeline	£2.80	PYE 725 (90°) 731 to 741	£9.20
PHILIPS 320	£2.80	PHILIPS G8	£8.80
RBM A823	£4.80	PHILIPS G9	£9.80
GEC 2028, 2040, 2100	£4.80	PHILIPS K13	£9.80
PYE 691-7 chassis type only	£5.00	PHILIPS K30	£18.50
PYE 713, 715	£6.80	THORN 3000/3500 SCAN, EHT	£6.90
PHILIPS 570, 571	£6.80	THORN 8000, 8500, 8800	£12.80
PHILIPS K9	£6.80	THORN 9000 to 9600	£12.90
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OTHERS AVAILABLE, PRICES ON REQUEST.
TRIPLERS Full range available. Mono & Colour.
Special Offer: THORN 3000/3500 EHT Tripler **£2.50** p.p. £1.30.
6·3V CRT Boost Transformers for Colour & Mono **£5.90** p.p. £1.40.
THORN TX10 focus control **£8.80** p.p. 80p.

CALLERS WELCOME AT SHOP PREMISES
THOUSANDS OF ADDITIONAL ITEMS, ENQUIRIES INVITED
LARGE SELECTION TESTED COLOUR PANELS POPULAR MODELS

Goods available if in stock immediately over shop counter (Mail order between 3 days and 1 week from receipt of order). ADD VAT 15%

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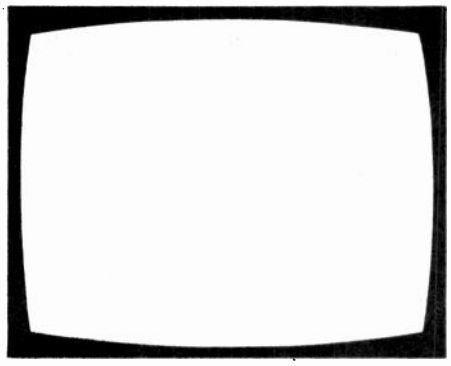
Access from all over Greater London.
Mail Order: 64 GOLDERS MANOR DRIVE, LONDON NW11 9HT
PLEASE ADD VAT 15% TO ALL PRICES INCL P+P



TELEVISION

October 1986

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On sale September 17th

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

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

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Requests for advice on dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Service Bureau". Send to the address given above (see "correspondence").

this month

OUR NEXT ISSUE DATED NOVEMBER WILL BE PUBLISHED ON OCTOBER 15

P. V. TUBES

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

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

SEMICONDUCTORS

AC107	35
AC126	34
AC127	34
AC128	34
AC128K	40
AC141	62
AC141K	39
AC176	35
AC176K	35
AC186	41
AC187	38
AC187K	46
AC188	35
AC188K	46
AD143=OC28	82
AD145	85
AD161	54
AD162	54
AD161/62 MP	1.15
AF106	49
AF114	89
AF118	1.20
AF121	75
AF124	48
AF125	53
AF126	53
AF127	53
AF139	63
AF178	1.54
AF239	60
AF279	1.56
AL102	4.90
AU106	7.50
AU110	3.01
AU113	5.20
BC107	20
BC108	20
BC109	20
BC114	12
BC115	17
BC116A	35
BC117	30
BC118	24
BC119	36
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BC140	32
BC141	30
BC142	30
BC143	31
BC147	13
BC148	9
BC149	12
BC157	16
BC158	16
BC159	15
BC160	52
BC161	32
BC170B	15
BC171	15
BC172	15
BC173	16
BC174	10
BC177	27
BC178	26
BC182L	15
BC183L	15
BC184L	15
BC186	35
BC187	25
BC204	10
BC208	13
BC209	10
BC212	15
BC212L	15
BC213	15
BC214	15
BC237	14
BC238	14
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BC252	12
BC261	33
BC262	30
BC300	50
BC301	53
BC303	33
BC307	20
BC308	25
BC323	99
BC327	22
BC328	18
BC337	18
BC338	18
BC461	42
BC527	35
BC547	13
BC548	13
BCX32 = BC637	39
BC549	10
BC550	10
BC557	10
BC558	9
BC635	19
BC637	23
BC639	30
BC640	32
BCY72	13
BD115	45
BD116A	90
BD124P	84
BD131	50
BD132	49
BD133	60
BD135	38
BD136	38
BD137	38
BD138	35
BD139	35
BD140	44
BD144	1.70
BD150	60
BD159	65
BD160	1.60
BD166	52
BD179	70
BD182	1.20
BD183	1.18
BD201	85
BD202	91
BD203	80
BD204	99
BD222	46
BD223	56
BD225	47
BD232	82
BD233	60
BD234	63
BD235	60
BD236	65
BD237	57
BD238	65
BD243	85
BD244	85
BD410	79
BD434	74
BD437	86
BD438	94
BD507	69
BD508	80
BD509	86
BD510	86
BD278A	81
BD517	60
BD519	1.08
BD520	75
BD535	82
BD536	91
BD696A	1.49
BD697	1.24
BD698=702	1.50
BD701	1.63
BD707	95
BDX32	2.10
BF115	38
BF117	36
BF125	26
BF127	47
BF154	15
BF158	18
BF160	27
BF167	24
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BF178	46
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BF181	39
BF182	36
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BF197	16
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BF200	35
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BF225	20
BF241	38
BF256	60
BF257	34
BF258	34
BF259	34
BF282	84
BF263	81
BF271	24
BF273	24
BF274	24
BF336	40
BF337	41
BF338	41
BF355	56
BF362	68
BF363	72
BF371	30
BF392	35
BF422	34
BF423	46
BF435 = BF491	35
BF457	35
BF458	43
BF459	58
BF460 = BF462	86
BF469	63
BF470	66
BF597	16
BF757	54
BF758	54
BFR39	27
BFR40	30
BFR79	85
BFR90	1.74
BFT42	42
BFT43	42
BFW10	60
BFX29	40
BFX84	42
BFX85	30
BFX86	30
BFX88	46
BFY50	32
BFY51	32
BFY52	32
BFY90	95
BR100	34
BR101	95
BR103	83
BR303	1.46
BRC4443	94
BRC4444	98
BRY39	56
BRY55	45
BRY56	57
BSR59	1.80
BSV57B	89
BT100	1.65
BT101	1.20
BT102/500	1.20
BT106	1.60
BT108	1.69
BT109	1.31
BT116	1.87
BT119	3.66
BT120	3.66
BT151/800	2.07
BU104	2.00
BU105	1.58
BU124	1.90
BU126	1.75
BU204	1.50
BU205	1.87
BU206	1.80
BU208	1.60
BU208A	1.65
BU208D	2.20
=BU800	
BUW81A	3.84
BU208/02	2.10
BU326A	2.00
BU407	1.70
BU426	3.07
BU500	2.50
BU526	2.46
BU508	3.20
BU806	1.40
BU807	2.94
BU826	4.95
BUW64	1.45
BUX84	1.50
E1222	40
MCR220	1.50
MEO411	20
MJE340	68
MJE520	50
MJ3000	1.98
MPSA92	35
MR814	45
MR854	55
MR475	2.46
MR479	2.60
OT112	1.91
OT121	1.91
R2008B	1.90
R2010B	1.92
R2265	1.50
R2322	84
R2323	67
R2461	1.50
R2540	3.20
RC4558	2.20
RCA16334	90
RCA16029	1.18
RCA16039	1.18
RCA16092	1.18
RCA16040	96
RCA16041	84
RCA16334 =ON447	90
RCA16335 =ON448	90
RCA16957	2.88
TIC45	90
TIC46	60
TIC47	72
TIL32	65
TIL78	48
TIP29C	43
TIP30A	47
TIP30C	43
TIP31C	55
TIP32C	42
TIP33B	75
TIP34B	1.06
TIP41C	47
TIP42C	50
TIP47	93
TIP120	65
TIP161	2.15
TIP2955	90
TIP3055	63
TIS91	32
TU106/02	1.80
2N696	21
2N918	82
2N2904	51
2N2905	28
2N3054	60
2N3055	79
2N3702	16
2N3703	16
2N3705	10
2N3706	10
2N3708	17
2N5294	48
2N5296	48
2N5298	69
2SB337	1.86
2N5496	53
2N6107	75
2N6109	81
2SA715	1.98
2SC495	1.10
2SC496	1.31
2SC643A	1.82
2SC1096	1.72
2SC1172Y	5.50
2SC1173Y	1.69
2SC1306	2.73
2SC1307	3.00
2SC1449	1.67
2SC1520	68
2SC1678	2.67
2SC1909	2.90
2SC1953	1.44
2SC1986 =2SC1061	2.94
2SC2028	1.82
2SC2029	2.60
2SC2078	2.90
2SC2091	1.34
2SC2166	2.73
2SD870 (Sony)	6.35
DEC1	2.20
DEC2	2.20
THY15/80	2.20
THY15/85	2.20
Transistor mounting kit TO66, TO3, TO220AB	30

INTEGRATED CIRCUITS

AN214Q	3.91
AN240	3.84
AN318	6.37
AN262	4.10
AN301	5.15
AN715Q	3.97
AN6340	7.85
AN6341N	8.97
AN6344	7.85
BA521	2.80
BA536	3.00
CA555	46
CA556	84
CA741	25
CA748	45
CA1532	4.20
CA3065	1.80
HA1151	3.89
HA1342	2.49
HA1306N	2.60
HA1366WR	2.80
HA1377	3.91
HA1392	3.95
HA11219	4.21
HA11244	4.04
LA3350	1.59
LA4031P	3.21
LA4032P	3.15
LA4102	3.37
LA4112	3.25
LA4400	3.05
LA4422	3.28
LA4440	4.07
LC7130	5.93
LC7120	5.87
LC7137	5.50
LM1011	3.25
LM1340T	75
LM8361= MM5387ANN	3.69
MB3712	2.60
MC1307	1.99
MC1310P	1.84
MC1327	1.70
MC1351P	2.93
MC1349	1.99
MC1350	1.50
MC1352	1.75
MC1358P	1.50
MC1495L	3.00
MC14011BCP	66
MC14049UB	43
MC7742	1.35
MC7812	1.35
ML231	2.20
ETTR6016	
ML232	2.20
ML236	5.35
ML237	2.50
ML238	6.00
ML239	2.50
ML920	4.12
ML922	3.29
ML928	2.18
MM5387ANN	4.15
MRF475	2.50
MRF477	10.00
MSN5807	7.87
MS1513L	2.80
MS1515L	3.28
SAA1025	8.50
SAA1124	5.34
SAA1250	4.99
SAA1251	5.75
SAA5000	6.15
SAA5010	6.30
SAA5012	6.50
SAA5020	5.90
SAA5030	8.25
SAA5050	8.50
SAA3210	2.93
SAF1032	6.30
SAF1039	7.77
SAS560S	2.07
SAS570S	2.07
SAS660	3.25
SAS670	3.25
SAS580	2.90
SAS590	2.90
SL901B	7.00
SL917B	9.25
SL1310	1.80
SL1327Q	1.20
SL1430	1.58
SL1432	3.36
SL76544	2.05
SN76110N	1.42
SN76115N	2.27
SN76131N	2.00
SN76226DN	2.72
SN76227N	1.18
SN76533N	1.70
SN76033N	2.49
SN76544N	2.35
SN76650N	1.24
SN76660N	80
SN76666N	1.52
SN76530A	1.47
STK015	7.36
STK032 = STK078	13.25
STK433	5.65
STK435	9.06
STK436	6.50
STK437	7.85
STK439	8.40
STK459	9.50
STK441	11.57
STK461=465	12.60
STK463	14.30
STR441	6.50
STR451	6.50
STR6020	8.50
SW153	3.90
TA7050P	95
TA7051P	95
TA7063P	2.20
TA7074P	3.46
TA7108P	3.43
TA7120P	2.43
TA7129AP	3.76
TA7130P	1.93
TA7146P	4.67
TA7193P	5.67
TA7171P	8.90
TA7172P	8.90
TA7173P	8.90
TA7176P	2.50
TA7202P	4.27
TA7204P	3.77
TA7205AP	3.72
TA7208P	3.40
TA7210P	5.60
TA7222	2.42
TA7223P	3.74
TA7227P	5.98
TA7228P	5.98
TA7310P	2.78
TA7609P	4.39
TA7611AP	2.92
TAA570	3.98
TAA310	2.83
TAA320	2.00
TAA550	55
TAA630	3.90
TAA8400S1	1.96
TAA661B	1.20
TBA120A (A),(S),(AS),(SA).	1.49
TBA120B	1.38
TBA120SB	1.37
TBA120T	1.49
TBA120U	1.49
TBA1440G	1.56
TBA395	1.75
TBA396	1.75
TBA440N (TBA1441)	2.75
TBA440P	2.50
TBA480Q	1.82
TBA510	3.00
TBA520(Q)	1.68
TBA530(Q)	1.38
TBA540	1.76
TBA560(Q)	1.93
TBA570	1.79
TBA590	1.50
TBA641BX1	3.50
TBA673	2.45
TBA700	2.12
TBA720	2.84
TBA750	2.98
TBA800	1.82
TBA810AS	1.38
TBA820	1.70
TBA820M	1.25
TBA890	3.94
TBA920(Q)	3.00
TBA950(2X)	3.25
TBA970	4.99
TBA990	1.90
TCA760	2.30
TCA270SQ	2.50
TCA800	5.95
TCA830	3.44
TCA900	2.20
TCA910	2.20
TCA940	1.95
TDA440	2.20
TDA1002	1.95
TDA1003A	5.50
TDA1006A	2.50
TDA1005	3.60
TDA1010	3.30
TDA1011	4.00
TDA1035	4.70
TDA1037	2.95
TDA1044	4.37
TDA1060A	4.44
TDA1062	1.58
TDA1083	1.68
TDA1170S	3.00
TDA1190	3.50
TDA1190P	3.50
TDA1180	2.91
TDA1200	2.95
TDA1220A	2.12
TDA1270	3.95
TDA1327	1.70
TDA1352B	1.60
TDA1412	1.50
TDA1415	1.40
TDA1470	4.67
TDA1770	5.60
TDA1908A	1.95
TDA2002	2.80
TDA2003	1.20
TDA2004	2.52
TDA2006	1.78
TDA2010	2.40
TDA2140	5.95
TDA2150 Superceded by TDA2151	2.22 / 3.25
TDA2190	3.30
TDA2020	4.66
TDA2030	2.80
TDA2522	2.66
TDA2523	3.40
TDA2524	2.25
TDA2525	4.00
TDA2530	2.70
TDA2532	2.90
TDA2540	3.84
TDA2541	3.84
TDA2560	3.50
TDA2571	4.90
TDA2576	3.75
TDA2576A	3.75
TDA2577	4.73
TDA2581	3.30
TDA2582	2.60
TDA2593	2.95
TDA2600	6.90
TDA2610	3.20
TDA2611A	2.35
TDA2640	2.92
TDA2652	7.31
TDA2653	5.90
TDA2680	3.40
TDA2690	2.72
TDA2710	5.67
TDA2720/1	6.77
TDA3190	2.00
TDA3500	6.90
TDA3561	6.66
TDA3562	8.60
TDA3571	3.75
TDA3651A	4.50
TDA4420	5.55
TDA4600	2.95
TDA4600-2D	2.95
TDA9503	4.21
TEA1009	1.86
UPC554	2.83
UPC566H	2.95
UPC575C2	3.40
UPC576H	2.60
UPC585	3.06
UPC587C2	2.34
UPC1025H	2.95
UPC1026H	1.24
UPC1028H	2.52
UPC1032H	94
UPC1042C	1.56
UPC1156H	4.26
UPC1158H	3.50
UPC1163H	2.48
UPC1167C2	2.70
UPC1168C	3.20
UPC1176C	2.53
UPC1177H	3.15
UPC1178C	4.21
UPC1180C	1.84
UPC1181H	1.62
UPC1182H	2.95
UPC1183H	2.48
UPC1185H	3.66
UPC1186H	1.60
UPC1188H	4.99
UPC1190G	1.20
UPC1198C	4.00
UPC1200V	1.18
UPC1211V	2.70
UPC1212V	1.34
UPC1215V	1.66
UPC1216V	1.20
UPC1217G	2.24
UPC1218H	1.80
UPC1223C	2.20
UPC1225H	2.00
UPC1226C	1.50
UPC1227V	1.20
UPC1228H	54
UPC1230H	4.39
UPC1238V	1.89
UPC1245V	1.35
UPC1350C	4.15
UPC1353C	4.76
UPC1365C	6.38
UPC1356C2	2.08
UPC1367	2.08
UPC1378H	2.70
UPC1358H	1.88
UPC1360C	2.20
UPC1363C	2.16
UPC1366C	1.84
UPC1368H2	2.15
UPC1370C2	2.58
UPC1382C	1.08
UPC1384	3.78
UPC1447H	58
UPC41C	2.80
UPC577H	2.46
UPC585C	1.28

COMPUTER SPARES

27256	4.75
2732	3.30
2764	1.87
27128	3.13
4116	1.10
4532/20NL	3.00
4164	1.60
6264	2.75
6522	4.09
Z80ACPU	2.14
8271	60.00
ZTX213	17
ZTX313	27
ZTX650/1	35
LM1889	2.00
74LS260	0.55
UHF modulator UM1233	2.20
Double sided heavy duty tape	5.75
Micro pliers	4.80
Micro cutter	5.00
Solder suckers anti static Min.	4.50
Std.	5.40
Large	6.20

VOLTAGE REG.

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

DIODES

AA119	9
BA102	17
BA115	13
BA145	17
BA148	17
BA154	6
BA155	14
BA156	15
BA157	20
BA317	26
BAX13	4
BAX16	8
BB105G	30
BY122	96
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
BY229	1.06
BY298	22
BY299	22
BYX10	20
BYX36/10	30
BYX55/600	30
BYX71/600	90
BY224	2.00
OA47	20
OA91	10
OA95	6
OA202	11
IN914	4
IN4001	4
IN4002	4
IN4003	4
IN4004	5
IN4005	5
IN4006	10
IN4007	10
IN4148	5
IN4448	10
IN5401	12
IN5402	14
IN5403	12
IN5404	12
IN5405	13
IN5406	16
IN5407	16
IN5408	20
ITT2002 = BAX16	
Y969 – Disc.	
R&P BZX85 30V General Purpose	
Triac	95
SKE4F	£1.19
SKE5F	£1.19

ZENER DIODES

BZV15 C12	1.24
BZX61 130V	28
BZX61 Range (1.3W)	20
BZX79 Range (400mV)	10
BZY88 Range (400mV)	10
BZY93, 90 (18V)	1.18

I.C. SOCKETS DIL to DIL

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

DIL to QUIL

14 way	32
16 way	34
18 way	37

QUIL to QUIL

14 way	32
16 way	36

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

THERMISTORS

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

COMMODORE SPARES

6510 CPU	15.50
6526	15.50
6569	15.50
6581	15.50
901225	15.50
901226	15.50
901227	15.50
906114	15.50

CRYSTALS & FILTERS

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

L.E.D.'s

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

P. V. TUBES

104 ABBEY STREET, (0254) 36521
ACCRINGTON, LANCS BB5 1EE. 32611

SONY PARTS

SEMICONDUCTORS

Diode CV12E	GEN	2.34
Diode GH3F	KV-GEN	1.42
Diode IS1555	GEN	25
Diode UO5G	KV1810UB	96
Diode V11N	KV1810UB	96
Diode 10E2	GEN	25
Thyristor SG-264A	KV-GEN	4.08
Thyristor SG629	KV1810UB	6.42
Thyristor SG-6533	KV-GEN = SG613	13.20
BX342	SLC7UB	4.08
CX104A	KV1810UB	5.28
CX136A	VTR-GEN	7.74
CX143A	SLC5/7UB	7.20
CX186	SLC5UB	5.28
M51231P	KV2200UB	2.34
STK2129	STRYX50L	13.20
TCP4621AF6	SLC6UB	13.87
TDA2578A	KV2752UB	3.24

Please ask for any part not listed.

UPC 1394C	KV2060/62U	2.34
UPO 546C107	SLC7UB	16.98
UPD 547C049	SLC7UB	8.94
TL494CN	SLC7UB	5.28
2SA 771	TAF5A	2.34
2SA 835	GEN	1.42
2SA 1027R	ICF-C820L	25
2SA 1175	SLC7UB	89
2SB 733	KV2204UB	96
2SB 740C	TCK88B	96
2SB 856	GEN	1.42
	SY8-724-375-01	
2SC 403C	GEN	25
2SC 867A	GEN	2.34
2SC 1034	GEN	5.28
2SC 1061 = 2SC1986	GEN	2.94
2SC 1114	GEN	5.28
2SC 1124	GEN	96
2SC 1316	GEN	3.18
2SC 1362-7	GEN	25
2SC 1364	GEN	25
	SY8-729-341-34	
2SC 1413A	KV-GEN	7.38
2SC 1475	KV1810UB	25
2SC 1982	GEN	1.42
	SY8-725-800-00	
2SC 2009	GEN	25
2SC 2278	GEN	96
2SC 2335 Kit	SLC7	7.38
2SC 2369	SLC5/7UB	3.18
2SC 2551	KV-GEN	98
2SC 2785	AG-7UB	25
2SC 3153	KV2060UB	4.08
2SD 257	ST5150	2.34
2SD 725	KV2204/2704	8.94
2SD 773	BM715T	25
2SD 774	SL/HMK	96
2SD 870	KV2704E	6.35
2SD 1164	SLC6UB	96
2SD 1497-02	KV2252/2752	4.08
2SD 1497-06	KV2252/2752	4.08

SUNDRIES

UHF Tuner BT-871	KV1810UB	37.20
Booster Antenna	SLC7UB	31.38
RF Modulator	SLC6UB	60.38

SONY REMOTE CONTROLS

SLC5UB	19.80
SLC6UB	17.40
SLC7UB	42.00

VIDEO/AUDIO HEADS

Ace Assembly	SLC7UB	24.10
Ace Assembly	SLC6UB	47.22
	SYA-676-104-6A rep	
	SYA-676-205-5A rep	
Video Head DRS-21R	SLC9UB	43.20
Video Head DSR-35A	SLC20/30/40UB	41.34
Video Head DSR-36R	SLC5/C6/7UB	42.00
Video Head DSR-43A	SL8000UB	46.74
Head Record-Play-back	PP128-3602C/GEN	13.87
Head Record-Play-back	181-3602D TC/HMK3000	4.12

SPECIFIC COMPONENTS

Philips G8 knobs sm/lg	50
90° transductor	2.60
Thorn 1591 speakers sm	6.20
lg	6.20
Thorn 1500 controls	59
390K frame 470K line	each
Focus control Thorn/GEC	2.95
Thorn 9000 focus unit	8.40
Thorn 8500 focus unit	4.75
Thorn Tx10 focus cont.	10.20
Decca bridge trans.	1.97

MECH. REPLACEMENT PARTS

Drum Assembly Main	SLC7UB	192.52
Idler Kit/Rewind Kit	SLC7/C5UB	5.95
Idler Kit/Rewind Kit	SLC6UB	3.95
Forward Assembly	SLC6UB	3.18
Gear Kit	SLC9UB	8.94
Guide Pin Kit	SLF1/C9UB	5.28
Pinch Roller	TC-GEN	96
Pinch Roller	TC204SD	1.42
Pinch Roller	HMK44/44B	96
Pinch Roller	TCK55	96
Cassette Holder Assembly	TCK44	1.42
Lever Forward Assembly	WM2	96
F/Wheel Assembly	WM2	3.18
Limiter Assembly	SLC7UB	2.34
Idler Assembly	SLC7UB/C5/3000	96
Brake Assembly	SLC7UB	1.42
Pulley Loading Assembly	SLC6UB	96
Thrust Bearing Assembly	HMP70	3.18
Screw Cassette Lid	WM2	25
Coil Spring	WM2	25
Battery Lid	WM2	96
Lid Timer	SLC7UB	96
Threading Gear	SLT6ME	96
C5 C7 Capstan Motor		34.00
C7 Drive Motor		32.95

BELTS

Belt	WMR2	96
Rubber Belt	TC-GEN	96
Take Up Belt	TC-GEN	96
Drive Belt	TC-GEN	96
Midway Pull Belt	TC-GEN	96
Capstan Belt	TC92	96
Capstan Belt	TC135/136SD	96
Flat New Belt	TC186SD	96
Capstan Belt	TC-GEN	96
Capstan Belt	HST300	96
Take Up Belt	HMK3000UK	96
Belt Capstan	HMK3000UK etc	96
Fast Forward-Rewind Belt	VO2850P	1.62
Forward Belt	VO2850P	1.02
Motor Belt	VO2850P	1.62
Capstan Belt	VP2000	4.32
Forward Belt	SLC7UB/SLC5UB	25
Capstan Belt	SL8000UB	96
Extension Belt	SL8000UB	2.34
Drum Belt	SL8000UB	1.52
Fast Forward Idler Belt	SLC7UB	96
Threading Belt	SLC7UB	25
Capstan Belt	SLC7UB/CS	96
Eject Belt	SLC7UB	25
Counter Belt	SLC7UB	25
Fast Forward Belt	SLT7ME	96
Forward Belt	SL8000UB	96
Belt	SLC6UB	96
Fast Forward Belt	SLC6UB	96
Counter Belt	SLC6UB	96
Threading Belt	SLC6UB	96
Relay Belt	SLC6UB	96
Capstan Belt	SLC6UB	96
Belt	PS-5520 etc	3.18

SWITCHES

Switch, Filter	KV2022UB	96
Switch, P.B. Channel	1820/2 & 1340	18.86
Switch, Push Power	KV-GEN	1.20
Switch, Push Button Power	SL8000UB	96
Switch, Power	KV14/2060UB	3.68
Switch, Slide Record	KV2022UB	4.08
Switch, Slide Record-Playback	SL8000UB	96
Switch, Push	SL8000UB	1.42
Switch, Power	KV1612UB	4.08
Button, Stop/Eject	KV-GEN	5.50
Knob, Control	WM4	96
	SLC7UB	96

MANUALS (Zero VAT)

Instruction Manual	SLC9UB	2.00
Instruction Manual	SLC6UB Mk 2	2.00
Instruction Manual	SLC7UB	2.00
Instruction Manual	SLC5UB	2.00
Instruction Manual	SL6UB	2.00
Instruction Manual	KV2212UB/E2	2.00
Instruction Manual	KV2705UB	2.00
Service Manual	HMK3000	8.25
Service Manual	KV1810UB Mk 1	8.25
Service Manual	KV1400UB	8.25
Service Manual	SLC7UB	8.25
Service Manual	SLC5UB	8.25
Service Manual	SLC6UB	8.25
Service Manual	SLC9UB	8.25
Service Manual	SLC6UB Mk 2	8.25

IF Gain module	9.00	Decca Speaker 8R	3.75
C.D.A. Panel	20.00	G11 47K pot plus switch	85
G8 rear conv. panel	23.00	15R fused res. G9	61
Decca 30 width cont.	50	G11 line lin coil	3.80
Decca 2M2 HT cont.	25	G11 pot G2 R.G.B.	6.75
Pye 731 HF choke	6.50	G11 line scan panel	54.00
Delay lines DL20, DL60, DL50, DL700	2.20	G11 power panel	41.06
CRT tube base	1.40	G11 timebase panel	37.50
EHT final anode cap	53	G11 bridge trans.	2.35
6.3V CRT boost trans.	5.80	G11 EW correc. coil	1.95
Focus rod	1.25	G11 final anode lead	3.20
Focus holder	2.20	G11 focus unit	6.80
AFC unit G8	8.82	G11 39R 3W resistor	98
		G11 RGB 10G diodes	69

THORN/FERGUSON

SEMI-CONDUCTORS

Diode GL4850	TX10	74
Thyristor TIC45X	TX9	1.18
Diode 19022W	TX9	43
(Thyristor T9053V) (Thyristor T9054V)	TX9 = T9054V	1.10
AN6360	3V29	6.81
HA11741	3V32	23.22
M293	TX90	7.10
M50790SP	3V35	6.98
M54544L	3V32	3.80
MC13002	38030	4.98
MC14493	TX9/TX10	2.74
MN1219	3V36	11.43
TDA1236	TX10	3.44
TDA3652	TX10	6.00
TDA4500	TX90	5.84
SL490	TX9/TX10/TX100	1.89
DTC144WF	3V35	30
R2540	ICE9000	3.20
TIP112H	TX90	69
T5051V	TX9	3.43
T6069V	TX9	38
T6071	TX100	1.46
T9063V	TX9	3.64
19064V	TX90	1.14
UPO553C 164	3V29	20.76
UPO7519G 031 036	3V36	17.13
UPO7538C 020	3V38	11.06
10 Volt TO5	3V29	8.74

MANUALS Please check for availability

Service Manual	TCE1690/1691	5.60
Service Manual	TCE1790	1.14
Service Manual	TCE9600	10.05
Service Manual	TCE9800	7.54
Service Manual	TX9	29.04
Service Manual	TX10	40.00
Service Manual	TX90	11.30
Service Manual	TX100	11.20
Service Manual	3V00 Stocks in soon	17.50
Service Manual	3V16	26.24
Supplement to 3V00 Stocks in soon	3V22	1.28
Service Manual	3V23	30.62
Service Manual	3V24	28.42
Service Manual	3V29	29.00
Instruction Manual	3V29	3.28
Service Manual	3V00	17.50
Instruction Manual	3V29	3.28
Service Manual	3V30	14.91
Instruction Manual	3V30	2.65
Service Manual	3V31	25.84
Instruction Manual	3V35	1.63
Service Manual	3V35/3V36	27.20
Supplement to 3V35	3V38	1.24
Supplement to 3V35/3V38	3V39	90
3V42		23.94
3V43		30.72

V.C.R. BELTS

Counter Belt 1	3292/3V00/3V16/3V22	60
Counter Belt 2	3292/3V00/3V16/3V22	60
Reel Drive Belt	3292/3V00/3V16/3V22	1.00
Relay Belt	3V00	2.79
Capstan Belt	3292/3V00/3V01/3V16/3V22	3.28
Unloading Belt	3292/3V00/3V16/3V22	60
Drum Motor Belt	3292/3V00/3V16/3V22	2.79
Cassette Drive Belt	3V23	60
Capstan Belt	3V29/3V30	1.62
Loading Belt	3V23	60
Loading Belt	3V29/3V30	60
Loading Belt	3V35/3V36/3V38	60
Tape Spool Drive Belt	3V35/3V36/3V38	60
Take Up Clutch Belt	3V29/3V30/3V35/3V36/3V38	60
Capstan Belt	3V35/3V36/3V38	1.21

VIDEO HEADS

Upper Drum Assmb	3292/3V00	36.26
Upper Drum Assmb	3V22	36.26
Upper Drum Assmb	2200/3660/3V16/3V23/3V24/3V31/3V35/3V36/3V38/3V39	36.26
Upper Drum Assmb	3V29/3V30	36.26

VIDEO LAMPS

Tuning Indicator Lamp	TX9	62
Cassette Lamp	3292/3V00	3.66
Cassette Lamp	3V16	1.53
Cassette Lamp Holder	3V16	60
Cassette Lamp	3V23	1.95
Cassette Lamp Holder	3V29/3V30/3V31/3V32	60
Cassette Lamp	3V29/3V30	1.41
Cassette Lamp	3V31/3V32	1.60

PHILIPS KT3/K30 PARTS

KT3 positor	1.80
Mains electrolytic 225/25 380V	3.06
Selector unit Mod. 933	16.67
On/off switch Mod. 933	3.84
Tripler	12.88
Luminance chroma panel	31.09
2003 UF module	18.63
U321 IF module	16.60
R.G.B. panel	12.87
Sound panel	12.50
Power panel	21.48
Mains input panel	17.96
Line sync panel	26.49
Mark II chroma panel	19.80
Sound module	10.20
LOPT	10.06
Focus unit	3.68
Philips K35 Remote Teletext TXT Slimline	£26.21
Philips CTX EHT Lead	£7.36

V.C.R. MOTORS

Capstan Motor	3292/3V00/3V01/3V16	51.45
Drum Motor	3292/3V00/3V01/3V16/3V22	43.49
SMP Reel Motor	3V23	32.79
Cassette Housing Motor Assembly	3V23	10.32
Capstan Motord	3V23	52.81
Loading Motor	3V23/3V24/3V29/3V30	8.56
Capstan Motor	3V29/3V30	27.32
Reel Motor	3V29/3V30	32.79
Lower Drum Motor Assembly	3V29/3V30	78.72
Cassette Motor	3V35/3V36/3V38	6.92
Mode Control Motor	3V35/3V36/3V38	5.95
Capstan Motor	3V35/3V36/3V38	23.90

REMOTE HANDSETS

T723 Non Text	3767/3788	38.60
T725 Non Text	20A2/2282/3781/37041/37081/37101/3714/37351/37361/37371	19.40
T731 Text and Stereo	20A4/22B4/37063/37093/37463/37493	20.01
T736 Text	20A3/2203/3795/3796/37003/37103/37353/37363/37373/37953/37963	31.60

SWITCHES

On/Off Switch	TX9	2.98
On/Off Switch	TX10	2.74
Focus Unit	TX10	10.20
8 Way Tuner Unit (Not Drawer)	37141	12.88
8 Way Tuner Unit (Not Drawer)	37360	13.50
8 Way Tuner Unit (Not Drawer)	37340/37370	20.44
Volume Control	38030	1.74
6 Button Switch Assmb	3722/4722/6722/8000	20.70

TRANSFORMERS & INDUCTORS

Line Output Transformer	TCE9000	25.53
FHT Transformer	TX10	33.80
Line Output Transformer	TX10	15.00
Line Output Transformer	TX9	23.85
Line Output Transformer	38030	6.18
RFI Choke	TX9	3.45
DC Input Choke	TX9	15.36
Mains Transformer	TX90	15.03
Linear Line Coil	TX9	1.77
RFI Input Choke	TX9	60

MECHANICAL SPARES – V.C.R. REPLACEMENT

Take Up Rubber Tyre	3292/3V00	60
Rewind Tyre	3292/3V00	60
Timing Gear Assembly	3V00	3.97
Audio Control Head Sub Assembly	3292/3V00/3V01/3V16/3V22	42.38
Fast Forward Idler	3292/3V00/3V16	1.63
Fast Forward Tyre	3V00/3V16	60
Pinch Roller	3292/3V00/3V01/3V16/3V22/3V23	7.30
Stop Solenoid	3V16	10.42
Pause Solenoid	3V16	16.60
Take Up Idler Assmb	3V00 up to Serial No 19006 3V16 up to Serial No 16509 3V22 up to Serial No 27700	7.54
Take Up Idler Assmb	3V00 Serial No. 19007 onwds 3V16 Serial No 16510 onwds 3V22 Serial No 27701 onwds	5.28
Rewind Idler	3V16	8.52
Take Up Tension Brkt	3V23	80
Roller Assembly	3V23	4.08
Take Up Spool Idler Assmb	3V29/3V30	2.12
Pinch Roller	3V29/3V30	8.66
Idler Counter Pulley	3V29/3V30	60
Cassette Housing Assmb	3V29/3V30	20.85
Take Up Clutch Assmb	3V29/3V30	2.36
Spool Carrier Idler Assmb	3V35/3V36/3V38	2.73
Cassette Housing Assmb	3V35/3V36	36.74
Lower Door Spring	3V35	60
IF Panels	TX10	23.52
Cassette Cover	3V29/3V30	4.34
TX90 Battery Inverter	TA127	£37.81

TUNERS/MIXERS BOOSTERS

Mix Booster	3292	30.62
Mix Booster	3V29	24.70
RF Convertor	3V29	59.32
Mix Booster	3V31/3V32	24.50
UHF Tuner	3V35/3V36	38.12
RF Convertor	3V35/3V36/3V38	36.08
UHF Tuner	3V39	21.87
Varicap Tuner	TX9/TX10	16.34

K30 LOPT	17.94
K30 focus unit	3.68
K30 EHT lead	8.30
Selector unit 1002 (early) 8 way	13.10
TMS 1000 panel 1234	17.03
Euro decoder panel 1234	46.00
A1 gun switches	70
On/off switch	2.60
Selector unit 1002 (late) 8 way	13.10
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K35 tuner drawer	10.00
Diode ZTX 33B	90

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Signal Ejector	4.00
Elect. Circuit Tester	1.50
5A Choc Bloc (12)	40
Fuse Wire 5A, 15A, 30A	05
4-way 13A Mains Conn.	5.00
Safe Block (mains)	8.50
13A Plug Top (box 10)	4.80
Probes (x10)	10.90
Probes (x1)	10.90
Micro Pliers	4.20
Micro Cutters	5.00
Philips Switchable Probes (×1. 2×10)	13.25
Factory recon. Avo meters	119.00
Avo Battery	2.95
Vero Board	2.59
LG Solder Sucker	6.20
Solder 500g	7.00
D.I.Y. Solder	45
Solder Sucker Antistatic	5.40
Nozzles	81
Trim Tools	
Metal End	30
Solda Mop Stnd.	74
Sidecutters sm.	1.20
Long Nose Pliers	1.20
Surge Protector Plug	12.50
Quick Set Adhesive	75
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Lg. Neon Screwdriver	65
I.C. Inserters	1.18
Automatic Wire Strippers	6.95
Scart Plugs	2.95
Scart Leads	3.50
TA81 Car Battery Leads/port. TV Thom 1690/91	4.47
TA51 Car Battery Leads/port. TV Thom 1613/1615	3.66
Car Battery Leads/port. TV Philips	3.95
Dynascan 467 Rejuv.	399
Dynascan 470 Testers	299

B+K tube bases Dynascan

No. 1	9.09	No. 14	16.63
No. 3	9.50	No. 15	16.44
No. 5	9.09	No. 18	10.83
No. 6	11.08	No. 19	10.83
No. 7	9.09	No. 21	14.40
No. 8	10.08	No. 23	13.86
No. 9	9.09	No. 24	27.07
No. 13	11.11	No. 25	12.57

C15 computer cass.	30
C20 computer cass.	33
5¼" floppy disc s/s s/d	1.61
2M Fly Lead	70
4M Fly Lead	1.20
10M Fly Lead	1.90
Figure 8 Mains Lead	62
Computer to TV	97
7 pin din to 5 pin din	98
5 pin din to 5 pin din	98
Fluorescent Starter 4-80W)	15p
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14SWG 100 Amp	1.86
17SWG 60 Amp	1.86
19SWG 45 Amp	1.86
20SWG	2.75
22SWG 25 Amp	1.86
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Std.	15

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Up to 25mm diameter,	100 at 54p
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320D Two Switched	3.92
Switches	
320E One Gang/One Way	80
320F One Gang/Two Way	1.05
320G Two Gang/Two Way	1.78

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FO35 3 Core Round 1.25mm²	28.21
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Coaxial 75R	13.50

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L11mm x D4m
6V 0.04A
12V 0.04A

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

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

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

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

PLUGS AND SOCKETS

5 pin DIN plugs 180°	20
5 pin DIN chassis sockets 180°	28
5 pin DIN line sockets 180°	28
5 pin DIN plugs 240°	20
5 pin DIN line sockets 240°	28
5 pin DIN plugs 360°	20
5 pin DIN chassis sockets 360°	28
5 pin DIN line sockets 360°	28
6 pin DIN plugs	28
6 pin DIN chassis sockets	36
6 pin DIN line sockets	28
7 pin DIN plugs	35
7 pin DIN chassis sockets	36
7 pin DIN line sockets	30
8 pin DIN plugs	56
8 pin DIN chassis sockets	64
8 pin DIN line sockets	55
Phono plugs	12
Phono chassis sockets	10
Phono line sockets	20
2.5mm Jack plugs	11
2.5mm Chassis sockets	14
2.5mm Line sockets	17
3.5mm Jack plugs	15
3.5mm Chassis sockets	24
3.5mm Line sockets	18
3.5mm Stereo jack plugs	35
3.5mm Stereo chassis sockets	18
3.5mm Stereo line sockets	28
6.3mm Stereo jack plugs	36
6.3mm Stereo jack line sockets	25
Standard mono jack plugs	20
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Banana Plug	60
Banana Socket	60

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

VIDEO BELT KITS

VEKIT 1	AKAI JVC	VS9300:VS9500:VS9800 HR3300:HR3320: HR3330:HR3360	
	TCE	8903:3V00:3V16:3V22	3.50
VEKIT 2	PANASONIC	NV7000B:NV7200B	3.00
VEKIT 3	SONY	SLC5:SLC5EC:SLC5CH: SLC5E1: SLC5E:SLC5SA:SLC5UB: SLC7E: SLC7UB:SLC7EC:SLC7F: SLC7: SLC5:SLC7:SLT9MER:	3.75
VEKIT 4	SONY	SL8000AS:SL8000E: SL8000SA: SL8000UB:SL8080AN: SL8500: SL8600:SL8600A:	4.50
VEKIT 5	SONY	SL3000UB	4.00
VEKIT 6	PANASONIC	NV3000B	3.00
VEKIT 7	SANYO	9300P	4.25
VEKIT 8	PANASONIC	NV2000B	3.75
VEKIT 9	PANASONIC	NV8600B:NV8610B: V011	4.25
VEKIT 10	TOSHIBA	V8600	3.00
VEKIT 11	SHARP	VC7300	3.50
VEKIT 12	SHARP	VC6300:VC6600	4.00
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VEKIT 15	JVC	HR7650	2.50
VEKIT 19	HITACHI	VT8000	1.12
VEKIT 20	HITACHI	VT11/33	2.15
VEKIT 21	HITACHI	9500	1.12

VIDEO IDLER TYRES

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

REPAIR KITS

Remote control handsets for Philips sets KT3/K30 chassis inc. foil unit button matrix and instructions.

Philips part numbers:
Foil 212 275 82 or
212 275 83.
Button matrices: 432 370 37 or
432 370 38.
No. 1 without Teletext,
No. 2 with Teletext £4.50

REMOTE CONTROL HAND UNITS

Some are original some are compatible types.

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

DATA BOOKS (Zero VAT)

Pair of A-Z/2N2S TV180	8.50
LIN IC Books (data only not Equiv.) LINI	5.95
IC equivalent booklet £3.25 and transistor equivalent booklet £3.25	
TDV1 Trans. Data Dictionary	7.50

TURNTABLE DRIVE BELTS ALL £1.20

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

SUNDRY VIDEO ACCESS.

VHS Drum Motor	25.50
VHS Capstan Motor	25.50
Sanyo 5000 Reel Motor	12.95
VHS Idler	5.95
Video Lamps	1.41
3V23 Lamps with Plug	1.95
Video Care Kit Deluxe	5.00
Universal Copying Kit	5.50
Video Head Cleaner	90
Sharp Reel Motor	15.60
Reel Idler (Sharp)	2.48
381/383/386/9100/9300/9500 Sanyo Reel Drive Pulley	6.95
Hitachi Idlers	3.50
Nat. Pan. Video Bulb	1.00

VIDEO HEADS

3HSS UHS	30.00
4HS VHS	31.00
PS3B Beta/Sony	35.00
Philips V2000	64.00
Philips 1700	64.00
Sanyo 9300/9455/9500	53.00
Sanyo 5000/5300/5400	53.00
Toshiba 9600 Upper Ass.	12.50
Toshiba 9600	50.00
Sharp 2300	58.00
Sharp 6300	58.00
Sharp 7300/7700/7750	58.00
Sharp 8300	58.00
Sharp 3300/9700	56.00
Hitachi HIVI	35.62
Hitachi VT33E/GEC 4004	35.62
Hitachi VT11/GEC 4100	35.62
Beta eccentricity gauge	55.00
Universal Sharp Video Head	42.00

VIDEO TAPE

SKC	E180	2.90
	L750	3.20
Scotch	E30	3.66
	E60	4.00
	E120	3.24
	E180	3.86
Beta	L750	5.22
VCC	240 While	6.20
	360 Stocks	6.33
	480 Last	7.23
LVC 1700	Philips 1200	17.50

NEW LABGEAR

* CM7271-MHA 15db	8.66 *
* CM7274 4 Way Dist.	21.45 *
* CM7082 UHF VHF DA	65.69 *
* CM7080/10 UHF NHA	15.71 *

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SUPER SERVISOL	1.04
SERVISOL Foam Cleanser	1.02
SERVISOL Plastics Seal	1.14
SERVISOL Silicone Grease	1.30
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SERVISOL Aero Klene	94
SERVISOL Aero Duster	1.28
SERVISOL Excel Polish	96
SERVISOL Video Head Cleanser	90
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Heat Sink Compound 25G	1.10
Silicone Rubber Tube 110G	2.98
Solda Mop standard reel	77

EVER READY BATTERIES

R20S	39
R6B	15
R14S	33
R03B	18
PP3B	54
PP3S	74
PP6	1.15
PP7	1.15
PP9	1.17
1289	63

RECHARGEABLES Ever Ready

RX6 (HP7)	1.31
RX14 (HP11)	2.31
RX20 (HP2)	2.61
RX22 (PP3)	4.89
Universal Charger	7.50

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Plastic Tape	50
F.M. Plugs	25
Set Top Aerial	2.30
Loop Aerial	1.00
Attenuator 6dB, 12dB, 18dB	1.80
27MHz Filter 50dB	2.10
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Single Outlets	80
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A Splitter	70
100M Coax	15.00
Coax Plugs per 10	1.80
1" U Bolts	30
J Bolts	25

ANTIFERENCE

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

LABGEAR

CM7261 Power Unit 12V	11.80
CM7262 Reg. Power Unit 12V	12.86
CM7065 VHF/UHF MHA W/B 12V	15.05
CM7066	14.04
CM7067 UHF 12V MHA (Specify A-B or C/D)	11.25
CM7068 UHF 12V MHA High Gain (Specify A-B or C/D)	16.74
CM7253 Behind Set UHF Amp. (Mains)	13.66
CM7243 Second Set Amp. UHF	12.72
CM7093 Behind Set UHF Amp. 3 Sets	16.03
CM7063 Dist. Amp. VHF/UHF 17db/output 12V	23.27
CM7108 VHF/UHF 8+1 Dist. Amp.	43.26
CM9700 27mhz CB Suppress.	4.45
CM6011 Outdoor Splitter (2 way) W/B	7.83
CM9003 Flush Single Outlet	1.95
CM9010 Flush Twin Outlet	2.04
CM9034 UHF Group Filters with DC Through Pass (state A/B/CD)	8.07
CM9033 6 Way Passive Splitter	9.72
CM7042 TV Games Combin.	3.09
CM9009 Flush TV/FM Outlet	3.20
CM9006 VHF/UHF Diplexer	3.78
Televerta up converta CM7122	36.20
Televerta down converta CM7057	41.01
7064 DA UHF VHF 28dB	30.06
7094 DA 4 way	19.50

MULTIMETRES

Amprobe Digital Meter AM7	45.00
Amprobe Digital Meter AM9	55.00
Amprobe Volt/Ameter/Ohmeter RF3	68.00
Philips Meter 2000 R. per V.	20.71

ANTEX SOLDERING EQUIPMENT

C15W Iron 240V	6.20
C240 Element	2.75
Bits 102	1.10
106	1.10
820	1.10
821	1.10
CS17W Iron 240V	6.40
CS240 Element	2.75
Bits 1100	1.10
1101	1.10
1106	1.10
XS25W Iron 240V	6.50
XS240 Element	2.75
Bits 50	1.10
51	1.10
Temp. Controlled	
30W Iron CSTC	16.95
40W Iron XSTC	16.95
Unit for above TCSU1	68.95
Stand	2.10
MLXS Auto Repair Kit	8.40
Cordless Gas Iron	15.99
Tips for Gas Iron	5.00
25 Watt Philips Iron	5.50
Turbo Rechargeable Iron Kit	16.99
Replacement Tips	2.20
Replacement Bulbs	28

WELLER

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

AUDIO HEADS AND MOTORS

Mono record/playback	4.32
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Mono/stereo erase	2.25
Electronic/rotation clockwise motors	
6V MD6515	4.95
9V MD9516	4.95
12V MD12517	4.95

CASSETTE DRIVE BELTS

35m	35	46mm	37	57m	37
66m	39	110m	59	71mm	41
90m	43			76m	43

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ELC1043-05	8.40
ELC104305 Mullard	12.50
ELC1043-06	8.40
ELC2003	16.50
Philips G8/G9	10.50
Philips G11 (U321)	9.90
U322	7.20
U341	9.50
U342	8.50
TX10 Tuner	8.75

PUSH BUTTON ASS.

Decca 4 way	7.93
6 way	9.17
GEC 2110 6 way	10.92
GEC Slim 6 way	10.29
GEC/ITT/PYE 7 way	16.67
Pye 6 way (207/715)	18.40
Pye 697 repair kit	10.35
Pye 725-735 (also Red Mk.1)	12.60
Pye 725-735 tuning head with PCB	12.50
Philips G8 (early)	17.82
Philips G8 (late)	18.97
Rank A823	12.36
Rank T20A	11.21
Hitachi 4 way	12.36
Philips G11 unit	26.50
Philips KT3 Mod. 933	16.67
Philips KT30 8 way Mod. 1002	13.10
ITT CVC 8/9 (mod)	13.80
ITT 6 way with VCR	8.90
Decca 7 way piano key replacement kit	22.42
GEC Conversion kit	16.50
Decca 4/6 way conversion kit	17.50
Thorn 8500 Push Button	6.50

SWITCHES & ACCESS

On/off gen. purpose 4A	80
G8 on/off	1.98
G11 on/off	1.58
G11 on/off remote	1.58
Gen. purpose rotary	66
Thorn Tx 9/10	2.98
GEC 2040	98
Thorn 1591 push on/off	2.90
Rank tuner buttons (while stocks last) 1½"×½", 2"×½", 2"×⅜"	20
GEC 2110 tuner neons	35
Thorn 3500 A1 beam	86
GEC 2110 A1 cont. R/B/G	58
ITT CVC5 on/off	1.24
ITT mains switch + solenoid	4.50
Rank mains switch + solenoid	4.50
Rank T20 on-off switch	1.95

MIDGET CONTROLS

Insulated Spindle Length 44mm
Log or Lin Without Switch
5K-10K-25K-50K-100K-250K-500K-1M 54
With D.P.S.T. Switch
Log: 5K-10K-25K-50K-100K 1.26
250K, 500K, 1M, 2M
Dual gang Controls 1.25
16mm Rotary Controls 10K, 22K, 10K, 100K, 1M

THICK FILM RESISTOR NETWORK

THORN 3500 (5 pin connection)	1.98
PYE 731 (6 pin connection)	2.20
THORN 9000 (Circuit Ref. R704/7)	2.15

CONVERGENCE POTS

3W/5R-6RB-10R-20R
50R-100R-200R-500R 60

METRIC CONVERGENCE POTS

PHILIPS G8
5R-10R-15R-20R-50R 60

SKELETON PRE-SET POTS

Standard or miniature
Horizontal or Vertical
100R-2M2 16p

SLIDER POTENT

Lin or Log
470R-1K-2K2
10K-47K-470K 75p

MULTITURN POTS

100K	65
GEC TE	65
PHILIPS G8	
DECCA, RANK	65

THERMAL CUT OUT

THORN 3000 2A Metal	2.68
GEC 2040 Metal	2.50

LINE OUTPUT TRANS.

R.B.M. T20A	13.95
R.B.M. A774 Mono	11.74
PHILIPS 320	8.70
PHILIPS 210/300 Mono	10.00
PHILIPS G8	8.75
PHILIPS U411	12.95
PHILIPS G9	9.50
PHILIPS G11	15.58
PYE 713/731	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	16.75
GEC 2040	9.50
ITT CVC 1-9	10.85
ITT CVC 25/30/32	8.65
ITT CVC 20	8.60
THORN 3000 EHT	9.95
THORN 3000 SCAN	7.95
THORN 8000	17.50
THORN 8500	17.50
THORN 3000/3500 Mains	10.00
THORN 1615	12.50
THORN 1691	9.68
THORN TX10	15.00
THORN TX9	23.85
PHILIPS KT3	10.06
RANK BUSHRANGER Early T16A	£10.00
RANK BUSHRANGER Late T18A	£10.00
PYE 741	8.20
B+O (2000, 3000)	14.69
ITT CVC 45	9.50
Philips TX2	13.39
Philips TX3	14.41

RECTIFIER TRAYS

THORN 950 Mk II	4.25
THORN 1400 3 Stick	5.20
THORN 1500 3 Stick	5.20
THORN 1500 5 Stick	5.99
THORN 1600	6.50
THORN 3000/3500	7.98
THORN 8000	6.95
THORN 8500/8800	7.15
THORN 9000	8.70
DECCA 1730/1830	5.48
DECCA 30	6.76
DECCA 80	7.12
DECCA 100	7.50
UNIVERSAL	6.00
GEC 2100	7.40
GEC 2200 (20AX)	6.50
GEC 2040/2028	6.60
GEC 2110 Pre Jan '77	7.00
GEC 2110 Post Jan '77	7.00
PHILIPS G8 Short Focus Lead	7.12
PHILIPS G8 Long Focus 550	7.12
PHILIPS G9	6.37
Pye/Philips K3 Tripler	12.50
PYE 691/3	7.58
PYE 713/4 Lead	8.79
PYE 713 Doubler 5 Lead	8.79
PYE 731/725	8.75
R.B.M. A823 (plug in) AV	8.75
KORTING (similar to Siemens TVK1)	7.32
ITT KB CVC5/9	7.50
ITT KB CVC20/25/30 (Mullard)	7.12
RRI T20	7.12
ITT CVC45	8.65
DECCA/TATUNG 120/130	6.50

RECTIFIER STICKS

TV11	90	TV18	1.10
TV13	1.26	TV20	1.43

REPLACEMENT ELECTROLYTICS

PYE 169 (200/200/100/32)	3.74
PHILIPS 320 (400/400/200V)	3.02
DECCA 30 (400/400/350V)	3.74
DECCA 80 (400/350V)	4.37
DECCA 100 (800/250V)	
PHILIPS G8 (600/300V)	2.53
PHILIPS G9 (600/300V)	2.44
PHILIPS G11 (470/250V)	3.19
PYE 691/7 (200/300/350V)	2.97
PYE 731 (600/300V)	2.55
RBM A823 (2500/2500/30V)	1.83
RBM A823 (600/300V)	3.12
RR1 T20A (220/400V)	2.20
ITT CVC5/9 (200/200/75/25)	3.28
ITT CVC 20 (220/400V)	2.20
GEC 2110 (600/250V)	2.14
GEC 2040 (1000/2000/35V)	1.31
GEC 2040 (300/300/150/100/50)	4.51
THORN 3500 (400/40V)	33
THORN 1400 (150/100/100/100/150/320V)	3.07
THORN 1500 (150/150/100/300V)	2.42
THORN 1500 (12/300V)	35
THORN 3500 (175/100/100/400/350V)	3.06
THORN 3500 (1000/63V)	95
THORN 3500 (1000/70V)	95
THORN 8000/8500 (2500/2500/63V)	3.72
THORN 8000/8500 (700/250V)	2.55
THORN 8000/8500 (400/350V)	2.82
THORN 9000 (400/400V)	3.61
GEC (200/200/150/50)	2.91
PHILIPS 69 2200/63V	1.38
THORN 4700 P/C 25V	1.32
G11 Capacitor 7N5 1500V	1.40

MAINS DROPPERS

DECCA 20	2.48
DECCA 27R/47R	1.40
DECCA 56R/6R8	1.40
R.B.M. A823 56R/68R	94
R.B.M. 161	82
GEC 2000/2018	70
GEC 27840	64
PYE 725/31 3RO/56R/27R	1.84
PYE 725 56R/27R	1.04
PHILIPS 210/5050 30R/125R/2k85	1.75
PHILIPS 210/5051 -/118R/148R	1.93
PHILIPS G8/5081 47R Section	72
PHILIPS G8/5083 2R2/68R	1.38
THORN 1400	1.52
THORN 1500	1.47
THORN 1600	1.77
THORN 3500	1.20
THORN 8000	1.24
THORN 8500	1.36
DECCA 2R5	96
DECCA 3R9 Modulohm	60

WIREWOUND RESISTORS*

4W 1R-10K	24p
7W 1R-22K	26p
11W 1R-22K	29p
17W 1R22K	32p

(Preferred values)*

CARBON RESISTORS*

¼W 3R3-8M2	30
½W 3R3-8M2	30
1W 10R-10M	46
2W 10R-10M	72

Sold in packs of 10 per type i.e. per value

See extra advert on following pages re exciting prices on Thorn New Life Exchange

VIDEO HEADS.
£22 + V.A.T.
inc. post & packing.

SERVICE MANUALS

Please check for availability

DECCA 80	5.35
100	4.80
PHILIPS G9	4.20
G11 now in stock	3.90
K30	3.90
KT3	3.90

See also SONY range.
Zero VAT on Manuals

GEC SERVICE MANUALS VIDEO

V4004	6.25
V4100	6.25
V4001H	6.25
V4000H	6.25

NEW VALVES

30FL2	1.70
DY802	98
DY86/7	66
ECC81	1.08
ECC82	98
ECC83	1.07
ECC84	80
ECC85	98
ECC88	1.35
ECF80	1.30
ECF82	88
ECH81	1.60
ECH84	1.66
ECL80	84
ECL82	1.30
ECL86	1.99
EF80	95
EF86	2.20
EF183	99
EF184	1.09
EH90	1.02
EL34	3.50
EL84	1.05
EY86/7	68
EY500A	2.25
EZ80/1	56
GY501	1.45
GZ34	3.50
KT66	8.50
KT77	8.50
KT88 (Alternative type)	12.00
PC92	3.00
PC97	1.65
PCC85	85
PCC805	1.40
PCF80	1.00
PCF200	1.35
PCF800	1.38
PCF801	1.13
PCF802	1.12
PCF805	1.80
PCF806	1.30
PCF808	1.63
PCH200	1.45
PCL82	1.20
PCL84	1.20
PCL86	92
PCL805	1.09
PD500	2.93
PFL200	1.86
PL36	1.87
PL81	94
PL83	1.43
PL84	84
PL504	1.65
PL508	2.90
PL509/19	5.30
PY88	81
PY500A	2.30
PY800/1	69
UCH81	2.25
UCL83	1.82
UY85	1.35
PL802T	4.00
40KD6	5.30
21LU8	3.00
17DW4A	4.50
3AT2B	5.00
12BY7A	3.75
12HG7	3.20

FUSES

	Per type	Pack of 10
1¼" QUICK BLOW		
100ma		73
250ma-500ma-750ma-1A		60
1.5A-2A-2.5A-3A-5A		60
1¼" ANTISURGE		
250ma, 500ma, 630ma, 750ma, 850ma, 1A, 1.25A, 1.5A, 2A		1.70
2.5A, 3A, 5A		2.70
20mm ANTISURGE		
80ma		4.80
100ma		2.50
160ma, 200ma		2.20
315ma, 500ma, 630ma, 800ma, 1A, 1.25A, 1.6A, 2A		1.30
2.5A, 3.15A, 4A, 400ma, 5A		1.90
20mm QUICK BLOW 315ma		
100ma, 250ma, 500ma, 630ma, 800ma		90
1A, 1.25A, 1.6A, 2A, 2.5A, 3.15A, 5A		60
4 Amp		60
1" MAINS		
2A, 3A, 5A, 10A, 13A		1.00

Please add VAT 15% to all prices including P&P chg. except when purchasing books OR for exports.

NEW FIDELITY Spares
Fly back trans.
FCC2015BE £10.74
FCC2215AE £10.74
20" mod. kit £1.10

CAPACITORS

Volts	Mfd	Price	63V		
6V3	33	9		2.2	12
10V	22	10		4.7	12
	47	10		10	11
	100	10		15	12
	220	15		22	13
	470	20		47	19
16V	32	11		100	23
	68	11		220	41
	220	16		470	56
	1000	27		1000	85
	3300	53		2200	1.10
25V	10	11	100V	10	13
	22	13		22	15
	47	15		47	20
	100	15		100	36
	220	29		220	70
	470	30	450	1	33
	1000	55		4.7	30
	2200	59		10	43
	4700	1.23		22	80
40V	10	10		33	94
	22	10	600	0.1	41
	400	48			

T.T.L. 74LS SERIES

74HTC160	1.12	74LS32	90	74LS85	98	74LS157	78	74LS244	2.20
74LS00	58	74LS37	35	74LS90	1.22	74LS158	65	74LS245	2.30
74LS02	58	74LS38	35	74LS92	65	74LS160	90	74LS251	65
74LS03	58	74LS40	35	74LS93	60	74LS161	85	74LS253	95
74LS04	58	74LS42	80	74LS107	80	74LS162	4.04	74LS257	1.20
74LS05	58	74LS47	85	74LS109	58	74LS163	85	74LS258	95
74LS08	58	74LS48	83	74LS112	50	74LS164	85	74LS259	1.70
74LS09	58	74LS49	33	74LS113	44	74LS165	1.50	74LS273	1.90
74LS10	58	74LS51	33	74LS114	70	74LS173	1.32	74LS283	1.30
74LS11	58	74LS54	43	74LS122	96	74LS174	85	74LS293	1.20
74LS13	37	74LS55	60	74LS123	80	74LS175	85	74LS352	1.40
74LS14	46	74LS73	60	74LS126	60	74LS191	1.02	74LS353	1.40
74LS15	33	74LS74	65	74LS132	63	74LS192	1.30	74LS365	75
74LS20	35	74LS75	65	74LS138	83	74LS193	1.30	74LS366	82
74LS21	35	74LS76	65	74LS139	65	74LS194A	75	74LS367	1.65
74LS22	35	74LS78	65	74LS151	85	74LS197	95	74LS368	65
74LS26	44	74LS83A	89	74LS153	85	74LS240	2.20	74LS373	1.40
74LS27	35	74LS86	39	74LS155	65	74LS241	2.20	74LS374	1.55
				74LS156	1.02	74LS242	2.20	74LS393	1.20
						74LS243	2.20	74LS670	1.78

'4000 B' SERIES CMOS

4001B	21	4027B	39	4068B	22	4510B	76	4539B	77
4002B	21	4028B	64	4069B	22	4512B	72	4541B	96
4008B	72	4029B	90	4070B	22	4513B	1.68	4543B	1.12
4011B	31	4032B	1.04	4071B	40	4514B	1.88	4551B	96
4012B	21	4035B	80	4072B	22	4515B	1.88	4553B	2.40
4013B	30	4038B	99	4073B	22	4516B	76	4554B	1.20
4014B	74	4040B	72	4075B	22	4518B	76	4556B	48
4015B	76	4042B	58	4076B	80	4519B	64	4560B	1.76
4016B	42	4043B	71	4077B	22	4520B	76	4561B	74
4017B	66	4044B	71	4078B	22	4521B	1.68	4566B	1.20
4018B	72	4046B	96	4081B	22	4522B	88	4580B	3.60
4010B	70	4047B	70	4093B	49	4526B	88	4581B	1.84
4020B	76	4049UB	32	4094B	1.56	4527B	1.20	4582B	80
4021B	70	4050B	32	4099B	1.20	4528B	88	4583B	1.00
4022B	70	4051B	72	4160B	72	4529B	1.04	4584B	40
4023B	21	4052B	72	4161B	72	4530B	62	4585B	88
4024B	50	4053B	72	4162B	72	4531B	72	4597B	1.84
4025B	21	4066B	43	4163B	72	4532B	1.00	4598B	2.40
				4502B	72	4536B	2.64	4599B	2.00
				4505B	1.88	4538B	1.04		

Volts D.C.

250V	0.1mF	38p	1250V	0.1mF	59
	0.91mF	1.92	1500V	0.0047mF	32
400V	0.22mF	29		0.022mF	30
1000V	0.01mF	24		0.033mF	62
	0.047mF	46	2000V	0.0052mF	1.20
	0.033mF	33	2500V	0.0022mF	50
	0.1mF	35			
	0.22mF	66			
	0.47mF	98			

TANTALUM

6.3V	47mF	42
	100mF	90
16V	10mF	22
	22mF	28
	47mF	1.03
25V	22mF	46
35V	0.1mF	13
	0.22mF	13
	0.47mF	13
	1mF	13
	2.2mF	17
	4.7mF	26
	10mF	57

POLYESTER

250V	0.01mF	13p
	0.1mF	16p
	0.22mF	16p
400V	0.01mF	14p
	0.1mF	17p
	0.22mF	17p

We are now stocking a range of Thorn New Life tubes. Please ring for prices and carriage costs.

DISC CERAMIC CAPS

8kV (12kV) 40p
200pF,
140pF,
180pF
270pF
300pF
63V/100V 12p
A range of pref. values 22pF-4700pF

Sheila says THANKS to her many valued customers and hopes the new additions are useful.

WE INVITE YOU TO COME AND SEE US! We make good tea.

NEW MONO TUBES

MULL. A31/510 110° 12"	22.00
MULL. A34/510 110° 14"	26.50
A50/120WR 110° 20"	18.50
A61/120WR 110° 24"	20.50

NEW TUBES

ATX 56-001	95.00
ATX 51-00X	95.00
A56/610	95.00

REBUILT COLOUR TUBES

ALL AVAILABLE EX-STOCK ON GLASS FOR GLASS EXCHANGE FROM TRADE COUNTER. SOME TYPES AVAILABLE WITHOUT EXCHANGE FOR SMALL GLASS CHARGE

17" A44/271X	32.00
18" A47/342X (Low Focus)	32.00
18" A47/343X (Stnd Focus)	32.00
20" A51/110X	30.00
19" A49/120X	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 (410X) 110°	36.00
26" A66/140X (410X) 110°	36.00
20" A51/161X	60.00
22" A56/510X	50.00
A56 540X	89.00
A66 540X	75.00
A66 500X	64.00

P.I.L. TUBES – we can rebuild your own glass – please ring for quotes. Carriage cost on tubes £10 + VAT

HUSSAIN CENTRAL TV LTD

NEW BRANCH NOW OPEN AT *SOUTHAMPTON*

BEST QUALITY AT THE LOWEST PRICES IN BRITAIN TODAY

G11 · 660	**£25**	ITT CVC 20/30	**£15**
PYE G11	**£30**	DECCA 80/100	**£15**
G11 REMOTE (with hand set)	**£45**	ITT REMOTE (with hand set)	**£30**
G11 TEXT (with hand set)	**£55**	TX TEXT (with hand set)	**£55**
G11 ELECTRONIC TUNER	**£30**	THORN 9000 REMOTE	**£15**
THORN 9600	**£25**	THORN 9200	**£27**
THORN 8800	**£10**	THORN 9800	**£15**
PYE 222	**£10**	G8 22"	**£10**
GEC SOLID STATE	**£10**	GEC STARLINE	**£15**

MANY MORE LATE MODEL TVs IN STOCK INC. REMOTE, TEXT, STEREO TEXT AND 14", 16" PORTABLES

All TVs have excellent cabinets

VHS: Working. Bring your own tape and try them yourself **at £65**

1000 Working VHS Video's in stock **from £120**

Untested Electronic VHS £90

BETAMAX VIDEO'S

ELECTRONIC Beta Full working from £40
Untested Beta from £25

Toshiba 9600, 5470, **Sanyo** 5000, 5300, 5010, **Sony** C5, C6, C7.

PLUS MANY MORE MODELS IN STOCK

Prices are subject to 15% VAT and based on quantity

Deliveries arranged on quantity or call at our branches for fast and friendly service from the professionals

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	021-622 1517		01-884 1314	

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

BUY WITH Access

INTEGRATED CIRCUITS

TYPE	PRICE (£)
AN303	3.45
AN305	3.50
AN7114E	2.33
AN7115	2.37
AN7116	2.35
AN7145	3.25
AN7168	2.95
HA1166	2.65
HA1338	2.78
HA1339	2.40
HA1342A	2.20
HA1366 W/WR	1.95
HA1374	2.45
HA1377	3.80
HA1388	4.20
HA1397	3.90
LA1201	1.75
LA1230	2.30
LA1365	2.45
LA4101	1.50
LA4102	1.95
LA4440	3.55
LA4445	2.65
LA4460	2.95
LA4461	2.95
SAA1250	3.85
SAA1251	4.95
SAA5000A	1.50
SAA5010	5.10
SAA5012	5.70
SAF1032P	3.25
SAF1039P	4.55
SAS560S	1.95
SAS570S	1.95
SAS580S	2.40
SAS590S	2.40
SL470	2.95
SL480	2.85
SL490	2.60
SL1430	1.95
SL1432	1.75
STK0039	6.45
STK0040	5.95
STK077	7.25
STK078	7.45
STK2129	8.50
STK4332	5.95
STK433	6.50
STK435	6.75
STK437	7.25
STK439	7.55
STK441	8.50

TYPE	PRICE (£)
STK459	7.35
STK461	7.95
STK463	9.30
STK465	9.95
TA7193P	4.30
TA7204P	1.90
TA7205AP	1.40
TA7222AP	1.85
TA7223P	2.85
TA7227P	2.95
TBA120AS	.95
TBA120SB	.90
TBA120T	1.25
TBA120U	1.00
TBA520	1.30
TBA530Q	1.00
TBA540	1.37
TBA560	1.60
TBA720A	2.65
TBA750	2.45
TBA800	.80
TBA810	1.35
TBA820	1.40
TBA920	1.50
TBA950	2.65
TBA2800	2.65
TCA270	1.55
TDA440	3.25
TDA1035T	2.75
TDA1037	1.95
TDA1044	3.10
TDA1170	1.80
TDA1470	3.65
TDA1506	3.95
TDA1512	3.35
TDA1670A	4.50
TDA1770A	3.95
TDA2003	2.33
TDA2030	1.95
TDA2170	2.95
TDA2190M	6.95
TDA2270	2.95
TDA2521/3	4.55
TDA2522	1.80
TDA2523	2.25
TDA2525	3.35
TDA2530	2.10
TDA2532	2.20
TDA2540	1.95
TDA2541	2.95
TDA2545	4.95
TDA2560	1.80
TDA2571A	4.95
TDA2576A	3.60

TYPE	PRICE (£)
TDA2577	3.55
TDA2578A	2.95
TDA2581	2.15
TDA2582	2.20
TDA2591	2.30
TDA2593	2.30
TDA2594	2.95
TDA2600	6.35
TDA2611A	1.50
TDA2640	2.40
TDA2653A	3.55
TDA3560	5.10
TDA3561A	5.35
TDA3562A	6.95
TDA3650A	3.95
TDA3651AQ	3.80
TDA3652	3.35
TDA4500	5.85
TDA4600	2.85
TDA4600(18P)	3.30
TDA9503	2.35
UPC1031H	2.95
UPC1032H	.95
UPC1156H	2.45
UPC1181H	2.20
UPC1182H	2.20
UPC1185H	3.30
UPC1230H	3.95
UPC1363C	4.65
UPC1365C	5.05
UPC1394C	2.95
UPC2002H	1.85

HITACHI VIDEO SPARES

TYPE	PRICE
9300 V/Head	33.95
VT11E V/Head	33.95
VT11E Idler	2.95
9300 Idler	4.35
VT11E Capstan Motor	24.95
9300 Capstan Motor	32.95
VT11E P/Roller	5.25
9300 Belt Kit	1.95
VT11E Belt Kit	2.95

GEC/HITACHI SPARES TV

TYPE	PRICE
Frame Module HM6251	4.95
STR 441	5.90
STR 451	5.90
STR 454	5.95
STR 6020	6.35

TRANSISTORS

TYPE	PRICE
BC107	.14
BC108	.14
BC109	.14
BC141	.26
BC142	.23
BC147	.09
BC148	.09
BC327	.11
BC328	.12
BC337	.11
BC557	.10
BC558	.10
BC637	.35
BC638	.25
BC639	.25
BD124M	1.05
BD131	.33
BD132	.33
BD222	.50
BD225	.55
BD237	.40
BD238	.39
BD438	.78
BD439	.70
BD677	.70
BD701	.85
BD707	1.05
BF337	.28
BF338	.30
BF458	.30
BF757	.75
BFR90	1.60
BR100	.18
BR103	1.95
BR303	2.95
BT106	1.15
BT116	1.30

TYPE	PRICE
BT151/800R	1.10
BU126	1.78
BU205	1.42
BU208A	1.45
BU208D	1.85
BU326A	1.48
BU407	1.12
BU500	1.95
BU508A	1.95
BU807	1.30
BU826A	3.20
R2540	2.35
TIP31C	.46
TIP32C	.47
TIP33	.95
TIP41C	.48
TIP42C	.48
TIP47	.75
TIP2955	.70
TIP3055	.70
2N3055	.50
15/80H	2.25
15/85R	2.25
2SB 618	2.45
2SC 867A	3.25
2SC 1034	4.85
2SC 1061	1.15
2SC 1114	4.75
2SC 1124	.97
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2SC 1969	1.95
2SC 2078	1.55
2SC 2335 (Kit)	7.55
2SD 588A	1.97
2SD 725	7.95

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TYPE	PRICE
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TYPE	PRICE
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5000 Reel Motor	8.55
5000 Pinch Roller	5.85
5000 Belt Kit	1.10
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SONY C5/7	2.85
SONY C9 Belt Kit	4.50
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DECCA 100	8.50
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RBM T20/T22A	7.35
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BY164	.40
BY179	.65
BY210/800	.30
BY223	1.25
BY227M	.23
BY229/600	.87
BY299/800	1.15
BYX10	.20
BYX55/600	.30
SKE5F3/10	1.45
1N4001-7	.07
1N5401-8	.16

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Price per pack is **£1.00.*** Order 12 you may choose another free. Items marked (sh) are not new but guaranteed ok.

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51. 1 – 12V 2 CO miniature relay very sensitive
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56. 1 – miniature uniselector with circuit for electric jigsaw puzzle
60. 5 – ferrite rods 4" × 5/16" diameter aerials
61. 1 – Mullard thyristor trigger module
66. 1 – magnetic brake – stops rotation instantly
67. 1 – low pressure 3 level switch can be mouth operated
69. 2 – 25 watt pots 8 ohm
70. 2 – 25 watt pots 1000 ohm
71. 4 – wire wound pots – 18, 33, 50 and 100 ohm your choice
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129. 4 – extra thin screw drivers for instruments
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136. 2 – car radio speakers 5" round 4 ohm made for Radiomobile
137. 1 – 6½" 4 ohm 10 watt speaker and 3" tweeter
142. 10 – 4BA spanners 1 end open, other end closed
145. 2 – 4 reed relay kits 3V coil normally open or c/o if magnets added
146. 20 – pilot bulbs 6.5V 3A Philips
154. 1 – 12V drip proof relay – ideal for car jobs
155. 3 – varicap push button tuners with knobs
169. 4 – short wave air spaced trimmers 2-30f
172. 10 – 12V 6W bulbs Philips m.e.s.
178. 3 – oblong amber indicators with liliputs 12V
180. 6 – round amber indicators with neons 240V
181. 100 – p.v.c. grommets ⅜ hole size
182. 1 – short wave tuning condenser 50 pf with ¼" spindle
184. 1 – three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188. 1 – plastic box sloping metal front, 16 × 95mm average depth 45mm
193. 6 – 5 amp 3 pin flush sockets brown
195. 5 – B.C. lampholders brown bakelite threaded entry
196. 1 – in flex simmerstat for electric blanket soldering iron etc.
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199. 1 – mains operated solenoid with plunger 1" travel
200. 1 – 10 digit switch pad for telephones etc.
201. 8 – computer keyboard switches with knobs, pcb or vero mounting
206. 20 – mtres 80 ohm, standard type co-ax off white
211. 1 – electric clock mains driven, always right time – not cased
216. 1 – stereo pre-amp Mullard EP9001
232. 2 – 12V solenoids, small with plunger
236. 1 – mains transformer 9V 1 amp secondary C core construction
241. 1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile
241. 2 – speakers 6" × 4" 4 ohm 5 watt made for Radiomobile
243. 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile
244. 1 – mains motor with gear-box very small, toothed output 1 rpm
245. 4 – standard size pots, ½ meg with dp switch
249. 1 – 13A switched socket on double plate with fused spur for water heater etc.
266. 2 – mains transformers 9V ½A secondary split primary so ok also for 115V
267. 1 – mains transformers 15V 1A secondary p.c b. mounting
291. 1 – ten turns 3 watt pot ¼ spindle 100 ohm
296. 3 – car cigar lighter socket plugs
298. 2 – 15 amp round pin plugs brown bakelite
300. 1 – mains solenoid with plunger compact type
301. 10 – ceramic magnets Mullard 1" × 3/8 × 5/16
303. 1 – 12 pole 3 way ceramic wave charge switch
304. 1 – stereo amp 2W per channel
305. 1 – tubular dynamic microphone with desk rest
308. 1 – T.V. turret tune (black & white T.V.)
310. 2 – oven thermostats
313. 5 – sub miniature micro switches
316. 1 – round pin kettle plug with moulded on lead

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules – i.e. Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for **£6.00** plus £2 postage. For prices of modules bought separately see TWO POUNDERS

CAR STARTER/CHARGER KIT

Flat Battery! Don't worry you will start your car in a few minutes with this unit – 250 watt transformer 20 amp rectifiers, case and all parts with data **£16.50** or without case **£15.00** post paid.

Ex-Electricity Board. Guaranteed 12 months.

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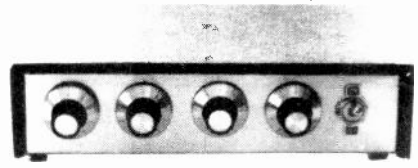
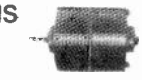
Mains operated with 20 amp switch One on and one off per 24 hrs. repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only **£2.95** without case, metal case – **£2.95**, adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater Price of adaptor kit is **£2.30.**

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off The audio input and output are by ¼" sockets and three panel mounting fuse holders provide thynstor protection A four pin plug and socket facilitate ease of connecting lamps. Special price is **£14.95** in kit form

12 volt MOTOR BY SMITHS



Made for use in cars, etc. these are very powerful and easily reversible. Size 3½" long by 3" dia. They have a good length of ¼" spindle –
1/10 hp **£3.45**
1/8 hp **£5.75.** 1/6 hp **£7.50**

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake – switch on lights to ward off intruders – have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at **£2.50**

THIS MONTH'S SNIP

is a 13·5V dc power supply unit, plugs into a 13A socket and its output is OK to work 12V portable TVs, car radios etc. etc. Offered at **£2** each, or 13 for **£24** post paid. Our references 2P110.

MAKING SUNBEDS?

CHOKE AND STARTER for 6' 100uva tube £2, post £1 for 1 or 50p each in quantity
TUBE HOLDERS Canopy type spring loaded, 4 pairs for £1, 100 pairs **£20,** 1,000 pairs £150, post paid.

TANGENTIAL HEATERS

We again have very good stocks of these quiet running instant heat units. They require only a simply case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1.2kw, 2kw, 2·5kw, and 3kw Prices are £5 each for the first 3, and **£6.95** for the 3k. Add post £1.50 per heater if not collecting.
CONTROL SWITCH enabling full heat, half heat or cold blow, with connection diagram, 50p for 2kw, 75p for 3kw

FANS & BLOWERS

Woods extractors
5" **£5** + £1.25 post. 6" **£6** + £1.50 post
4" × 4" Muffin equipment cooling fan 115V **£2.00**
4" × 4" Muffin equipment cooling fan 230/240V **£5**
5" Plannair extractor **£5.50**
9" Extractor or blower 115V supplied with 230 to 115V adaptor **£9.50** + £2 post.
All above are ex computers but guaranteed 12 months.
10" × 3" Tangential Blower. New. Very quiet – supplied with 230 to 115V adaptor on use two in series to give long blow **£2.00** + £1 50 post or **£4.00** + £2.00 post for two.

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Master sockets (has surge arrestor – ringing condenser etc) and takes B.T. plug **£3.95**
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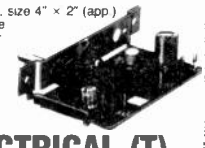
Dual adaptors (2 from one socket) **£3.95**
Cord terminating with B.T. plug 3 metres **£2.95**
Kit for converting old entry terminal box to new B T master socket, complete with 4 core cable, cable clips and 2 BT extension sockets **£11.50**

MINI MONO AMP on p.c.b. size 4" × 2" (app.)



Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of **£1.50 each, or 13 for £12.00**

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2P3 – Variable and reversible 8-12V psu for model control
2P4 – 24 volt psu with separate channels for stereo made for Mullard UNILEX
2P6 – 100W mains to 115V auto-transformer with voltage tappings
2P8 – Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
2P9 – Time and set switch. Boxed, glass fronted and with knobs Controls up to 15 amps Ideal to program electric heaters
2P10 – 12 volt 5 amp mains transformer – low volt winding on separate bobbin and easy to remove to convert to lower voltages for higher currents
2P12 – Disc or Tape precision motor – has balanced rotor and is reversible 230V mains operator 1500 rpm
2P14 – Mug Stop kit – when thrown emits piercing swawk
2P15 – Interrupted Beam kit for burglar alarms, counters, etc.
2P17 – 2 rev pr minute mains driven motor with gear box, ideal to operate mirror ball
2P18 – Liquid/gas shut off valve mains solenoid operated
2P19 – Disco switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
2P20 – 20 metres extension lead, 2 core – ideal most Black and Decker garden tools etc
2P21 – 10 watt amplifier, Mullard module reference 1173
2P22 – Motor driven switch 20 secs on or off after push
2P24 – Clockwork operated 12 hour switch 15A 250V with clutch
2P26 – Counter resettable mains operated 3 digit
2P27 – Goodmans Speaker 6 inch round 8 ohm 12 watt
2P28 – Drill Pump – always useful couples to any make portable drill
2P31 – 4 metres 98 way interconnecting wire easy to strip
2P32 – Hot Wire amp meter – 4½ round surface mounting 0-10A – old but working and definitely a bit of history
2P34 – Solenoid Air Valve mains operated
2P35 – Battery charger kit comprising mains transformer, full wave rectifier and meter, suitable for charging 6V or 12V
2P38 – 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc.
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2P46 – Our famous drill control kit complete and with prepared case
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2P49 – Fire Alarm break glass switch in heavy cast case
2P51 – Stereo Headphone amplifier, with pre-amp
2P55 – Mains motor, extra powerful has 1½" stack and good length of spindle
2P62 – 1 pair Goodlans 15 ohm speakers for Unilox
2P64 – 1 five bladed fan 6½" with mains motor
2P66 – 1 2kw tangential heater 115v easily convertible for 230V
2P67 – 1 12v-0-12v 2 amp mains transformer
2P68 – 1 15v-0-15v 2 amp mains transformer
2P69 – 1 250v-0-250v 60 mA & 6.3v 5A mains transformer + £1 post
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2P72 – 1 115v Muffin fan 4" × 4" approx
2P75 – 1 2 hour timer, plugs into 13A socket
2P82 – 9v-0-9v 2 amp mains transformer
2P84 – Modern board with press keys for telephone redialler
2P85 – 20v-0-20v ½2A Mains transformer
2P88 – Sangamo 24 hr time switch 20 amp S H
2P89 – 120 min. time switch with knob
2P90 – 90 min time switch with edgewise engraved controller
2P91 – Panel meter size 2½" × 2" scaled power factor
2P95 – 13A socket on satin chrome plate very superior G.E.C
2P97 – mains transformer 24v 2A upright mounting
2P98 – 20m 4 core telephone cable, white outer
2P99 – 500 hardened pin type staples for telephone cable
2P101 – mains transformer 15v 4A upright mounting
2P105 – capillary type thermostat adjustable for air temperatures with 10A c/o switch
2P107 – membrane keyboard, telephone type superior plug in type
2P108 – mains motor with gear box giving 110rpm
2P109 – 5" wide black adhesive pvc tape 33m, add £1 post if not collecting
2P111 – 12v P.S.U. plugs into 13 Amp socket

£5 POUNDERS*

5P1 12 volt submersible pump complete with a tap which when brought over the basin switches on the pump and when pushed back switches off, an ideal caravan unit
5P2 Sound to light kit complete in case suitable for up to 750 watts
5P3 Silent sentinel ultra sonic transmitter and receive kit, complete
5P5 250 watt isolating transformer to make your service bench safe, has voltage adj taps, also as it has a 115v tapping it can be used to safely operate American or other 115v equipment which is often only insulated to 115V. Please add £3 postage if you can't collect as this is a heavy item
5P6 12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall Ex GPO but in perfect order and guaranteed
5P15 Uniselector 5 pole 25 way 50 volt coil
5P18 motor driven water pump as fitted to many washing machines
5P20 2 kits, matchbox size, surveillance transmitter and FM receiver
5P23 miniature (appr 2½" wide) tangential blow heater, 1·2kw
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5P60 DC Muffin type fan 18w to 27v, only 3w
5P61 drill pump mounted on frame, coupled to mains motor
5P62 2½kw tangential blow heater, add £1 50 post if not collecting

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Motor driven switch bank with connection diagram, used in connection with 4 sets of X-mas lights makes a very eye catching display for home, shop or disco. only **£5** ref 5P56.

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741	0.25	STK015	6.20
747	0.70	TA7146P	4.60
AN214Q	3.80	TA7203P	2.76
AN240P	3.42	TA7204P	1.50
BTT6218	1.98	TA7205AP	1.30
CA301AT	0.80	TA7222P	2.32
CA358	0.66	TAA550	0.50
CA810QM	1.20	TAA611A12	3.50
CA3020	2.10	TAA621AX1	3.50
CA3065	1.60	TAD100	2.90
CA3080E	0.68	TDA120A	0.80
CA3140E	0.45	AS/S/SB/T/U	0.80
HA1366WR	1.59	TDA120B	1.30
LA4422	3.20	SA/SQ/UQ	1.30
LC7131	4.90	TBA520	1.50
LC7137	5.40	TBA530	1.20
LM324N	0.45	TBA540	1.64
LM380N8-P	1.15	TDA560C	1.50
LM380N14-P	1.80	TBA810S	1.20
LM1011N	3.20	TBA950/2A	3.05
LM1458N	0.98	TCA270SA	4.02
LM3900N	0.85	TDA1003A	5.50
M51513L	2.30	TDA1004*	4.95
M51515L	3.18	TDA1006A	2.45
MC1307P	1.99	TDA1035S	4.50
MC1327P	1.50	TDA1170S	1.99
MC1330P	1.60	TDA1352A	1.80
ML232B	2.10	TDA2002	1.80
ML237B	2.30	TDA2020	4.00
NE555	0.25	TDA2030	1.90
SAA1025	4.00	TDA2140	2.90
SN76226DN	1.70	TDA2160	2.50
SN76227N	1.10	TDA2522	2.75
		TDA2530	2.20
		TDA2532	2.80
		TDA2560	3.20
		UPC57562	1.45
		UPC1350C	4.05
		UPC1156H	2.75
		UPC1182H	2.75
		UPC1218H	1.80
		UPC1356C2	3.00
		UPC2002H	2.78

74LS190	0.82	74LS00	0.24
74LS192	0.98	74LS01	0.24
74LS193	0.98	74LS02	0.24
74LS194	0.75	74LS03	0.24
74LS195	0.74	74LS04	0.24
74LS196	0.84	74LS05	0.24
74LS197	0.96	74LS08	0.24
74LS221	0.85	74LS09	0.24
74LS240	0.80	74LS10	0.24
74LS241	0.80	74LS11	0.24
74LS242	0.94	74LS12	0.24
74LS243	0.94	74LS13	0.33
74LS244	0.80	74LS14	0.48
74LS245	1.20	74LS15	0.24
74LS247	1.00	74LS19	0.44
74LS251	0.75	74LS20	0.24
74LS257	0.73	74LS21	0.24
74LS258	0.75	74LS22	0.24
74LS259	1.20	74LS24	0.28
74LS266	0.55	74LS26	0.24
74LS237	1.20	74LS27	0.24
74LS279	0.70	74LS28	0.24
74LS283	0.80	74LS30	0.24
74LS353	1.10	74LS32	0.24
74LS365	0.50	74LS33	0.24
74LS366	0.50	74LS37	0.24
74LS367	0.50	74LS38	0.24
74LS368	0.50	74LS40	0.24
74LS373	1.00	74LS42	0.50
74LS374	1.00	74LS47	0.79
74LS375	0.70	74LS48	0.85
		74LS51	0.24
		74LS55	0.24
		74LS73	0.30
		74LS74	0.33
		74LS75	0.44
		74LS76	0.38
		74LS83	0.88
		74LS85	0.82
		74LS86	0.35
		74LS90	0.48
		74LS91	0.90
		74LS92	0.54
		74LS93	0.54
		74LS95	0.60
		74LS96	1.20
		74LS107	0.40
		74LS109	0.44
		74LS112	0.44
		74LS113	0.40
		74LS114	0.39
		74LS122	0.68
		74LS123	1.00
		74LS124	1.15
		74LS126	0.50
		74LS132	0.60
		74LS135	0.26
		74LS136	0.42
		74LS138	0.44
		74LS139	0.58
		74LS145	0.93
		74LS147	1.64
		74LS148	1.28
		74LS151	0.70
		74LS153	0.70
		74LS155	0.55
		74LS157	0.45
		74LS158	0.58
		74LS160	0.62
		74LS161	0.68
		74LS162	0.70
		74LS163	0.68
		74LS164	0.74
		74LS165	1.10
		74LS166	1.50
		74LS168	1.48
		74LS170	1.40
		74LS173	0.98
		74LS174	0.75
		74LS175	0.70

CMOS

4000	0.19
4001	0.24
4002	0.24
4006	0.68
4007	0.24
4008	0.59
4009	0.44
4010	0.39
4011	0.23
4012	0.24
4013	0.35
4014	0.58
4015	0.58
4016	0.38
4017	0.54
4018	0.59
4019	0.59
4020	0.78
4021	0.58
4022	0.68
4023	0.30
4024	0.49
4025	0.24
4026	0.89
4027	0.44
4028	0.44
4029	0.73
4030	0.33
4031	1.28
4033	1.25
4034	1.40
4035	0.68
4036	2.48
4038	0.73
4039A	2.70
4040	0.58
4042	0.48
4043	0.42
4044	0.48
4049	0.38
4050	0.34
4051	0.68
4052	0.58
4053	0.58
4066	0.44
4068	0.24
4069	0.24
4070	0.24
4071	0.24
4072	0.24
4073	0.24
4075	0.24
4076	0.68
4077	0.24
4078	0.24
4081	0.24
4082	0.24
4085	0.58
4086	0.58
4089	1.22
4093	0.37
4094	0.70
4095	0.93
4096	0.98
4097	2.65
4098	0.78
4099	0.75
4161	0.96
4162	0.96
4163	0.96
4174	0.96
4175	1.00
4195	0.99
4501	0.38
4502	0.58
4503	0.38
4507	0.45
4508	1.28
4510	0.54
4511	0.54
4512	0.54
4514	1.10
4515	1.20
4516	0.60
4517	2.70
4518	0.48
4520	0.05
4521	1.10
4522	1.20
4526	0.58
4527	0.64
4528	0.68
4531	1.20
4532	0.64
4536	2.50

ZENER DIODES

400mW Plastic 3V-75V	8p each. 10/75p
1.3W Plastic 3V-200V	15p each. 10/£1.40
1.5W Flange 4.7–47V	£1.25 each*
2.5W Plastic 7.5-75V	64p each*
20W Stud 7.5-75V	£1.35 each*

*Only available while stocks last

ZENER DIODE KIT 400 M/W

55 ZENER DIODES
5 EACH VALUE
£3.50

ORYX PORTASOL PORTABLE GAS SOLDERING IRON

Powered by ordinary lighter fuel. 60 mins. cont. use, adj. temp.
10/60W Price £13.90

ELECTRICAL

13A 3p Fused Plugs	46p
	42p/10
As above – Rubber	78p
	72p/10
2 way 13A 3p ext. socket	2.45
3 way 13A 3p ext. socket	3.25
4 way front fused	4.10
4W front fused + 3m lead	5.75
2W adaptor, fused 13A	1.20
3W adaptor, fused 13A	2.10

12V RECHARGEABLE UNIT

A bank of 10 D type Ni-Cads encapsulated in a black plastic box complete with inlet and outlet sockets (XLR type) and fuse holder. This giving 12V from a very neat and tidy unit. Approx. 245×75×75mm
£5.99 + £1.85 P&P + 15% VAT

CERAMIC KIT 50 VOLT

125 CAPACITORS
5 EACH VALUE
£4.75

CHART RECORDER SPECIAL

Brand new 3 channel pen recorders complete with charts. Full spec. upon request. Price £40 + £10 p&p + VAT.

RESISTORS ¼W CARBON FILM 5%

¼W 1R0 to 10M (E12 Range)	2p each. 15p/10. 75p/100
½W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100
2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

H.V. DISC CERAMICS

1KV 1.5nf	.18
8KV 56, 100, 120, 150, 180pf	.30

RESISTOR KITS – each value individually packed

¼W pack 10 each value E12 – 10R to 1M 610 pieces	5.75
¼W pack 5 each value E12 – 10R to 1M 305 pieces	3.35
½W pack 10 each value E12 – 2R2 to 2M2 730 pieces	7.95
½W pack 5 each value E12 – 2R2 to 2M2 365 pieces	4.75
1W pack 5 each value E12 – 2R2 to 1M 353 pieces	15.25
2W pack 5 each value E6 – 10R to 2M2 317 pieces	18.50

MULTISECTION ELECTROLYTICS

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

UNIVERSAL BATTERY CHARGER

To charge AA, C, D and PP3 Ni-Cads
Price £4.50

Rechargeable Batteries

AA (HP7)	95p	10/ 85p each
C (HP11)	£2.14	10/£1.96 each
D (HP2)	£2.30	10/£2.10 each
PP3	£3.75	10/£3.65 each

Full range of Battery Holders

SERVICE AIDS

Switch Cleaner	1.24
Circuit Freezer	1.40
Foam Cleanser	1.22
Aero Klene	1.14
Plastic Seal	1.34
Excel Polish	1.16
Antistat Spray	1.24
Aero Duster	1.48
Super 40	1.86
Video Head Cleaner	1.10
Fire Extinguisher	3.28
Silicone Grease Hero	1.50
Silicone Grease Tudle	1.66
Heat Sink Compound	1.10
SoldaMop 0.12mm	0.74
SoldaMop 0.08mm	0.76
SoldaMop Industrial Reel 10m 0.12m	2.90

RESISTORS – WIREWOUND. Generally 5%

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

TELEPHONE SPECIA

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

REPLACEMENT TV MAINS DROPPERS

GEC2010	8R + 15R + 17R + 70R + 63R + 188R	0.95
GEC 2018	10R + 15R + 19R + 70R + 188R	1.15
Philips G8	2.2R + 68 R	0.80
Philips 70	6R + 124R + 84R	0.68
Philips 300	118R + 148R (with link)	0.85
RRI A640	250R + 14R + 156R 50W	1.05
RRI A816	302R + 70R + 6.2R	0.78
Thorn 1500	350R + 20R + 148R + 1.5K + 317R	1.34
Thorn 3000/3500	6R + 1R + 100R Fused	0.93
Thorn 8000	56R + 1K + 47R + 12R	0.95
Thorn 8500	1K5 + 40R + 50R	1.28

Plus Many More. Please enquire.

FUSES Prices per 10

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

VALVES

Enquiries are welcomed for any other valve not listed here.

Type	Price (£)
AZ31	4.50
AZ41	1.98
DAF96	1.00
DF96	0.75
DK96	2.65
DM71	2.95
DY86/87	0.66
DY802	0.95
CV850	2.50
CV4015	2.80
E180F	6.50
EABC80	0.98
EAF42	1.50
EB91	1.30
EBC41	2.00
EBF80	0.75
ECC81	1.00
ECC82	0.90
ECC83	1.00
ECC84	0.80
ECC85	0.95
ECC86	2.80
ECC88	1.25
ECC189	0.85
ECF80	1.20
ECF82	0.85
ECF83	1.90
ECF86	1.70
ECH35	3.75
ECH81	1.40
ECH84	1.50
ECL85	0.75
ECL86	1.75
EF80	0.75
EF86	1.80
EF91	2.00
EF95	1.68
EF183	0.90
EF184	1.00
EH90	0.98
EL34	3.25
EL36	1.96
EL81	6.95
EL84	1.00
EL85	4.75
EL86	0.90
EL509	7.85
EL519	7.95
EM80	0.85
EM84	1.75
EM87	2.55
EY51	0.90
EY86/87	0.65
EY88	0.75
EY500A	2.50
EZ41	2.80
EZ81	0.80
GY501	1.40
GZ32	1.20
KT66(G.E.C.)	18.00
KT77	11.50
KT88(G.E.C.)	19.00
PC88	1.40
PC92	3.00
PC900	1.40
PCC88	0.80
PCC89	0.75
PCC189	0.85
PCF80	0.95
PCF82	0.95
PCF84	0.75
PCF86	1.25
PCF87	0.50
PCF200	1.95
PCF201	1.95
PCF800	1.20
PCF801	1.05
PCF802	1.05
PCF805	2.00
PCF806	1.20
PCF808	1.60
PCL82	1.00
PCL83	2.50
PCL84	1.00
PCL86	0.90
PCL88	2.50
PCL805	1.05
PD500	2.90
PFL200	1.85
PL33	1.50
PL36	1.75
PL82	0.75
PL95	2.00
PL504	1.40
PL508	2.70
PL519/509	5.25
PL802	5.50
PY81/800	1.10
PY82	1.75
PY88	0.80
PY500A	2.20
PY801	0.68
UABC80	0.85
UAF42	1.25
UBC41	3.00
UBC81	1.50
UCC85	0.75
UCF80	1.20
UCH42	2.50
UCH81	2.00
UCL82	1.80
UCL83	1.80
UF41	1.25
UF89	2.50
UL84	1.25
UY85	1.15
2D21	1.60
6AT6	1.25
6AU6	1.00
6C4	1.00
6GH8A	1.20
6J5GT	2.50
6K7G	2.00
6K8G	2.75
6KD6	6.50
6X4	1.50
30FL2	1.70
30FL12	1.60

TRANSISTORS + DIODES

Type	Price (£)	Type	Price (£)
AC127	0.28	BC118	0.16
AC128	0.30	BC119	0.28
AC128K	0.34	BC125	14
AC141	0.58	BC140	0.27
AC141K	0.38	BC141	0.24
AC142	0.56	BC142	0.24
AC142K	0.38	BC143	0.26
AC151	0.45	BC147	0.18
AC152	0.45	BC147B	0.14
AC153	0.57	BC148	0.10
AC153K	0.46	BC148B	0.12
AC176	0.30	BC149	0.10
AC176K	0.38	BC149C	0.14
AC187	0.28	BC157	0.10
AC187K	0.38	BC158	0.12
AC188	0.28	BC159	0.12
AC188K	0.38	B/C	0.14
ACY22	1.50	BC160	0.30
AD142	0.88	BC161	0.30
AD143	1.10	BC168B	0.20
AD149	0.72	BC169C	0.12
AD161/162	1.20	BC170/A/B/C	0.16
AD162	0.52	BC171/A/B	0.10
AF114	1.20	BC172/B/C	0.12
AF115	2.10	BC177/A/B/C	0.24
AF116	2.10	BC182/A/B/C	0.10
AF121	0.56	BC182L	0.12
AF124	0.42	LA LD LC	0.10
AF125	0.58	BC183/A/B/C	0.10
AF126	0.58	BC183L	0.10
AF127	0.38	LA LB LC	0.10
AF139	0.40	BC184	0.10
AF178	2.28	A B CL LC LB	0.10
AF239	0.50	BC207	0.15
AF279S	1.40	BC212/A/B/C	0.10
AL100	5.40	BC212L	0.09
AL102	4.40	LA LB	0.10
ASY80	5.20	BC213/A/B/C	0.10
AS217	2.00	BC213L	0.10
AU110	2.80	LA LB LC	0.10
AY102	4.40	BC237	0.11
B40C200	1.03	BC238	0.12
BA110	0.68	BC251/A/B	0.14
BA115	0.14	BC262	0.20
BA121	0.40	A B	0.28
BA129	0.38	BC301	0.30
BA148	0.16	BC302	0.30
BA155	0.12	BC303	0.30
BA157	0.28	BC307A	0.18
BB105B	0.30	BC317A	0.12
BB105G	0.48	BC323	0.90
BB110B	0.42	BC327	0.16
BC107	0.10	BC328	0.18
A or B	0.12	BC337	0.12
BC108	0.10	BC338	0.12
A,B or C	0.13	BC350A	0.24
BC109	0.10	BC351	0.16
A,B or C	0.14	BC440	0.36
BC115	0.12	BC441	0.40
BC116	0.12	BC461	0.58
BC117	0.22	BC478	0.24
BC516	0.48	BF178	0.26
BC547	0.12	BF180	0.27
A or B	0.10	BF181	0.27
BC548	0.12	BF182	0.32
A B or C	0.10	BF183	0.32
BC549	0.10	BF184	0.30
A or B	0.10	BF185	0.28
BC550	0.10	BF194A	0.15
A or B	0.10	BF196	0.12
BC557	0.10	BF224J	0.20
BC558A	0.10	BF240	0.30
BCY70	0.16	BF241	0.30
BCZ10	3.21	BF244A	0.30
BCZ11	2.60	BF257	0.22
BD124P	0.70	BF258	0.26
BD129	0.90	BF259	0.30
BD130Y	0.68	BF262	0.34
BD131	0.36	BF263	0.38
BD132	0.36	BF270	0.30
BD135	0.26	BF271	0.28
BD136	0.26	BF273	0.22
BD137	0.28	BF274	0.34
BD138	0.30	BF294	0.46
BD139	0.30	BF336	0.32
BD140	0.28	BF337	0.28
BD142	1.26	BF338	0.28
BD145	1.82	BF355	0.37
BD150A	0.72	BF371	0.27
BD160	1.58	BF450	0.38
BD165	0.45	BF457	0.36
BD183	0.70	BFR51	0.36
BD201	0.52	BFR61	0.32
BD202	0.57	BFR90	0.86
BD204	0.50	BFT41	0.68
BD222	0.80	BFT43	0.86
BD225	0.40	BFY50	0.22
BD232	0.45	BFY51	0.22
BD234	0.30	BFY52	0.22
BD235	0.30	BFY90	0.80
BD236	0.38	BFY90S	1.34
BD237	0.38	BR100	0.25
BD410	0.76	BR101	0.40
BD434	0.58	BR103	0.50
BD438	0.58	BR303	2.75
BD439	0.85	BRY39	0.50
BD441	1.00	BRY56	0.42
BD507	1.05	BSX20	0.30
BD520	1.20	BSY52	0.35
BD687	0.88	BSY95A	0.25
BD707	0.88	BT100A/02	0.90
BDX18	1.00	BT101/300	2.75
BDX32	1.48	BT101/500	3.25
BF115	0.32	BT102/300	3.60
BF117	0.50	BT106	1.15
BF119	0.82	BT116	1.20
BF120	0.38	BT119	3.30
BF125	0.42	BT138/600	1.30
BF127	0.41	BT151/560R	0.90
BF154	0.14	BTY79/400R	2.80
BF157	0.46	BU104	1.80
BF160	0.23	BU105	1.20
BF167	0.32	BU108	1.75
BF177	0.42	BU124AE	0.98
BU126	1.40	ORP12	0.95
BU133	1.90	R2008B	1.20
BU204	1.30	R2010B	1.20
BU205	1.30	R2540	2.71
BU206	1.50	TIP30A	0.32
BU208A	1.40	TIP31C	0.39
BU326S	1.75	TIP32	0.35
BU407	1.10	TIP33A	0.55
BUX80	3.70	TIP34A	0.70
BUY20	2.75	TIP41C	0.42
BUY69A	2.60	TIP42	0.44
BUY69B	1.98	TIP47	0.42
BY100	0.80	TIP121	0.63
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MJE2955	1.60	2SC1957	0.70
MJE3055	1.40	2SC1969	2.80
MPSA05	0.30	2SC2028	0.73
MPSA12	0.80	2SC2029	2.70
MPSLO1	0.34	2SC2078	1.05
MPSUO5	1.05	2SC2091	0.70
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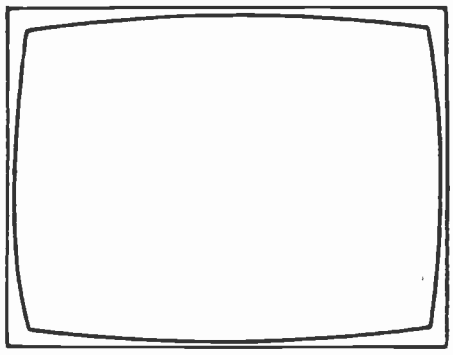

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COVER PHOTO
This month's cover photo shows a Ferguson 3V29 with the top cover removed. It's a near relative of the JVC HR7300. See article on page 780.

NO ADDRESS
Would Mr. D. Mahony of Sunderland please send us his address (Query Service).

INFORMATION WANTED
Does anyone know of a source of spares/service data for Wye monochrome portables?

INDEXES
Indexes prior to Vol. 30 are no longer available. We will announce when the index to Vol. 36 is available.

Towards a UK DBS Service

Third time lucky it seems. After two previous attempts to establish a UK DBS TV service the latest looks like being a success. The first effort was by the BBC on its own. This fizzled out when the Corporation came to the conclusion that the project was too risky for it to undertake, given in particular its financial constraints. The second effort, when the BBC was joined by the ITV companies and a group of five non-broadcasting organisations, came to grief in mid-1985, mainly over arguments about the cost of providing the satellites – the government had insisted on nominating the supplier. Earlier this year the IBA was asked to advertise the DBS services as a franchise operation with fewer conditions. The deadline for applications to run the three-channel DBS franchise was at noon on August 29th. Five applications were received, from BSB, DBS UK, DBL, NBS and Sat UK.

The BSB consortium comprises Amstrad Consumer Electronics, Anglia Television and the Granada, Pearson and Virgin groups. It plans to offer a subscription film channel and three "programme packages" financed by advertising – Now for live events, Galaxy as a general entertainment programme and a Disney programme. The consortium has emphasised the need for DBS services to be "programme led" and to be complimentary to existing services. The DBS UK consortium comprises Carlton Communications, Columbia Pictures International, London Weekend Television, Dixons, bankers Hambros and Robert Fleming and advertising agency Saatchi and Saatchi. It was formed by Carlton's chairman Michael Green and intends to finance all three channels by advertising. The emphasis would be on serving groups neglected by the established broadcasting networks. Direct Broadcasting Ltd. brings together British and Commonwealth Shipping, News International, the Electronic Rentals Group, Cambridge Electronic Industries, Sears and Ferranti. It would finance the three channels by a combination of advertising, subscription and pay-per-view. The participants in National Broadcasting Service are James Lee, former chief executive of Goldcrest Films and Television, and Robert Holmes à Court's Bell Group International. It would offer two advertising financed channels and a premiere subscription channel for first-run feature films and mini-series. Sat UK Broadcasting comprises Lonrho, the Bond Corporation of Australia, Celtic Films and the TV and video facilities group Trillion. It would offer one entertainment channel financed by advertising, a subscription film channel at £5 a month and a subscription family channel at £2 a month. In addition Independent Television News has applied to provide a 24-hours a day live news channel, Starstream (owned by British Telecom, D.C. Thomson and Thorn EMI) has applied to make its cable TV Children's Channel available and Direct Business Satellite Systems has applied for a contract to operate a DBS teletext service.

The IBA hopes to award the DBS franchise by the end of the year and envisages that the services could begin in late 1989 or 1990. The consortia who have applied have substantial resources and appear to be committed to investment in DBS TV – whether wisely or not remains to be seen. It's interesting that some of them are emphasising the need for low-cost receiving equipment to be available to the public. Amstrad's Alan Sugar believes "it can be done for between £100 and £200". His successes with other consumer electronics products suggests that this could be feasible. Carlton has recently announced a substantial investment in receiving equipment for the present 11GHz band services: its subsidiary Skyscan Systems has ordered over 10,000 TVRO systems.

The Japanese Effect

One thing that has always been a bit of a puzzle is how Japanese manufacturers have been able to take over previously unsuccessful UK TV plants and make a go of them. It was not for want of technical know-how or, it seems, investment that Rank's Plymouth plant, GEC's Hirwaun plant and the Philips/Pye Lowestoft plant were uncompetitive. See-saw market conditions in the UK have never helped but the problems were rather more fundamental. How is it that Toshiba made a success of Plymouth, Hitachi of Hirwaun and Sanyo of Lowestoft? A recently published book, "Strike free: New Industrial Relations in Britain", by the *Financial Times'* labour editor Philip Bassett sheds considerable light on the subject. Whilst mainly concerned with the strike-free deals pioneered by the EETPU it nevertheless gives much background information on conditions in particular plants.

It's not that there are any particularly new revelations. Overmanning, the problems of multi-union representation and demarcation, and poor organisation generally are highlighted. Overmanning was problably due to historical causes: the plants were originally labour intensive. The Japanese were prepared to be ruthless about this and, backed by the fact that it was in most cases a matter of no plant or a plant run on much changed lines, the EEPTU was prepared to co-operate. Conditions at Hirwaun seem to have been particularly chaotic. The EEPTU's Wyn Bevin is quoted as saying: "Discipline was non-existent – people wandering off the production lines to do whatever they wanted whenever they wanted to. The lines were full of pies, pasties and cups of tea, with people smoking and tapping ash. You can't have sophisticated electronic equipment with pieces of pasty and cups of tea falling all over it."

Cover Mounted Gift

If all goes well purchasers of this issue of *Television* will find taped to the front cover an i.c. removal aid. Unfortunately as we go to press the supply of these tools is held up by the customs where a go-slow is taking place. Assuming that they are released in time we hope you will find this little gadget a helpful addition to the armoury.

Long-distance Television

Roger Bunney

There was a decrease in Sporadic E activity during July, as many DXers have commented, though signals were received on most days, including several interesting exotics. Now that we have 50MHz amateur radio operation in the UK it's interesting to note the number of transatlantic contacts that are being made. This suggests that the lower Band I TV channels should be available across the Atlantic, certainly ch. E2. In the opposite direction the lowest channel is A2 with vision at 55·25MHz. This is likely to be more difficult because of the higher frequency – we're talking about double- and triple-hop propagation. The peak months for the transatlantic SpE path seem to be June-July. It's worth keeping this in mind! Now to the collated SpE log for the period:

5/7/86 TVE (Spain) chs. E2, 3, 4; RTP (Portugal) E3; RAI (Italy) IA, B.
6/7/86 RAI IA.
7/7/86 TVE E2, 3, 4; TVE-2 E2; JRT (Yugoslavia) E3, 4; TVR (Rumania) R2.
8/7/86 TVE E2, 3, 4; TVE-2 E2; RAI IA, B; EPT (Greece) E3; RTC (Albania) IC; +PTT (Switzerland) E2; ARD (West Germany) E2; TDF (France) L3, 4; CST (Czechoslovakia) R1; TVP (Poland) R1, 2; DR (Denmark) E3; TSS (USSR) R1, 2, 3; SR (Sweden) E2; NRK (Norway) E2, 3, 4; RUV (Iceland) E4.
9/7/86 TVE E2, 3, 4; RAI IA, B; JRT E3, 4; ARD E2; MTV (Hungary) R1, 2; TVP R1, 2; ORF (Austria) E2a, E4; CST R1, 2; TSS R1, 2; NRK E2, 3, 4; SR E2.
10/7/86 TSS R1, 2, 3 and R9; MTV R1, 2; TVP R1, 2; CST R1, 2, 4; ORF E4; JRT E3, 4; DFF (East Germany) E4; ARD E2; +PTT E2, 4; SR E2, 3, 4; NRK E2, 3, 4; DR E3; RAI IA, B; TVE E2, 3, 4.
11/7/86 TVE E2, 3, 4; TVE-2 E2; RAI IA, B; Italy ch.IA 'Videolina' private station; RTP E3; EPT E3; RTS IC; MTV R2; TDF L4; TVP R1; DFF E4; TSS R1, 2; SR E2, 3; NRK E2, 3.
12/7/86 TVE E2, 3, 4; TVE-2 E2; RAI IA, B; RTP E3; CST R1; TDF L3; TVP R1, 2, 3; TSS R1, 2; SR E2, 3, 4; NRK E2, 3; RUV E3, 4.
13/7/86 TVE E2, 3, 4; TVE-2 E2; RAI IA; RTP E3; TDF L4; JRT E3; TSS R1.
14/7/86 TVE E3; RAI IA, B; RTP E3; MTV R1; ARD E2; CST R2; +PTT E3; CST R2; ORF E4; SR E4.
15/7/86 TVE E3.
16/7/86 NRK E4.
17/7/86 TSS R1, 2; TVP R1; TVR R2, 3; JRT E3, 4; RAI IA, B; NRK E2, 3, 4; SR E2, 3, 4.
18/7/86 RAI IA, B; TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; JRT E4; RTS IC; CST R1; TSS R1, 2, 3, 4.
19/7/86 TVE E2, 3, 4; TVE-2 E2; RAI IA, B; RTP E3; JRT E3, 4; +PTT E2, 3; ARD E2; TDF L3; RTS IC; ORF E4; MTV R1, 2; TSS R1, 2; SR E2; NRK E2, RUV E4; CST R1.
20/7/86 TVE E2, 3, 4; RTP E2; RAI IA; CST R1, 2; ORF E2a; JRT E3; DFF E4; TSS R1; TVE-2 E2.
21/7/86 TVE E3; TVE-2 E2; RTP E3; RAI IA, B; JRT E3, 4; CST R1, 2, 3; TSS R1, 2; YLE (Finland) E3.
22/7/86 NTA (Nigeria) E3; CST R1.
23/7/86 TVP R1; TVE E2, 3, 4; RTP E3; ARD E2; JRT E3.
24/7/86 TSS R1, 2; TVP R1, 2; ORF E2a, 3, 4; ARD E2; DFF E4; SR E2; +PTT E3; JRT E3, 4; RAI IA, B; Radio Tele Uno ch. E3 (Italian private station).
25/7/86 JRT E3; RAI IA; TDF L4; RTP E3; TVE E2, 3, 4; TVE-2 E2 (the MUF this day reached 106MHz).
26/7/86 RAI IA, B; NRK E3.
28/7/86 SR E2, 3; NRK E2, 3; YLE E3; TVP R1; CST R1; ORF E2a.
29/7/86 TSS R1, 2.
30/7/86 TVE E2; RAI IA; MTV R1; ARD E2; +PTT E3; JRT E3; ORF E4; TVP R1; CST R1.
31/7/86 TSS R1, 2; SR E2, 3, 4.
1/8/86 JTV (Jordan) E3; RAI IA; TVE E4.
3/8/86 RAI IA; TVE E3.
4/8/86 RAI IA, B; TSS R1, 2; CST R1, 2; SR E2.

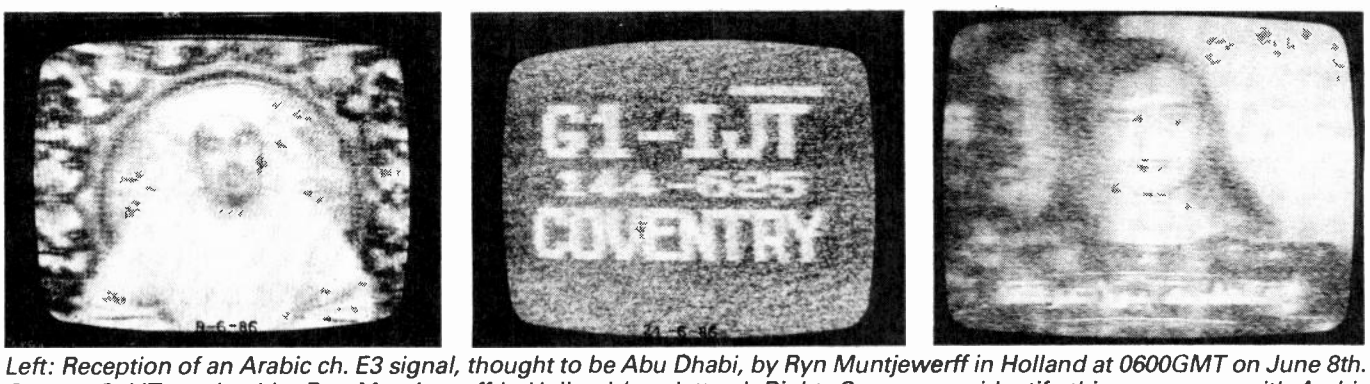
SpE activity in the two-metre amateur band was reported as reaching 144MHz on July 1st (to Malta/Sicily), 2nd (Eastern Europe), 6/7th (Malta), 8th (Scandinavia/E. Europe), 12th (Spain/Ibiza) and 18th (Malta/Sicily). Transatlantic SpE openings in the 50MHz band were noted on the 2nd and 6th (New York), 9th (N. Carolina), 12th (several eastern seaboard states), 17th (USA plus OX3VHF Greenland beacon) and the 21st.

A slight tropospheric lift during the late evening on the 19th produced Band III/u.h.f. signals from France and Spain in the west country.

The low sunspot activity will continue through to next year: the first sunspot group of the new cycle was noted in early July.

During an intense evening opening on July 10th (2055-2109BST) Tim Anderson received Russian Band III signals at St. Leonards, Sussex – programme material with heavy fading.

While tuning through the OIRT f.m. band (66-73MHz) on July 19th at 1105BST I was surprised to hear the announcement "and now for the news in English", fol-



Left: Reception of an Arabic ch. E3 signal, thought to be Abu Dhabi, by Ryn Muntjewerff in Holland at 0600GMT on June 8th. Centre: G1IJT received by Ryn Muntjewerff in Holland (see letters). Right: Can anyone identify this announcer with Arabic script (either Kuwait, Egypt or the Sudan) received by Tim Anderson on June 5th in Band I? Phonetically her name is Fatima Binta Loofer . . .

lowed by a news item and then fading. Identification of the 67·6MHz signal has so far not been possible. It could have been from a Black Sea tourist area. I had another mystery signal on the 21st, this time a System M (525 lines) transmission at 2020BST. There was no identification but the carrier frequency was unusual in being at 54·7MHz (confirmed by a v.h.f. radio), wedged between chs. E3 and IA (also in at the time). The signal faded after a few minutes.

On the 22nd Tim Anderson noted a coloured male announcer with a white togo over his shoulder. Tim's aerials were pointing south and the weak ch. E3 signal lasted from 1450 to 1540BST. Material received included a schools' programme at 1500 – simple words and cartoon type explanations, in English, with coloured male and female participants. Thoughts are that the transmission came from NTA (Nigeria). Can anyone confirm this?

On the day of the Royal Wedding, July 23rd, CNN Europe relayed the BBC vision plus sound effects with a CNN commentary via the Intelsat bird at 27·5°W. Interesting to note that the CNN sound was delayed with respect to the local BBC sound while a further delay occurred to the CNN picture. Most strange, comparing the sources and the complete lack of sync on CNN.

My thanks to Roger Fussel (Torpoint), Iain Menzies (Aberdeen), Simon Hamer (Powys), Bill Cotterill (Tipton), Cyril Willis (Downham Market), Dave Moller (Birmingham), Tim Anderson (St. Leonards) and Dave Shirley (Hastings) for sending in logs and reports.

News Items

Sweden: The Horby SR-1 transmitter finally closed on June 30th. Broadcasting arrangements are due to change next summer (1987). Stockholmskanal (at present TV-1) will be on air from 1300-2400 weekdays, 0800-2400 Saturdays and 0900-2400 Sundays. Rikskanal (at present TV-2) will be on air from 1730-2230 Mondays-Thursdays and 1730-2400 Fridays-Saturdays. All times local. There will be regional variations on both networks.

Hungary: A commercial v.h.f. (100·5MHz) stereo radio station, Radio Danubius, opened on July 1st with German language programmes from Kabhegy. The eleven hour a day service of music, news and information is intended for holiday makers and will continue for a three-month trial period. If judged successful the service will return next year.

Satellite TV: Scrambling, at present a highly controversial subject in the USA, is on the increase there. Further information has come to hand on the operation conducted by "Captain Midnight" who jammed the Home Box Office programme uplink (and hence downlink) for about five minutes during the early morning of April 27th this year. While HBO was showing a movie called "Falcon and the Snowman" Captain Midnight fed up an NTSC test pattern with the message inlaid "Good Morning HBO, this is Captain Midnight. $12·95 for HBO? No way! Movie Channel/Showtime beware!". The threat of jamming by transmitting sources almost impossible to locate has wide implications and has caused quite a stir.

At a recent meeting in Czechoslovakia the EBU, OIRT and other broadcasting organisations suggested that the band 22·5-23GHz should be made available for TV broadcasting. The wide spectrum would be particularly useful for transmitting HDTV without the need for the bandwidth compression/limiting techniques that would be required if the 12GHz band is used for HDTV.

A new dual-band (4/12GHz) feedhorn introduced by Seavey Engineering in the USA is of interest in that the feeds are co-located on a common axis – previous dual-band systems have had adjacent feedhorns built as a single head unit.

Radio Shack has introduced a TVRO package in the USA comprising an 8·5ft dish, 80°K LNB and a receiver with stereo sound capability. The package comes complete with a video tape that presumes no knowledge of TVROs yet gives full instructions on how to install the equipment.

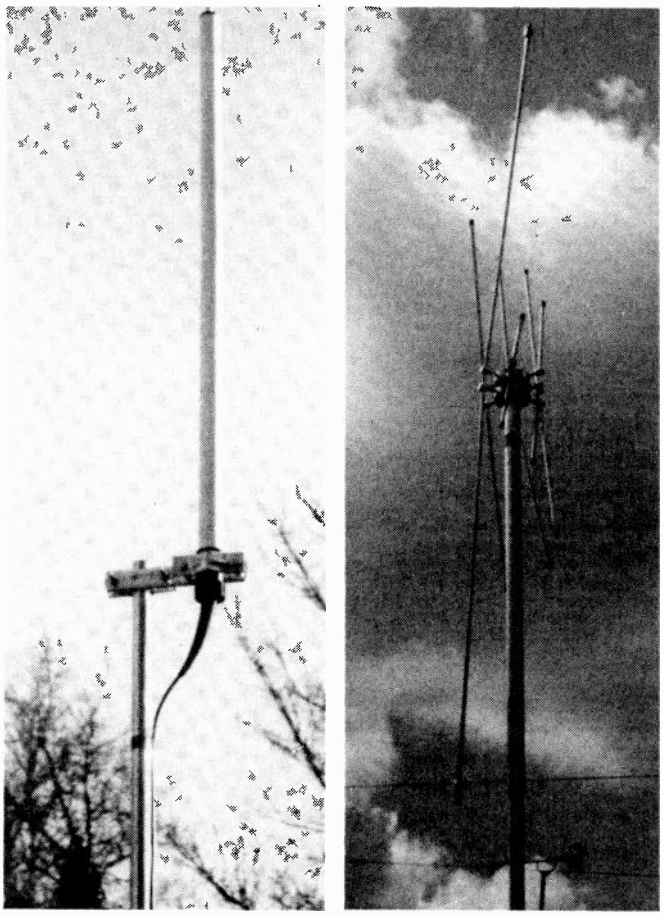
From our Correspondents . . .

Bill Cotterill is now using an NSF4780 tuner from Sendz for TV-DXing and comments on its excellent performance. The Band I coverage extends to 70MHz and there's plenty of gain in Band III and at u.h.f. Apart from the frequency coverage the performance compares with or is better than the ET021. We'd like to hear of other readers' experiences with various tuners advertised in the magazine.

On June 24th Ryn Muntjeweff (Holland) received an ATV signal transmitted by John Driver in Coventry. John (G1IJT) was at the time (1519-1825GMT) in two-way picture contact with a Belgian amateur (ON7GG), with picture quality to P4. John's equipment consists of an 8W transmitter, a BNOS 10-50W linear amplifier and a Jaybeam MBM48/70 aerial at 40ft – his location is some 750ft ASL. There are about a dozen 70cm ATV stations active within a twelve mile radius of John.

Wideband Monitoring Aerials

The availability of general coverage v.h.f./u.h.f. scanners has led to the introduction of various aerials with



Left: The Tandy 20-9005 monitoring aerial.
Right: The Revco Radac 2045 monitoring aerial.

wideband capability. We've tried a couple of these, the Tandy 60-600MHz aerial (catalogue no. 20-9005) which sells at £19·95 and the more upmarket Revco Radac Model 2045 which sells at around £69·95.

The Tandy monitoring aerial is housed in an attractive white PVC tube some 39in. long overall and of 1⅜in. diameter. It's capped with a black plug and integral eyelet, apparently for hanging in attics, and has a thicker black polythene base assembly. The aerial to vertical mast bracket that comes with it clamps around the base assembly. This galvanised bracket has only single pressure clamping which if too slack results in the aerial tilting away from the vertical. I was wary of over tightening it however. Cable connection is via an SO329 socket on the underside of the base assembly, i.e. you need a PL259 plug.

There's little technical information on the internal construction in the instruction sheet provided. The v.h.f. section apparently consists of a form of helical end-fed element, while a half-wave dipole is used for u.h.f. The latter was about 4-5dB down on a standard half-wave dipole at 450MHz. The sheet provided invites buyers to write to the makers who will prove the performance figures quoted, but a letter to Tandy asking for information on the aerial failed to produce a reply.

The performance at v.h.f. was surprisingly good. SpE signals down to 50MHz were well received, which is surprising considering the overall length. During an interesting SpE opening signals from the USSR proved to be predominantly vertically polarised; the signals the Tandy aerial produced were considerably better than those from a five-element wideband Band I aerial mounted higher with horizontal polarisation. Its general performance on the various v.h.f. PMR/marine bands proved to be good but the u.h.f. performance was poor. For serious monitoring the addition of a low-noise, wide dynamic range amplifier such as the Mutek 500U is really essential.

The aerial is available from your local Tandy store or via mail order (add £3·45 for carriage) from Radio Shack, 188 Broadhurst Gardens, London NW6 3AY – where it rejoices under the Telescan name.

Revco Electronics have been in the PMR radio aerial market for many years and are noted for their high-quality aerial systems – many police forces use their products, which I feel is sufficient recommendation. In the general monitoring aerial field they are perhaps best known for their Revcone wideband discone aerial. Continuing research into improved wideband performance for both general monitoring and transmission has led to the introduction of the Radac aerial. A sample Model 2045 was kindly supplied for assembly and evaluation.

Assembly is a long task taking over an hour. Two hard alloy shallow hubs are mounted one atop the other. Around the perimeter of each hub are six holes which accept short stub arms that are secured by grub screws. The two hubs are of similar external construction, some 3·5in. in diameter, and the holes are matching pairs one above the other. So there are six sets of two stub arms, all colour coded to ensure correct assembly. Each stub arm has a thick end into which a quarter-wave element is fitted, again secured by a grub screw – the 25MHz elements are the exception with two grub screws each. An Allen key comes with the kit.

Once constructed there are six half-wave dipoles around the central hub. The elements are designed to give optimum coverage throughout the intended bandwidth, though it's possible to specify particular frequencies of interest for which elements can be provided. In fact this led to the Model 2046, which has dipoles cut to suit the various v.h.f./u.h.f. amateur bands, allowing both reception and transmission. The review Model 2045 covered 100-480MHz with options down to 25MHz. Apart from this lowest frequency, which requires inductive loading, the elements are a full quarter wave: one 100MHz element has a telescopic lockable extension for 50MHz.

When assembled the dipoles slant by 22·5° relative to the vertical. The design intension here is to maintain a good phase relationship and optimum coupling together with good matching at 50Ω. The system gives a wider bandwidth product than would be achieved using conventional elements. Typically ±40MHz is achieved at a centre frequency of 450MHz; the bandwidth below 100MHz is 5MHz while at 25-50MHz the figure is 3MHz.

The whole system is made to a very high standard. It defies brief description due to the design complexity. As with the Revcone a 14g support mast is provided. It bolts to the lower hub. Cable access to the SO329 connector is through this 1·5in. o.d. support mast.

On test I found that the performance was excellent, the best achieved with any general purpose monitoring aerial so far tried. As with any wideband system it can't compete in terms of gain with a Yagi or even a two-element (3dB gain) aerial cut to frequency. Assuming one can accept a performance of about 0·5-2dB down with respect to a dipole over the *whole* range covered this Radac aerial is a high performance compromise that I would highly recommend. It's available at £69·95 inclusive of postage (it's a heavy array!) from Garex Electronics, 7 Norvic Road, Marsworth, Tring, Herts HP23 4LS.

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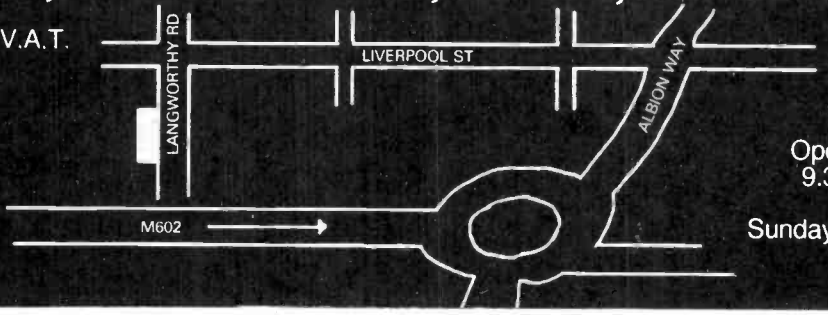

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Battery-powered CRT Tester

Nick Laidlaw

It's a gamble as to whether the tubes are serviceable or not when you buy second-hand CTVs "off the pile". A portable tester that gives a quick indication of tube emission is therefore useful. The unit described in this article will test both delta-gun and PIL type tubes. It's powered by a 6V, 3Ah sealed lead-acid battery.

Circuit Operation

The circuit diagram of the tester is shown in Fig. 1. It can be split into two sectons, the power supply and the testing circuitry. Tube emission is checked in the usual manner – by applying a positive voltage to the first anodes and a negative voltage to the cathodes and measuring the resultant current flow between them.

IC1 in the power supply section is connected as an astable multivibrator. It produces pulses which are amplified by Tr1 whose output drives the Darlington pair Tr2/3. The output is developed across the primary winding of transformer T1. This is the only critical component in the unit: it's the e.h.t. transformer used in the Thorn 3500 chassis – the line output transformers used in this and other chassis give markedly less voltage and are not really suitable. The voltage developed across the e.h.t. overwinding is rectified by bridge rectifier D1-4 which charges the reservoir capacitor C3 to around 250V. This voltage is applied via the meter selection switch SW2 and the meter to the tube's first anodes.

The meter needs to be able to read 1mA f.s.d. Resistor Rx is used to shunt the meter on the milliamperes range if a 1mA meter is not available. Ry is a series resistor to enable the h.t. voltage to be read while Rz enables a battery voltage check to be made.

Precaution

Since the power supply can produce a continuous current of about 30mA at 250V, and as C3 can produce an instantaneous discharge of around 10A and a rather nasty shock, C3 is shorted by R1 when the unit is switched off.

Testing and Use

When you've built the unit, switch on and check that you can hear the oscillator – it's fairly loud. Alter the value of R3 if you find the oscillator's frequency irritating. If the oscillator is running, measure the voltage across C3 – it should be about 250V. Operate the meter range switch and check that the meter reads both the battery and h.t. voltage correctly.

If all is well connect the unit to a good tube and switch on. Select battery and check that the voltage is not less than 5·5V. Switch to h.t. and check that the reading is about 250V. Switch to milliamperes and wait for the tube to warm up. A good tube will give a reading of greater than 200μA, but it's as well to try several different tubes, good and bad, to calibrate the meter.

When using the meter, always check the battery voltage as the tube warms up: a drop of more than 0·5V gives a marked reduction in the tube's emission. The h.t. voltage is not critical, but it's as well to check it just to be sure that the unit is operating correctly.

Alternative Use

The power supply can also be used as a general 250V d.c. source from a 6V battery, the current consumption being about 1A.

Results

The unit gives very reliable results and has proved to be invaluable. At one retailer I visited there were ten Philips G8s I could have purchased: eight were found to have dud tubes and I came away with the only two good sets from the pile!

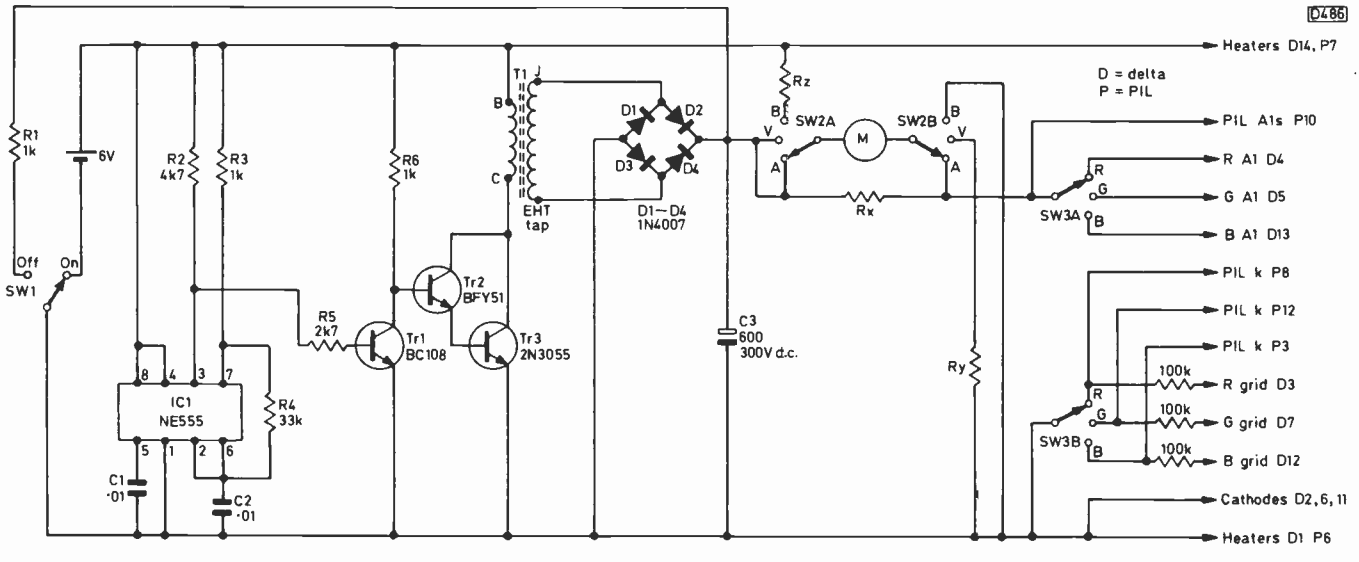

Fig. 1: Circuit of the battery-operated c.r.t. tester. SW2A/B provides meter selection, SW3A delta-gun tube first anode selection and SW3B PIL cathode/delta-gun tube grid selection. The battery is an RS type 591-360.

Servicing the JVC HR7300

David Botto

The JVC HR7300 VCR is a VHS machine that contains some complex circuitry. Increasing numbers are now arriving in our workshop with various problems. The following notes are intended to save you a few headaches by detailing the faults we've encountered so far.

Access

To remove the cabinet top, unscrew and remove the two screws from the cassette lid, then the five screws in the cabinet top. This will enable you to lift the top cover and cassette lid away, revealing the interior. Don't remove the front panel unless this is essential: if you must do so, it's best to remove the bottom panel first – after removing the many screws that hold it in place. To save hours of hunting for lost screws a magnetic screwdriver with interchangeable bits is recommended (obtainable from Halfords, Tandy etc. for less than five pounds).

Power Supply Circuitry

The circuit boards are all identified by letters and numbers. Fig. 1 shows the power supply circuitry, most of which is on the regulator board. The mains a.c. input goes first to connections 1 and 2 of the rear a.c. power panel, then via switch S005, fuse F1 (1·25AT) and the voltage selector to the primary winding of T001. When F1 feels that it's worked overlong it can fail, with the result that the whole machine goes dead. If the fuse hasn't blackened you'll probably find that a replacement will restore normal operation. In this case run the machine for at least four hours before returning it to the customer.

The secondary windings on the mains transformer produce a.c. outputs of 18·3V, 22V and from the tapped winding 34V and 46V. The following circuitry is conventional. An unregulated 22V d.c. supply for heater R001 is provided at connector points 51 and 52. A regulated −26·5V supply is provided at connector 71, regulated 13V and 12·5V supplies being provided at connectors 24 and 82/21/41/31/13 respectively. Connectors 23 and 43 provide unregulated 22V outputs while the regulated 12·5V output at connector 61 is unswitched, i.e. it's taken off prior to contact 1 of relay 1, also F8. This relay (part no. PU51258-2) has a second contact which switches the unregulated 22V outputs at connectors 23/43. Thus d.c. voltages are present at connectors 82/21/41/31/13 and 23/43 only when the relay operates. The unregulated 40V output at connector 83 goes to the tuning voltage supply regulator on the tuner/i.f. panel.

When power switch S208 on the function board is switched to "on" one side of the relay's coil is taken to chassis. As the other end is taken to the "ever" 12·5V supply the relay operates and d.c. supplies appear at 82/21/41/31/13/23/43. The earthy end of the coil is also connected to the collector of transistor Q4 (type 2SD636Q, R or S – the S version is the recommended replacement). Connector 62 links the base of this transistor via connector 52 on the presetter/timer board to pin 26 of the microcomputer chip IC201 (type UPD553C-100). In the automatic timer recording mode pin 26 of this i.c. goes high to switch on Q4, thus operating the relay to initiate a recording. On rare occasions the relay has been known to stick, much to the annoyance of the customer who wanted to record a particular programme. If you can't use S208 to switch off in the manual mode Q4 has probably gone short-circuit.

It's essential that the regulated 12·5V supply is exactly correct. Connect a digital multimeter between connector 21 on the regulator board and chassis and, with S208 switched to "on" and the stop mode selected, adjust R5 for a reading of exactly 12·5V. Check the voltage again after running the machine for half an hour. This may save you problems at some future time.

Power Supply Faults

If the machine on your bench refuses to respond to the commands replay, fast forward, rewind etc., check F8 (1·25AT) before looking for complex faults. This sounds obvious but it's easy to get caught. We've also known fuse F3 (2·5AT) to fail due to power transistor Q2's mica washer breaking down.

The fast and easy way to check the regulator board is first to measure the d.c. output voltages. If one or more are missing, check all the diodes and transistors in the relevant section of the circuit. This takes only minutes using a component tester. Pay particular attention to zener diodes D5 and D14. Examine the small electrolytics carefully, checking that none have dried out – these can also be checked with a component tester (details, June 1984 issue). Don't forget fuse F1 on the rear panel section if T001 doesn't produce any a.c. outputs from its secondary windings.

Function Faults

If the tape stops after about ten or fifteen seconds in the play mode suspect IC3 (HA11711) on the servo board. This board is mounted upright at the extreme left-hand side of the machine (viewed from the front). You may be able to prove the point by alternately heating and freezing IC3. Prerecorded tapes playing o.k. but a nasty juddery jitter on the machine's own recordings can also be caused by IC3.

If the tape refuses to load suspect transistor Q8 (2SD636P, Q or R – the R type is best for replacement) on the servo board: it likes to go short-circuit base to emitter. In fact if you get strange effects from the servo board it's best to make a quick check of the eight transistors on it.

IC4 and IC5 on this board (both type M54519P or IR2403-2), though reliable, can nevertheless cause strange and puzzling effects – such as transistor Q5 (2SB641P, Q or R – the R type being again the recommended replacement) turning on instead of off in the playback mode (this sends incorrect signals to IC3, upsetting its operation). These two i.c.s are easy to check with a logic probe. Each contains seven inverters, so whatever logic conditions (high or low) you find on pins 1 to 7 should be inverted on pins 16 to 10 respectively.

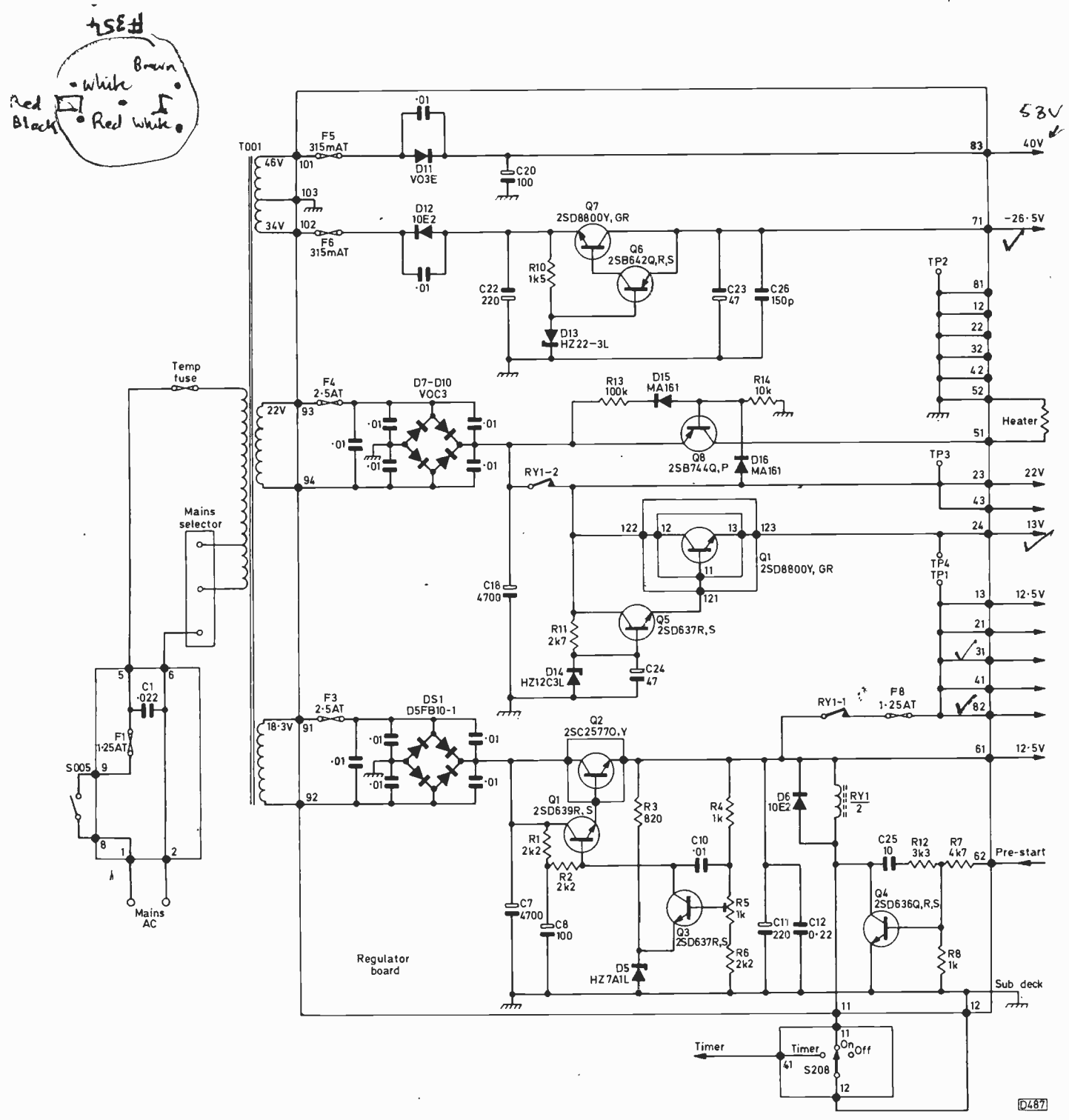

Fig. 1: Power supply circuitry used in the JVC Model HR7300.

The MDA board is mounted upright on the left of the machine next to the servo board. When the drum runs very fast, suspect IC201 (VC1029) on this board. If the capstan motor is slow in the playback mode only (Mk. 2 version) change IC205 (UPC1458C). Loss of capacitance in C213 (10μF, 16V electrolytic) can result in the drum motor running too fast.

Before replacing suspect i.c.s on this board always check the surrounding transistors and examine the print carefully for dry-joints.

If the loading belt (part no. PU48941-2) between the loading motor and the worm gear that drives the loading ring is slack the machine won't load correctly. It's sound policy to replace all the belts at the same time if they show the slightest sign of wear.

Another cause of the cassette tape refusing to load correctly is the unloading switch that lives just below the loading ring. You can usually clean this switch, using just the merest trace of Castrol DWF. Clean the afterloading switch at the same time – it may save you the trouble of having to dismantle the machine after you've just put it all back together.

On rare occasions the main solenoid (part no. PU51254) goes open-circuit. The result is that the tape laces up, with no other tape movement, then the tape unlaces still looped. If you have to replace the solenoid, always check transistors Q6 and Q7 (both type 2SB744P or Q) at the same time.

If the tape laces but the head drum and capstan refuse to turn, check for cracked print at the connectors that link the servo and mechacon panels – check especially around connector 404-410 on the mechacon panel.

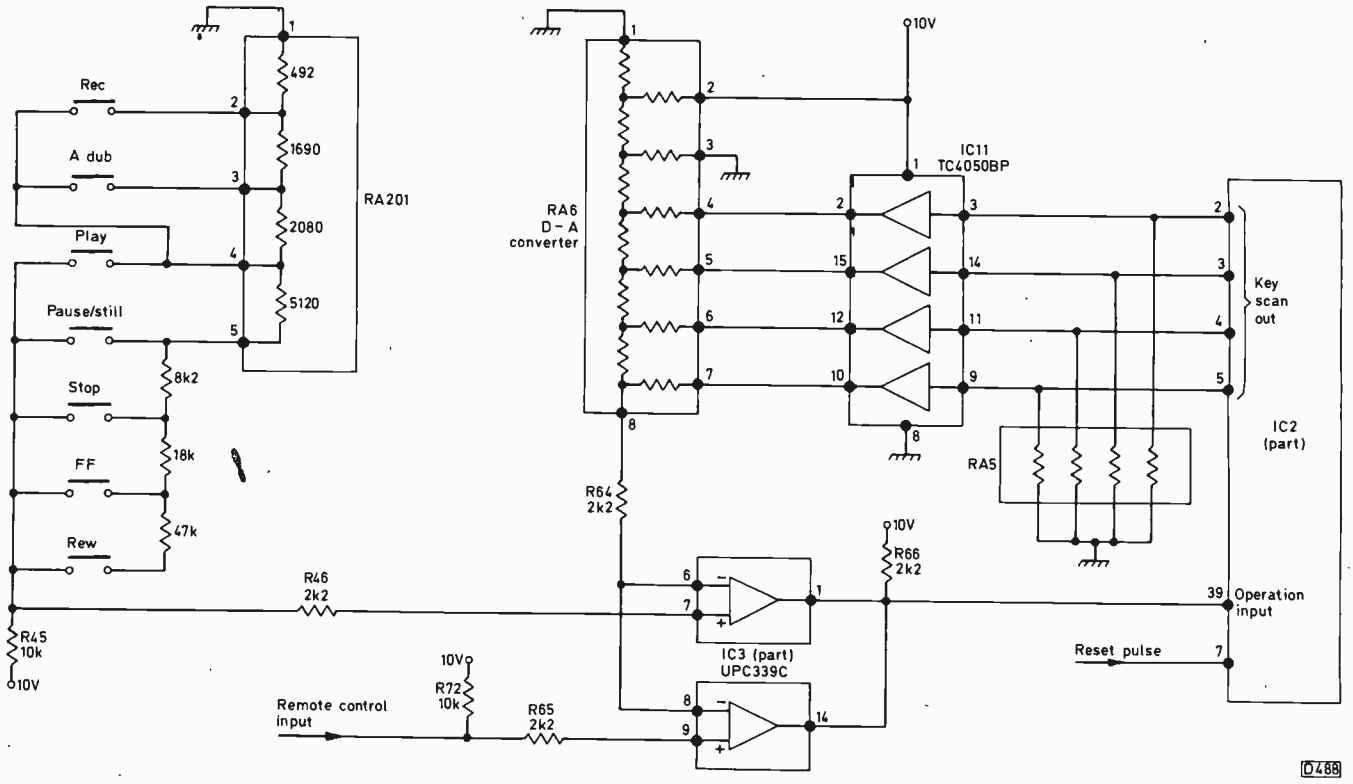

Fig. 2: Simplified circuit showing the arrangement for function selection.

If the rewind light stays on when it shouldn't the start sensor (PN202S phototransistor) may be open-circuit. If the cassette light refuses to light, thus stopping all functions, but the light itself is o.k. you'll probably find that transistor Q1 (2SB643) on the deck terminal board is short-circuit base to emitter. Also check diode D1 (MA150) and capacitor C1 (33μF, 16V electrolytic) on this board.

The main microcomputer control chip IC2 (UPD553C-164) lives on the mechacon board. This i.c. does occasionally cause problems, such as entering the wrong mode when a function is selected or turning on several of the function lights at once. Fig. 2 shows a simplified diagram of function selection. When a function switch is operated the voltage at pin 7 of IC3 (UPC339C) is set at a certain level. At the same time a sixteen step staircase waveform derived from IC2 via IC11 (TC4050BP) and RA6 is fed to pin 6 of IC3. This i.c. acts as a comparator: its output drives pin 39 of the microcomputer chip. Use a logic probe to check around IC2. Table 1 shows some useful logic levels at various pins of this i.c.

Table 1: Easy check logic levels for IC2.

Pin	*Function*	*Logic level*
1	Clock	H+P+L
12	Loading motor power	L
13	Loading motor reverse	H
14	Loading motor forward	H
15	Reel motor FF/rew power	H
16	Pinch solenoid hold	H
17	Pinch solenoid drive	H
18	Main solenoid hold	H
19	Main solenoid drive	H
22	Reel motor forward	H
23	Reel motor reverse	H
24	Reel motor forward	H
25	Reel motor reverse	H
37	25Hz drum FF input	H+P+L
38	10-400Hz reel sensor in	H+P+L
40	Rec safety switch in	L

Logic levels shown are those when the relevant function is active and operating. H+P+L = all LEDs alight.

Pin 40 reads H when the protective tab has been removed from the cassette.

Record/Playback Faults

If the machine plays prerecorded tapes nicely but the machine's own recorded tapes have no or poor video, before replacing IC202 (HA11724) on the video and audio board check the waveform (scope with 10:1 probe) at TP202. If it's missing or reduced check capacitors C221/C222 (both 330pF, 50V wkg).

No playback or record colour with the E-to-E picture normal can be caused by failure of IC401 (AN6360) or to the small electrolytics around IC401 drying out – check the capacitors first and watch out for dry-joints in this area. C414 (0·001μF) or C420 (0·01μF) being leaky can cause colour problems on playback.

If you get "unlocked" or incorrect colour, replace IC403 (AN6371). If this doesn't cure the problem suspect crystal X401: check at TP404 for a reading of 5·060572MHz ± 50Hz.

If the picture looks as if one video head is faulty check C273 (0·015μF) before fitting new heads. This capacitor is connected between pin 5 of IC202 and TP204 on the audio/video board.

Watch out for dry-joints and dried up small electrolytics on this board.

Display Board

Moving now to the display board, if C404 (120pF) or C405 (220pF) start to leak the 400kHz oscillator in IC401

(UPD552C-068) will stop and there will be no clock display drive, i.e. no clock display. Use your logic probe to check for oscillation at pin 1 or 42 of IC401. These two capacitors are both rated at 50V – use replacements rated at a higher working value. C402 (47μF, 16V electrolytic) can lose capacitance, upsetting things in this part of the circuit.

Other things to check on the board are C401 (33μF, 16V electrolytic) which can dry out and upset the reset pulse, and for the usual dry-joints. Also check C406 (100μF, 35V electrolytic). IC401 can fail but rarely does so.

Presetter-timer Board

There's another microcomputer chip on the presetter-timer board, IC201. It's the same basic type as the microcomputer chip on the mechacon panel. They are not identical however – the final three figures are important as they indicate the programming of the internal ROM. IC201 is type UPD553C-100 – be sure you get this number right when replacing the chip or the results obtained will be strange indeed. If everything seems to be inactive, check for clock oscillation at pin 42 of IC201. If the 400kHz signal is absent, check C206 (220pF) and C207 (120pF) before condemning IC201. We've yet to have a crystal fail.

Tuner/i.f. Board

We've not had much trouble with the tuner/i.f. board. Low gain however is sometimes caused by C3 (0·0022μF).

Circuit Varnish

When repairs are complete, use only a very small brush to apply circuit varnish to any joints you've soldered. This will prevent the varnish reaching parts it shouldn't, causing all sorts of nasty problems!

Related Models

In conclusion, the Ferguson equivalent of the HR7300 is the 3V30, though you might find some minor circuit differences. The HR7200 and 3V29 differ from the HR7300/3V30 mainly in having a different clock-timer and the omission of Dolby noise reduction. With the HR7200/3V29 the wired remote control is an optional extra.

Review: DX DSA680 Satellite TV Receiver

Hugh Cocks

I had the opportunity recently to evaluate the latest receiver, Model DSA680, from the DX stable. This Japanese manufacturer is well known for its satellite TV products, being a pioneer in the manufacture of 11GHz low-noise converters (back in the days of OTS-2 and 3m dishes in the centre of the spot beam). Up till now the receivers available from the company have been basically for the SMATV market, i.e. in a much higher price bracket than those intended for the domestic market.

Features

The DSA680 is a lower cost receiver intended for domestic TVRO installations. It measures some 30cm wide by 27cm deep by 6cm high and weighs just over 3kg, so it's physically smaller than a lot of the models at present on the market. Channel selection is by means of eight front-mounted pushbuttons each of which can be tuned to anywhere in the standard 900-1,700MHz range – there's a bank of TV-type thumbwheel potentiometers on the top of the receiver beneath a small flap. A useful feature beside each potentiometer is a video level switch, enabling similar levels to be obtained on each channel (signal levels vary from channel to channel and from satellite to satellite). A video fine tune control is positioned to the right of the pushbuttons: this enables say Filmnet and Screen Sport to be received on the same button with fractional retuning. The on/off switch and a sound tune control are located to the left of the channel selector buttons.

There's a polarisation change switch on the front panel but this is intended to interface with the DX DSW3E switching unit, which switches between the outputs from two LNBs to separate horizontally and vertically polarised signals. The switching unit is operated by a positive/negative voltage at the rear of the receiver. There are no facilities for using a standard polariser that's servo motor driven by a pulse voltage.

There are video and audio outputs on the rear panel, also a baseband output for feeding to a descrambling unit. A standard tunable u.h.f. modulator is used, with an F connector (all DX equipment uses this type of r.f. connector). The 5·5 or 6MHz sound output is switch selected. An external mixer unit (type AD680) is available to enable the TV aerial and receiver outputs to be combined, thus avoiding plug pulling at the TV aerial socket when changing from satellite to terrestrial signals.

Performance

The picture obtained with this receiver is excellent and the sound is crisp. Only minor beat patterns are visible on the Teleclub test card when the high-level unmodulated 5·5MHz subcarrier beats with the 6·5MHz sound signal. This is a severe test for receivers in the lower price bracket – the problems are associated with compromises in the receiver's i.f. bandwidth and the linearity of the demodulator/video amplifier parts of a receiver. The energy dispersal flicker is very well removed from all signals.

Weak signal reception is extremely good, both sound and vision. The low-level Sat-1 sound carriers via Eutelsat-1 came through very well. Having evaluated virtually all the receivers at present on the market I can say that this is one of the best for fringe-area use.

The tuner's i.f. output at 479·5MHz goes via a discrete bandpass filter to the demodulator and processing circuitry. The tuner itself is a standard Mitsumi type. A PLL device is used for audio demodulation. The internal

construction is of good quality, but on the review sample the mains transformer tended to run warm after protracted use.

DX is planning to introduce a remote control version (Model DSA780) shortly. This will not be the same as the remote control receivers DX sell in the USA.

The DSA680 should satisfy the demand for a well-built, reliable and relatively low-cost receiver. It will work with either the DX DSA518 (10·95-11·7GHz) or the DX DSA513S (12·5-12·75GHz – Telecom satellite) LNB – other manufacturers' LNBs can be used with no problems. The receiver is available from Harrison Electronics, Century Way, March, Cambs PE15 8QW who stock DX equipment. The address in Japan is: The DX Trading Co. Ltd., 4th Floor DX Building 2-15, Hamazaki-Dori, Hyogo-Ku Kobe 652, Japan.

Teletopics

ANOTHER REVIEW OF TV

The fact that governments and political parties in the UK never seem to be happy about our broadcasting arrangements seems to prove to this scribe's mind how good the arrangements are. Be that as it may, the government has announced that it will shortly be reviewing the future of TV broadcasting, including cable and satellite services, in the UK. One thought the Peacock Committee had just done precisely that. But the Committee failed to come up with any coherent, practical plans. So the government is to have another go. The Home Office, the Department of Trade and Industry, the Treasury, the Cabinet Office and the Foreign Office (because of satellite TV) have already been involved in interdepartmental meetings. Eventually – some time next year it's suggested – the government will produce its review. It's hard to understand why a perfectly sensible system that works well can't be left alone: maybe it's the thought that technical developments may bring about unplanned changes that causes such concern amongst ministers, or perhaps their advisers.

RTS COMMEMORATES 50 YEARS OF TV

The Royal Television Society is to present a major public audio-visual show this autumn to commemorate 50 years of television broadcasting in the UK. The event will be held at the Commonwealth Institute, Kensington, London and will run for nine weeks. The hour-long programme will use the latest audio-visual techniques including a 30ft video wall from Philips. It will commence with the discovery of television and will then unfold the story of British TV broadcasting from the first regular scheduled transmissions in November 1936 to the present day. There will also be a look at likely future developments. The BBC, Independent Television, Channel 4 and a number of industry organisations have contributed the resources to mount the show. The Royal Television Society has its roots in the earliest developments in TV in the UK, having been founded in 1927.

THORN-DIXONS DEAL

In what is claimed as the largest single order ever placed for UK produced TV sets Dixons have agreed to buy 200,000 TV receivers from Thorn. At retail prices the deal is worth some £50 million. Dixons plan to start selling the sets this autumn under a new brand name – the sets will be stocked by all Dixons outlets including Currys and Power City. As an example of expected prices, Dixons say that a typical 20in. set sold under the new brand name will retail at £199. According to a recent report (The Consumer Electronics Report 1986, £235) from Euromonitor Publications (87-88 Turnmill Street, London EC1M 5QU) the Dixons group at present has around 17 per cent of the UK consumer electronics products market. Taken in conjunction with the announcement earlier this year (see Teletopics, June) that Thorn is to produce 200,000 sets a year for JVC, Thorn's TV plants should be busy in the coming months.

Thorn have announced an agreement with Nihon Electronics Ltd. for the exclusive manufacture of Ferguson colour TV receivers in India. The agreement is valued at some £9 million and includes the exchange of technology together with the supply of components, management and technical consultancy, and the provision of quality assurance. Nihon, together with Orson Electronics, is part of the worldwide Chhabria group of companies: Nihon and Orson manufacture Sony and Orson TV sets and audio products in India. Nihon Electronics is expected to be given an Indian stock market quotation within the next couple of months.

BUSINESS NEWS

Philips has reported increased sales by volume of 7 per cent in the second quarter of its financial year, with net income increased by 18 per cent compared with the corresponding quarter of 1985. Sales in Europe continued to develop favourably, with a very substantial rate of growth achieved in consumer electronics – colour TV sets, VCRs and compact disc players in particular. For the half year the increase in volume sales was 6 per cent. An increase in the number of employees of 6,900 during the first half has mainly been due to the good business in consumer electronics. The group is being held back by conditions in the USA, particularly the depressed semiconductor market there.

The latest Japanese electronics firm to report reduced profits is Sanyo. In the half year to May net profits fell by a massive 60·3 per cent, the first such fall since the firm started to issue consolidated financial statements in 1970. Matsushita and Toshiba have both announced plans to increase output of consumer electronics goods in the USA. The importance of the US market is emphasised by the fact that it took three quarters of the imports of TV receivers to the six main industrial countries last year – a massive 13·5 million sets. The latter figures come from a Market Direction report on television (available from Market Direction, 87-88 Turnmill Street, London EC1M 5QU at £650).

CABLE IMPROVES

Latest figures from the Cable Authority reveal that the number of UK homes taking cable TV services increased from 143,000 to 172,000 during the period April 1st to July 1st. The penetration rate – the proportion of homes connected out of those which have cable services available – rose from 14·5 to 16 per cent. Increased confidence in the prospects for cable TV is emphasised by the fact that Prudential Assurance has decided to invest £500,000 in

the East London cable franchise. The Prudential reports encouraging results from its investment in Clyde Cable (Glasgow) where the penetration rate is about 28 per cent. Financing of the East London franchise has now been completed.

CAMCORDER REPAIRS

Newark Video Centre, 108 London Road, Balderton, Newark, Notts has, in conjunction with JVC, set up facilities to repair JVC GRC1 and GRC2 videomovie camcorders. Newark Video can be reached on 0636 71475.

VIDEO ALARM FROM RADIO RENTALS

Radio Rentals is now selling a simple but effective video alarm suitable for all front and top loading VHS recorders. The video alarm looks and loads like an ordinary video cassette and will send out an 85dB alarm if the machine is moved in any way. To set the alarm a pin is removed before the cassette is inserted, making the alarm childproof. The alarm is available from Radio Rentals showrooms throughout the country at £9·95 complete with batteries.

BINATONE'S MINI TVs

Binatone has entered the small-screen TV market with the launch of three new models, the Colour 5, the Sportable and the Minivision Mk 2. The Colour 5 has a recommended price of £199·99 and in addition to the 5·5in. screen TV section incorporates an MW/v.h.f. radio receiver. The Sportable, at around £59·99, is a lightweight 5in. monochrome set. These two models can be operated from the mains, a car battery or dry batteries. The 4·5in. Minivision monochrome portable operates from the mains or a car battery: the suggested price is around £69·99.

BBC's RADIO DATA SYSTEM

The BBC has announced its intention to start a Radio Data System (RDS) from its v.h.f.-f.m. transmitters in the Autumn of 1987. The RDS system will allow a new generation of receivers to perform a variety of functions automatically, ranging from advanced automatic tuning with a readout of the station name, a clock that's always accurate, instant switching to pick up traffic messages on other channels, automatic switch-on of a preselected programme, to the provision of visual readout details of music being received. The RDS signals to control these functions are broadcast as digital codes in parallel with the main programme: an inaudible 57kHz subcarrier phase-shift-keyed by a 1187·5 bit/s digital data stream carries a variety of information that can be decoded by an RDS receiver. BBC engineers have been working with European colleagues for a number of years to produce a common standard for RDS signals throughout Europe. This has resulted in an EBU technical specification (Document 3244) which is to be submitted to the CCIR for consideration as a world-wide standard. The five functions the BBC will start to transmit next year are as follows:

(1) Programme identification. This helps the receiver to find the chosen service automatically and always selects the strongest signal. Each station is identified by a unique code.

(2) Programme service. A longer code giving up to eight text characters that can be displayed by the set to show the station name.

(3) Alternative frequency list. These codes inform the receiver of other frequencies for each station – frequencies to which the receiver can switch if it finds a stronger signal.

(4) Other network information. Using these codes the receiver can, whilst tuned to one station, monitor information on broadcasts from other stations. This allows for example instant retuning to a different station on which a traffic announcement is due.

(5) Clock time and date. Time and date information that automatically takes account of local variations, e.g. from summer to winter.

Other codes which the BBC may add subsequently include programme type, traffic programme identification, traffic announcement identification, decoder identification, music/speech switch (a receiver could have separate volume controls for music and speech), programme item number, radio text and transparent text channel. The latter option provides a limited data capacity.

BOOKS RECEIVED

The second edition of Steve Beeching's **"Domestic Videocassette Recorders – a Servicing Guide"** has been published by Newnes Technical Books at £15·95. This new edition includes a substantial section listing common faults on a number of popular VCRs.

"Colour and Mono Television, Vol. 3" by K. J. Bohlman has been published by Dickson Price Publishers Ltd., PO Box 88, Gravesend, Kent DA13 9PR at £6·50. This third volume covers colour decoder circuitry, remote control and teletext. The text is clearly written and well illustrated.

"The Best of CQ-TV" has been published by the British Amateur Television Club at £3·50 including post and packing. Available from BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN. It includes numerous projects and much practical information. Boards are available for some of the projects. Highly recommended.

The 16th edition of **"Newnes Radio and Electronics Engineer's Pocket Book"** has been published at £5·50. A compilation of commonly needed data.

A revised edition of the **"Practical Electronics Handbook"** by Ian Sinclair has been published by Newnes Technical Books at £5·95. Practical information ranging from Ohm's Law to the use of linear and digital i.c.s.

The second edition of **"Oscilloscopes – how to use them, how they work"** by Ian Hickman has been published by Newnes Technical Books at £5·50. Provides guidance on how to choose and use an oscilloscope, with clearly presented information on scopes ranging from the simplest to advanced real-time types.

The second edition of **"Op-Amps – their principles and applications"** by J. Brian Dance has been published by Newnes Technical Books at £4·95. Provides practical details on the use of a wide variety of types of operational amplifier.

The **"16-Bit Microprocessor Handbook"** by Trevor Raven has been published by Newnes Technical Books at £9·95. Explains the operation and characteristics of the Intel 8086, Motorola 68000, Zilog 8000 and Texas Instruments 99000 families of microprocessor chips and their applications in computer systems. Appendices include a useful glossary of computer terms.

Note that Newnes Technical Books are now published by William Heinemann Ltd., 10 Upper Grosvenor Street, London W1X 9PA.

Servicing the Ferguson 3787/NordMende 8180

Colin R. Boggis

Large quantities of ex-rental NordMende 8180 14in. colour portables recently became available at trade warehouses. They are extremely well made sets from West Germany, with attractive case styling, and are capable of producing an excellent picture on the in-line gun black matrix tube. The chassis is of modular construction and most of the modules can be plugged into the rear of the main board to facilitate servicing.

The same basic chassis is used in the Ferguson 3787 portable, with a modified control panel. These sets were imported by Thorn as an interim measure before the TX9 chassis went into production. A large number of 3787s are still in use today.

The chassis uses a thyristor line output stage and a thyristor power supply regulating arrangement, plus some novel protection circuits. Note that all circuit reference numbers used in this article relate to the Ferguson 3787. They should in general apply to the NordMende sets as well.

Access

Once the back has been removed the main chassis can be hinged down after releasing the wing nuts at the top of the frame. The modules are grouped vertically at the left- and right-hand sides of the main board, except for the field timebase panel which is mounted horizontally just below the tube's neck. A further two boards are fitted to the case itself: the mains panel is at the bottom of the case while the control panel is to the left of the tube when viewed from the rear.

Power Supply Arrangements

The power supply arrangements used in the set are shown in simplified circuit/block diagram form in Fig. 1. There are four thyristors in all: DU04 with the associated circuitry comprising transistor TU07 etc. provides a soft-start action plus overload protection, DU11 provides regulation, while DA12 and DA14 are the flyback and scan thyristors respectively in the line output stage.

The a.c. mains supply is fed to the degaussing circuit, to bridge rectifier DR02, to DR03 and via the mains transformer to bridge rectifier DR01. DR01 and DR03 are both concerned with the start-up system. DR01 provides a 14V start-up supply (U4) for the line generator circuitry. Once the line timebase gets going DU09 produces a 22V supply (U3) which takes over from the U4 supply via DZ38 – DR01 is then reverse biased. At switch on DR03 begins to charge the h.t. reservoir capacitors CA06/7 via RU05. Thyristor DU04 is at this stage held cut off by TU07.

Slow-start System

Fig. 2 shows the slow-start system. At switch on CA06/07 are discharged so that the emitter of TU07 is effectively at chassis potential. Its base will be at a positive voltage set by the potential divider RU06/7/8. TU07 is thus conductive, shorting the gate and cathode of DU04 so that it cannot be triggered. Once CA06/7 charge to a higher voltage than that at TU07's base TU07 switches off. DR02/DU04 then take over to maintain the charge across CA06/7, DU04 being triggered by pulses from the combi coil. Overload protection is an inherent feature of the circuit since a short across the h.t. supply – DA12 going short-circuit for example – will return TU07's emitter to chassis potential with the result that it switches on while DU04 is switched off. DR03 then takes over as h.t. rectifier and the fusible resistor RU05 goes open-circuit.

Line Output Stage

The basic essentials of the line output stage and regulation circuit, which keeps the width and e.h.t. constant, are shown in Fig. 3. The line output stage itself is the standard thyristor arrangement which has been described in these pages on previous occasions. The scan thyristor DA14 begins to conduct towards the centre of the line: its associated efficiency diode shares a common encapsulation. The flyback thyristor DA12, again with a parallel diode in a common encapsulation, is switched on just before the flyback, producing a current pulse (in conjunction with the output stage tuning components) that switches off DA14 to produce the actual flyback. When DA12 switches off the T-network capacitors CU21-23 begin to charge via the combi coil. The rising waveform thus developed in the secondary winding eventually switches DA14 on again via CA15 etc.

Regulation System

The regulation circuit has been described as a reverse current regulator, which is an apt term. Basically the idea is to return excess energy developed in the line output stage to the h.t. reservoir capacitors via thyristor DU11. During normal operation of the line timebase positive-going pulses are developed at the junction of RU13 and the combi coil's primary winding. These pulses exceed in amplitude the voltage across CA06/7, reverse biasing DU12. Regulation is effected by switching DU11 on during the latter part of the line scan, prior to the flyback. DU11 thus connects CA06/7 across the line timebase, providing a damping action and at the same time topping up the charge held by CA06/7. We need to be able to vary the time at which DU11 is switched on during the line scan in order to make the regulation effective: this is done by the circuitry shown on the right-hand side of the line output transformer in Fig. 3.

The pulses developed at pin 11 of the line output transformer are clipped by DZ08 and integrated by RZ09 and CZ18 to produce a sawtooth waveform which is fed to the base of TZ03 via CZ17 and DZ22. The pulses developed at pin 12 are rectified by DZ10 which thus produces a voltage proportional to the amplitude of the flyback pulses across CZ10. This voltage is applied to the base of TZ03 via the set-e.h.t. control RZ13, DZ16 and DZ22. It sets the point during the sawtooth when TZ03 switches on. TZ03 drives TZ04 which in turn switches on DU11. If the pulse voltages developed in the line output

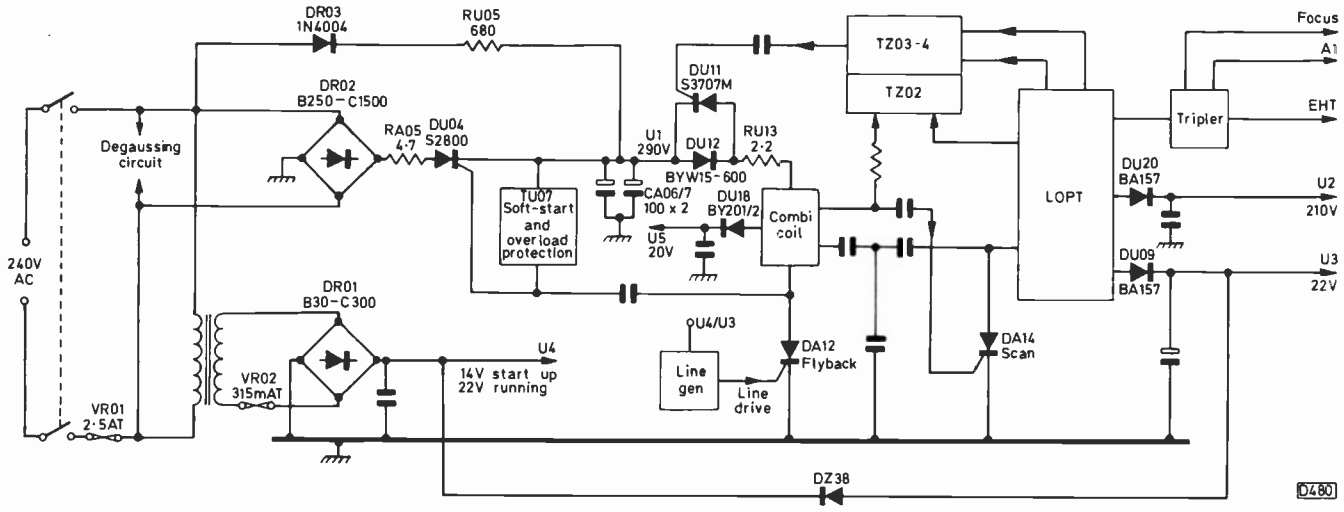

Fig. 1: Simplified circuit/block diagram showing the power supply arrangements.

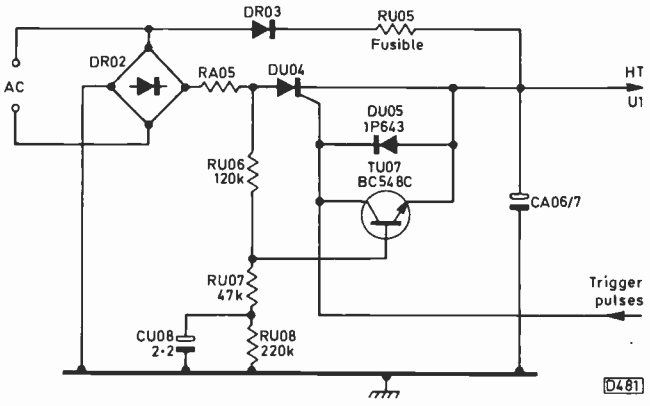

Fig. 2: The slow-start/shutdown circuit.

stage rise in amplitude TZ03, TZ04 and DU11 turn on at an earlier stage during the scanning cycle, thus increasing the damping across the line timebase to restore correct conditions.

Protection against excessive line output stage loading is built into this circuit. Under normal conditions the voltage across CA18, potted down by RZ26/7, holds TZ02 conductive. As a result the lower end of RZ25 is connected to chassis and the pulses from the combi coil via RA13 and RZ22 are shorted out. When an excessive load reduces the voltage across CA18 sufficiently TZ02 switches off. The pulses from the combi coil now switch TZ03 on at an earlier point in the line scan cycle, increasing the damping on the stage via DU11 and CA06/07.

Note that in later versions DU11/12 share a common encapsulation.

Line Oscillator

The line oscillator is a TDA2590 chip (IZ01). This drives the flyback thyristor via an emitter-follower (TZ06, BC337). The drive is removed when the scan coil plug is disconnected.

Yet another protection circuit is used in the line generator stage. Excessive beam current, due for example to a short-circuit tripler, is sensed across RA25 (see Fig. 4). An excessive beam current rise triggers a bistable multivibrator (TZ07/8) on the horizontal generator board. As a result the voltage at pin 4 of the TDA2590 line oscillator chip falls from 11V to 6V and its line drive

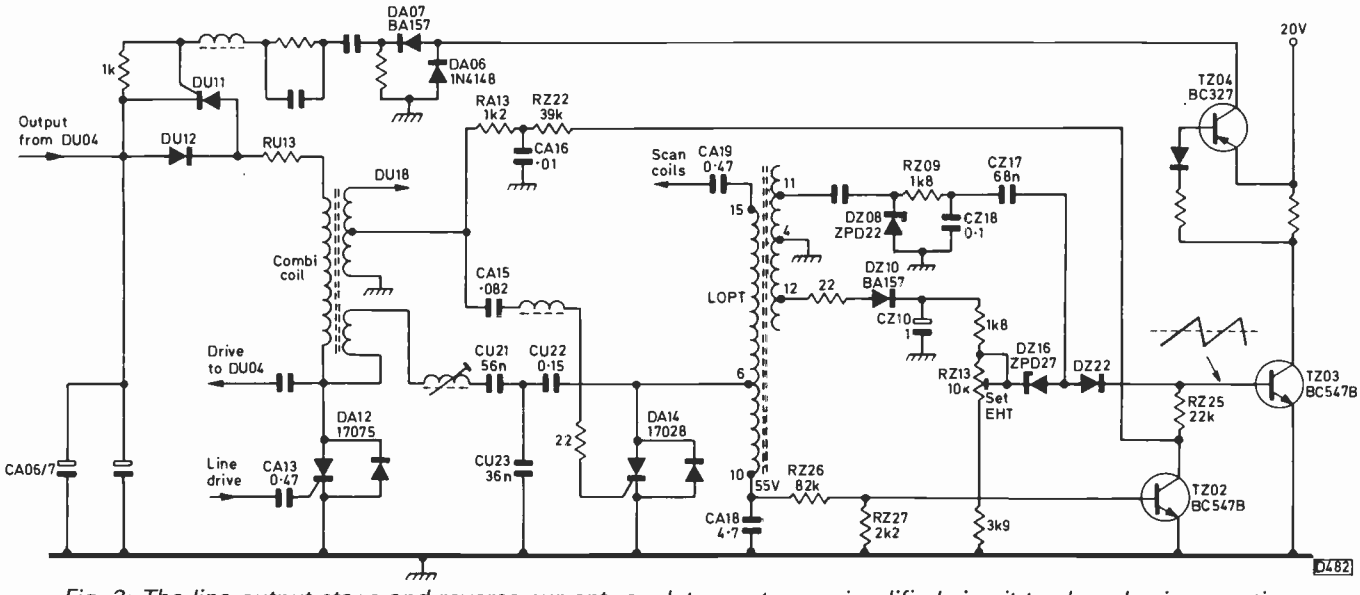

Fig. 3: The line output stage and reverse current regulator system – simplified circuit to show basic operation.

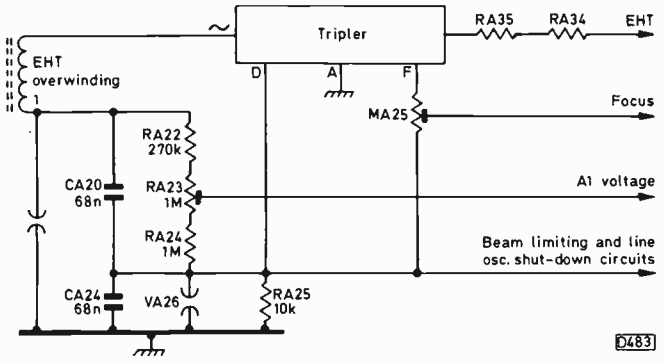

Fig. 4: The e.h.t./focus/A1 voltage supply circuit.

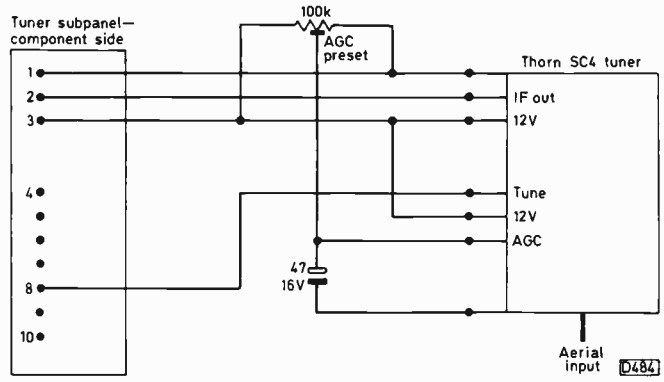

Fig. 5: How to use a Thorn SC4 u.h.f. only tuner as a replacement for the original v.h.f./u.h.f. tuner.

output is removed. The bistable circuit can be reset only by switching the set off and on again. If the fault condition remains the set will continue to trip.

Beam Limiting

The voltage across RA25 is also used to provide beam limiting on the decoder panel. The beam limiting action is applied to pins 11 and 16 of the TDA2560 luminance/chroma amplifier/control chip IG01 via transistor TG03 (BC558B).

Fault Finding

A common cause of trouble in these sets is faulty thyristors in the line output stage. They can give the no results symptom, can be responsible for failure of the TDA1170 field timebase chip, and can also produce the e.h.t. but no raster symptom. They should be changed as a pair. The universal types 15/80H (scan) and 15/85R (flyback) have proved to be highly reliable. They can be obtained from Economic Devices, Willow Vale, Peco and other suppliers.

Capacitor CA24 (see Fig. 4) tends to go short-circuit, perhaps as a result of a flashover. Once this occurs the beam limiter circuit is disabled and high currents can be drawn. These can damage the line output stage thyristors: it's worth changing them both when you find that CA24 is short-circuit. In addition it's as well to replace CA13, CA15 and CA16 when this sort of trouble is experienced. Also check the diodes between CA24/RA25 and the line oscillator shutdown circuit, i.e. DZ92 (ZPD12), DZ89 and DZ90 (both 1N4148). A short across VA26 produces similar effects of course.

Repeated flashovers across VA26, coupled with no field scan (more about this later), are most likely to be caused by a fault in thyristor DU11 or diodes DA07 and/or DA06 in its gate circuit. If excess energy can't be returned to CA06/7 the voltage across CA24 builds up until it can jump across VA26. It seems likely that the chain of events associated with CA24 going short-circuit goes something like this: DU11 fails, giving rise to repeated flashovers across VA26; CA24 breaks down; the beam current is no longer clamped and the line output stage thyristors suffer. Just why the many protection circuits don't stop this sequence isn't clear. Maybe you just can't halt the inevitable. A 15/85R can be used to replace DU11 – don't forget to remove DU12 when doing this.

Whilst the tripler used in these sets seems to be reliable and troublefree, a very common problem is loss of the top half of the line output transformer's core! For some reason our German cousins decided that a clamp around the core was unnecessary – they put their faith in glue. This faith was misplaced however and it's quite common to find the half core laying at the bottom of the cabinet. The result will be low voltages from the line output transformer. You can either stick the core back with Superglue or clamp it with a piece of heavy wire fed round the core and soldered to the PCB at each side – they even provide you with the holes to do this! Don't forget to ensure that the mica gap spacers are still in place (they are usually stuck to the core ends).

The set-e.h.t. control RZ13 should be adjusted whenever repairs have been carried out in the line output stage – for 55V across CA18.

If you find that the fusible resistor RU05 is open-circuit, check for shorts across the h.t. rail (e.g. DA12 short-circuit); also check RA05 which could be open-circuit. If the set appears to be suffering from a case of severe hiccups, that is very fast on/off tripping, and RU05 feels very hot but hasn't gone open-circuit, RA05 is probably open-circuit but there's not a full short-circuit across the h.t. supply.

DU04 and DU05 are worth checking in the event of the no results symptom.

The signals circuits follow conventional practice and don't give much trouble. A fairly uncommon chip (TDA1037) is used in the audio section however. It's inclined to go open-circuit. Replacements can be obtained from Economic Devices.

The field timebase consists of a TDA1170 chip and its peripheral components. It takes its supply from the U3 rail. This i.c. seems to be particularly sensitive to the voltage spikes that occur during a flashover. In every set we've had where there's been vigorous cracking over the TDA1170 has always been dead. If the set you're servicing is flashing over don't fit the field module until you've cleared the fault. To provide a load on the U3 rail, fit a 100Ω, 7W resistor between pin 5 of the module plug and chassis. Keep the brightness and contrast turned down whilst there's no field scan.

Improved field timebase chip protection can be provided by fitting a 15W, 24V zener diode across the chip's supply and adding a 2·2Ω, 0·25W resistor in series with the supply. In the event of a flashover the zener diode will conduct, protecting the i.c., while continuous flashover will burn out the resistor instead of the chip.

An item that causes troubles such as intermittent failure to start or random cutting out is the earthing strip that runs from the top to the bottom of the main panel, to the left of the tube base. It's prone to becoming dry-jointed. Check its connections to the print and, as a precaution, add a wire link between the chassis metal and the earth

print in the vicinity of the junction of DA06/CA02 towards the bottom of the panel.

Tuning

The tuner panel is held by a wing nut which must be released before the panel can be pulled out. The tuner itself is a v.h.f./u.h.f. type with integral band switching controlled by a d.c. bias voltage. If the tuner is faulty a u.h.f. only type such as the Mullard ELC1043 or the similar Thorn SC4 can be used as a replacement. Fig. 5 shows how the SC4 can be used.

There's no a.f.c. circuitry in the receiver, but the stability of the original tuner and the suggested replacements is sufficiently good. It's very important however that the tuning potentiometers (and the selector switches in the case of the NordMende 8180) are not dirty or noisy.

Tuning drift can be caused by the 33V tuning voltage stabiliser DD01 (TAA550A) which is mounted on the i.f. panel.

Spares

Spares and service data for NordMende sets are available from Hayden Laboratories Ltd., Hayden House, Chiltern Hill, Chalfont St. Peter, Gerrards Cross, Bucks SL9 9UG. As a general policy they supply only NordMende dealers. As far as Thorn are concerned the chassis is now regarded as obsolete and spares are no longer available. Line output transformers can be obtained from Quick Save TV Spares, The Coach House, Muxton Lane, Telford, Salop while suitable thyristors are available from Economic Devices, Willow Vale and Peco.

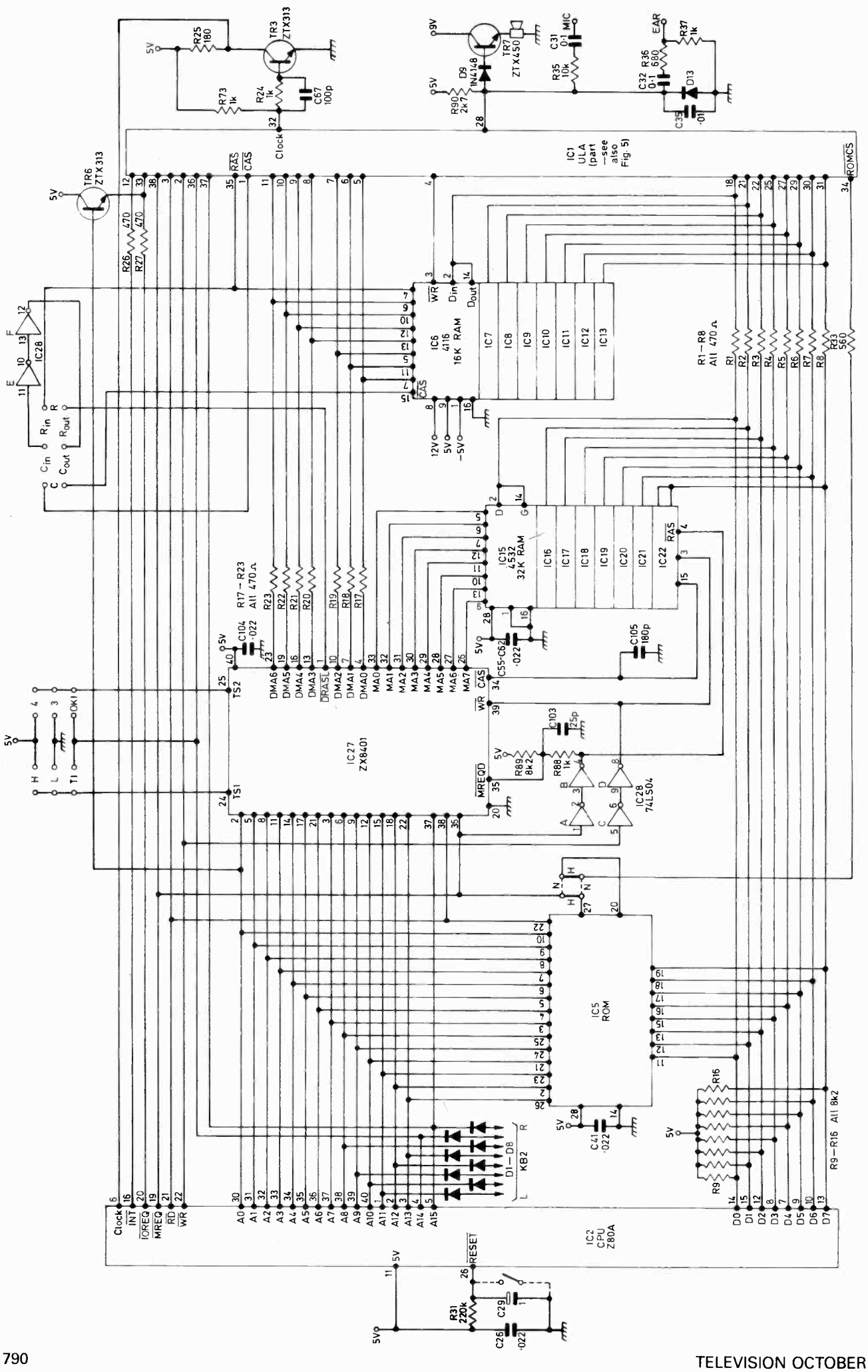

Fig. 12: Computing circuitry used in the issue 6 version of the Sinclair Spectrum microcomputer. Pins 7/11/5/13/12/10/6 of IC6 are connected to chassis via 1k resistors (R50-56). All diodes are type 1N4148.

Servicing Sinclair Microcomputers

Part 6

Ken Taylor

Previous instalments in this series have dealt with versions of the Spectrum up to and including the 3B. Development continued, and issues 4A, 4B, 5 and 6A subsequently appeared. With each new version the board varies somewhat from the previous one. The differences with the later versions are highlighted below. We'll deal with the voltage generator section separately because although the basic design remained the same there were a number of modifications.

The Later Spectrums

The issue 4A and 4B boards are similar to the 3B, the main exception being the use of a 6C001-7 ULA chip. This necessitated a timing modification. The two spare nand gates in IC24 are connected in series (to maintain the correct polarity) and replace R32 in the $\overline{RAS}$ line to IC3 and IC4 (see Fig. 1 part 3). Replacement ULAs must be of the −7 or later type.

A major change was introduced with the issue 5 board. The six decoder/multiplexer chips IC3, IC4, IC23. IC24, IC25 and IC26 were replaced with a Mullard ULA type ZX8401. But something seems to have gone wrong somewhere because the two gates are still needed in the $\overline{RAS}$ line and the new circuit requires an additional four. A 74LS04 hex inverter chip (IC28) provides the six inverters required. Although these changes greatly altered the appearance of the board the basic circuitry hasn't changed very much and servicing shouldn't be affected.

The issue 6 version is very similar to the issue 5, but there's now an alternative supplier of the main ULA (IC1) – Saga joins Ferranti. Certain component changes go with this (see Table 4). Fig. 12 shows the computing circuitry used in the issue 6 version – refer to Fig. 5 for the rest of the circuit. Note that for clarity some supply line decouplers have been omitted, also the connections to the edge connector (refer to Table 3 for these).

The Voltage Generator Circuit

Throughout the development of the Spectrum the circuit that's been most subject to change has been the voltage generator. The issue 3/3B version shown in Fig. 4 had already been substantially modified from the issue 1 version. The item that's seen most alteration has been R60, whose value has gone up and down in an almost random manner. Some of the changes are more logical. For example the introduction of the 22μF capacitor (C80) in the 12V supply: this isolates the 9-11V input from the output when there's an oscillator fault. It seems that each time the board was changed this circuit was subject to modification whether or not it improved the performance.

In the hope that they got it right by this stage the issue 6 circuit is shown in Fig. 13 (lucky for some?). If you are making any changes I would recommend that you use the values shown here, though if you compare this circuit with Fig. 3 you'll see that they differ in only a few respects. In any case, when TR4 has blown the minimum alteration I'd advise would be to change R60 to 220Ω and to fit C80 and D17 if these are not already present. Any other changes are up to you.

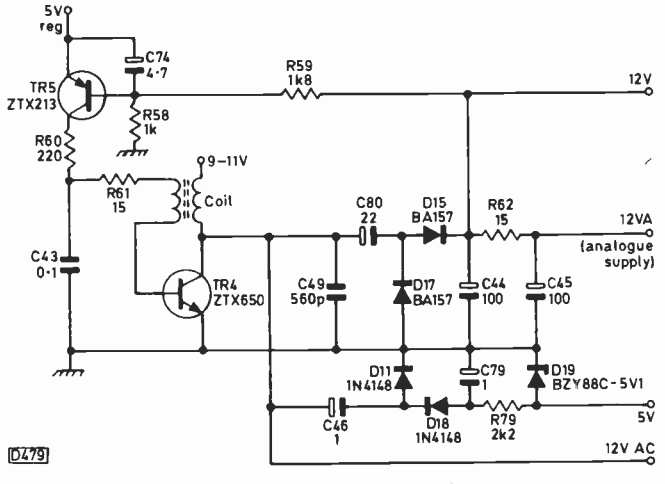

Fig. 13: The issue 6 voltage generator circuit.

Correction

Note that the EAR socket circuit was shown incorrectly in Fig. 5. It should be as shown in Fig. 12 in all versions.

Alternative Components

Instructions for fitting alternative ROM and ULA chips have been given in earlier instalments. RAM chip replacements have also been dealt with. It's recommended that all replacement ceramic capacitors are of the axial type – if you can get them. Here's a list of alternatives to the E-line transistors (you may find that some are more obscure than the originals):

Table 4: Component changes when alternative ULAs are fitted to issue 6 boards.

Component	*Saga ULA*	*Ferranti ULA*
C30	Delete	22nF
C32	220nF	100nF
C35	100nF	10nF
C52/3	Delete	150pF
C67	Delete	100pF
C68-71	Delete	100nF
C76	Delete	22nF
R33	560Ω	680Ω
R34	Delete	15Ω
R48	Zero ohms	2k2
R49	Delete	10k
R50	Delete	4k7
R51	1k2	2k2
R56	Delete	1k
R63	Delete	1k
R65-67	Delete	10k
R68	Delete	6k8
R69	Delete	10k
R73	Delete	1k
R74-5	Delete	10k
R76-7	Delete	1k

Refer to Figs. 1, 5 and 12 as necessary.

VCR Clinic

Reports from Derek Snelling, Keith Hamer, Garry Smith, M.S. Barakat, Roger Burchett, Mick Dutton, R.S. Narwan, Philip Blundell, Eng. Tech. and J.R. Cutts

Mitsubishi HS304

This machine wouldn't switch off, at least not properly. In the off position the tape functions wouldn't work but the cassette light stayed on if a cassette was inserted and the channel lights remained on – in fact normal E-E was possible. Everything worked normally in the on position. Clearly not all the power supplies were being switched off. The off signal from the operate switch was correct and was reaching the power supply, also the two switching transistors Q906/7 were working normally. But whilst the collector of Q907 went up and down with operation of the on/off switch the TU 12V regulator transistor Q905's base voltage was almost steady. The question was, where was the voltage coming from in the off position? The resistors connected to Q904 in Q905's base circuit checked out o.k., but replacing R908 and R910 cured the problem. One of them was obviously going low under load. **D.S.**

Philips/Finlux VR1010

The complaint with this recently installed machine was jumping on all tapes. When I got there the cause was obvious: the head switching appeared to be taking place about a third of the way up the picture. Not having much experience of this type of machine I didn't fancy fault tracing in the field, but relying on the fact that most failures with newly installed VCRs are due to sillys such as dry-joints or disconnected springs I took the top off and had a look around. Whilst examining the rear board I moved a wire and one end of R3012 fell out (we all get lucky breaks sometimes). A quick check showed that it hadn't been inserted properly in the first place – refitting it cured the problem. A look at the manual when I got back to the workshop revealed that this resistor is connected to the wiper of the "position adjustment" potentiometer R3016. **D.S.**

Philips/Finlux VCRs

The problem with this machine was a dirty head. These machines are of Philips manufacture and the symptoms are a bit different from what you normally get. If you play back a blank section of tape you don't get snow on the screen as you do with other VHS machines. You get a series of vertical black and white stripes. With a dirty head you get the same effect with the picture in the background. On this particular machine the dirt wasn't too bad and affected only the top half of the picture, i.e. the effect of the dirty heads was what appeared to be a normal picture with dark vertical striations across the top half. **D.S.**

Ferguson 3V29/3V30

A problem we've had from time to time after transporting these machines is failure to operate – as if the bulb had gone. What happens is that the white nylon shaft which operates the switch falls out. On one side of this shaft there's a small pip that locates in a slot in the mounting hole. The shaft is put in the hole then rotated through 180° to lock it in place. It it's rotated through 90° it can be locked in the down position for test purposes. What happens is that the shaft at some point gets twisted to the unlocked position, where it will work quite happily until the VCR is moved – movement shakes the shaft out. **D.S.**

Electronic VCRs

On any of the electronic type of VCRs if fast forward and rewind are o.k. but the machine switches off a few seconds after play has been selected check whether the pinch roller engages. If not the loading belt(s) are probably stretched. I've had this fault on the following models: Ferguson 3V29/30, Hitachi VT11 and VT8000 series, and the Panasonic NV2000 and NV7000. **D.S.**

Panasonic Aerial Amplifiers

I feel I must disagree with David Botto when he says in his article on servicing the Panasonic NV7000 that it's not worth repairing the booster unit. This was true when the machine was under guarantee. Out of guarantee there's a great deal to be said for repairing it. I've serviced over a dozen of these units and in every case replacing Q1, Q2 and Q3 cured the fault. This takes less than a quarter of an hour and costs less than £2 – a new booster costs nearly £20. **D.S.**

Panasonic NV370

The fault on this two-day old machine appeared to be a duff on/off switch. Pressing the button brought the VCR into action intermittently, but it couldn't be latched. When the front escutcheon was removed we discovered that the plastic on/off button wasn't pressing the switch in far enough. We confidently repositioned the switch slightly and refitted the front escutcheon. The switch now functioned correctly but during a test the machine would go dead intermittently, with the LED "on" and the tape counter indicators being extinguished for a fraction of a second. Clearly much of the original complaint was still present! A check around the power supply showed that the voltages were constantly varying by 1V or so, even when the machine appeared to be working correctly. The problem was eventually traced to the 3·9V zener diode D1002 in the regulator circuit. Unlike a lot of intermittent faults, the symptoms returned when the offending component was refitted. **K.H.-G.S.**

Panasonic NV370

There were no functions and no display with this machine. On checking we found that the −30V line was missing. Replacing Q1102, the 30V zener diode D1109 and the safety resistor R1102 restored the functions but the mode display didn't work correctly – all functions were shown as on irrespective of the operation. Replacing Q6501 and I6501 cleared this final fault. **M.S.B.**

Hitachi VT11

This machine loaded and ran for ten seconds then unloaded. The idler and captain were working normally. During the ten seconds when the machine operated the picture and sound were muted.

On checking the bottom of the machine I found that the loading motor was still running during the ten seconds of operation. By manually turning the loading gears the machine's mode switch slid forward and the machine worked normally. The problem is that the idler wears out quickly and the tolerance is restricted – less than 2-3mm thickness before it ceases to operate. The idler will function normally for a much longer period if the upper edge stop lip is filed down. **M.S.B.**

Hitachi VT33

Somehow or other the owner of this scruffy machine had managed to get the loading gears out of alignment. The cassette housing went down but would come up three seconds later. Also the function lights worked but no function could be initiated. A phone call to Hitachi produced the information that if I linked pins 1 and 4 of PG922 and removed the carriage the machine would work without a cassette. It did too, though the idler had to be replaced first. To realign the gears is fiddly but not difficult. Unfortunately the procedure is not shown in the manual. Basically you align the arrows on the cogs with the housing up. Perhaps someone could provide a diagram that could be included in the magazine? **R.B.**

Finlux VR1010

This machine had lost its tuning memory and wouldn't retune. The cause was a faulty PCD8571 memory chip. **P.B.**

ITT VR3916

The hot weather brought a plague of these machines that wouldn't record the sound or erase the colour. The fault was intermittent of course. Removing the plug from the top of the erase head and soldering the wires directly to the pins seems to have put an end to the trouble. **P.B.**

Sharp VC9700

The trouble with this machine was that the capstan and drum servos would intermittently begin to wow in the play mode – they didn't in search. The machine had been in recently for the usual failure to record the sound modification, and as the controls on the stand-up board are rather vulnerable I began by checking that none of them had been knocked. R745 set up o.k. in the E-E mode but the signal (TP707) was then off lock in play. The multivibrator should be locked to the PB 50Hz in playback but wasn't. The trouble was that Q710 was open-circuit. **P.B.**

Hitachi VT8300

This machine wouldn't complete its loading cycle: it would start to lace up normally but not go far enought to engage the pinch roller. When the top was removed we found that there was sand in the machine. This appeared to have got inside the loading gear, causing it to be very stiff. The sub-deck had to be stripped down to component parts and everything cleaned individually before the machine would load properly. It turned out that the customer had a large dog which would come into the house after a swim in the sea, shaking itself out over the VCR which lived on the floor.

Other faults we've had on this model include lack of signals in the E-E mode due to poor soldered joints to the earthing lugs within the i.f. module, and a semi-dead machine with no output from the PB 9V transistor Q942 due to R987 (1kΩ) being open-circuit. **M.D.**

Ferguson 3V29

Sound slow and a picture with no line lock was the complaint. It seemed that both the capstan and the head servos were faulty. We started checking around the servo panel and discovered that all the voltages were haywire. The supply rail input was then found to be 16V instead of 12V. This was due to the regulator transistor being short-circuit collector to emitter. Fortunately there was no other damage. **M.D.**

Sharp VC7300

It took us a week to find the cause of this fault. In the fault condition all the auxiliary motors were pulsing, but the machine would work for hours on end before the fault would appear. At last we were able to trace the cause of the trouble to a faulty 2SC1212A regulator transistor in the power supply. Fitting a BD139 with a large heatsink cured the problem. **J.R.C.**

Ferguson 3V36

The complaint with this machine was no colour. Scope checks at the pins of the HA11741 colour processing chip IC401 revealed that there was no signal at pin 16 – a 4·43MHz signal from the external oscillator block XB401 should be present here. A replacement crystal block restored the colour. **R.S.N.**

Panasonic NV333

A common fault with these machines is no eject damping – the gear teeth inside the damper unit break. Replacing the unit provides a cure. **R.S.N.**

Panasonic NV333

There was no colour – and the monochrome picture was poor. A quick check on the chroma signal path was carried out and I then noticed that the power supply had been worked on. So I decided to check the l.t. rails. The 5V line was 1V down and couldn't be set up with R1003. A check on the previous work revealed that the 0·39Ω 0·25W fusible resistor R1001 had been replaced with a 39Ω resistor. Much time had been wasted on this machine! **R.S.N.**

Panasonic NV730

No rewind or fast forward on one of these machines was traced to the reel power transistor Q1504. **R.S.N.**

Philips VR6460

The problem with this machine was low gain on the monitor and E-E paths. The 12V supplies were checked and found to be present so a new aerial amplifier/modulator unit was ordered. Fitting this cured the problem. The three transistors inside the original unit all measured o.k. **R.S.N.**

ECONOMIC DEVICES, PO BOX 228, TELFORD TF2 8QP

15/80H	3.30	2SA940	1.81	2SC535	0.79	AF180	0.55	BA656	8.99	BC560C	0.14	BDX63A	1.96	BFY52	0.27	BYX71-350	0.72
15/85R	3.30	2SA940-2	2.14	2SC536	0.41	AF181	0.53	BA7100	10.85	BC635	0.36	BDY20	1.21	BFY79	0.49	BYX94	0.14
16039	0.79	2SA950	0.72	2SC537	0.54	AF186	0.53	BA841A	16.72	BC636	0.42	BDY81	1.18	BFY90	0.61	BYY56	1.20
16181	1.04	2SA951	1.26	2SC605L	1.16	AF239	0.43	BA843	3.96	BC637	0.24	BF115	0.40	BLY49	2.20	BZY93C30	1.86
16182	1.04	2SA966-Y	1.16	2SC620	1.46	AF279	0.88	BA854	5.76	BC639	0.20	BF117	0.66	BR00	0.22	BZY88 RANGE	0.10
16334	0.98	2SA999	1.36	2SC643A	1.54	AL113	1.36	BAV18	0.21	BC640	0.24	BF118	0.67	BR01	0.75	BZX61 RANGE	0.18
16335	0.94	2SB774	1.15	2SC668	0.67	AN115	3.98	BAV19	0.11	BC879	0.39	BF121	0.25	BR03	0.75	BZX79 RANGE	0.10
16446	0.98	2SB185	1.13	2SC681	4.40	AN155	1.89	BAV20	0.31	BC880	0.31	BF123	0.21	BR03	1.26	C106D	0.46
16600	1.38	2SB375	3.87	2SC682	1.88	AN206	2.58	BAV21	0.34	BCX34	0.40	BF127	0.13	BRC116	0.67	C106M	0.76
16802	1.27	2SB400	0.40	2SC684	1.65	AN208	3.55	BAW62	0.19	BCY70	0.30	BF137	0.29	BRC300	2.01	C1129	0.58
17052	5.61	2SB405	1.03	2SC693	0.63	AN210	2.28	BAX12	0.44	BCY71	0.21	BF153	0.58	BRC5296	0.77	CA3046	2.06
17053	5.61	2SB407	3.24	2SC710	0.69	AN211	3.25	BAX13	0.11	BCY72	0.20	BF154	0.26	BRC6109	0.83	CA3089	0.83
17074	9.30	2SB449B	6.98	2SC711A	0.50	AN214Q	2.75	BAX16	0.11	BD115	0.46	BF157	0.33	BRC82	1.08	CA3090AQ	3.25
17089	5.35	2SB511	2.50	2SC717	1.28	AN231	14.65	BC107	0.13	BD116	0.70	BF158	0.18	BRC83	2.19	CA3094	2.20
17127	3.51	2SB54	1.39	2SC734	1.43	AN234	5.92	BC107A	0.11	BD124	1.31	BF159	0.18	BRC84	2.08	CA3131EM	3.12
17376	1.58	2SB546	3.75	2SC761-Y	0.95	AN236	3.78	BC107B	0.18	BD124P+KIT	0.69	BF160	0.31	BRX44	0.60	CBF16848N-071	1.56
17523	1.32	2SB56	2.80	2SC783	3.98	AN239	6.95	BC108	0.15	BD131	0.42	BF167	0.38	BRX49	0.53	CD4001	0.38
17524	1.32	2SB618A	2.22	2SC790Y	1.64	AN240P	1.52	BC108B	0.15	BD132	0.42	BF173	0.34	BRY39	0.69	CD4002	0.27
1N4001	0.06	2SB631	3.25	2SC828	0.28	AN241	1.71	BC109	0.12	BD133	0.53	BF177	0.35	BSS38	0.87	CD4008	1.35
1N4002	0.06	2SB643	0.61	2SC867A	3.05	AN245	4.49	BC109B	0.15	BD135	0.36	BF178	0.40	BSTB0140G	5.25	CD4011	0.29
1N4003	0.06	2SB669	3.67	2SC876	0.96	AN253	2.97	BC109C	0.12	BD136	0.26	BF179	0.36	BSTC0246	7.25	CD4012	0.24
1N4004	0.06	2SB681	3.96	2SC930	0.54	AN260	3.85	BC113	0.14	BD137	0.36	BF180	0.36	BSTC0233	7.25	CD4013	0.47
1N4005	0.08	2SB695	1.98	2SC935	4.13	AN262	1.98	BC119	0.36	BD138	0.46	BF181	0.32	BSTCC0143	3.07	CD4016	0.46
1N4006	0.08	2SB75	1.04	2SC936	8.66	AN272	7.92	BC126	0.23	BD139	0.34	BF182	0.34	BSTD1043	2.85	CD4017	0.82
1N4007	0.07	2SB774	0.72	2SC940	4.68	AN281	6.65	BC132	0.14	BD140	0.37	BF183	0.39	BSV57B	3.49	CD4020	1.23
1N4148	0.04	2SB819	0.89	2SD1128	2.90	AN295	5.52	BC135	0.14	BD144	1.70	BF184	0.43	BSW68	0.60	CD4021	0.39
1N4448	0.05	2SC1034	6.75	2SD1138	1.07	AN301	5.55	BC137	0.18	BD150	1.25	BF185	0.39	BSX19	1.29	CD4023	0.28
1N5401	0.14	2SC1050	5.06	2SD1273	1.25	AN302	3.99	BC138	0.34	BD157	0.67	BF194	0.14	BSX20	0.34	CD4025	0.64
1N5402	0.15	2SC1096	1.16	2SD1453	0.75	AN303	4.39	BC139	0.28	BD160	1.60	BF195	0.14	BSY52	0.50	CD4028	0.84
1N5403	0.16	2SC1104	3.98	2SD152K	2.64	AN305	9.47	BC140	0.45	BD163	0.71	BF196	0.17	BSY79	0.51	CD4040B	0.85
1N5404	0.15	2SC1106	4.54	2SD198	3.87	AN315	2.46	BC141	0.34	BD165	0.62	BF197	0.16	BT100A	1.61	CD4047	1.06
1N5408	0.35	2SC1114	6.75	2SD234	0.49	AN316	5.53	BC142	0.34	BD166	0.42	BF198	0.17	BT106	1.55	CD4049	0.46
1N914	0.04	2SC1116	4.95	2SD235	0.60	AN318	6.27	BC143	0.33	BD168	0.73	BF199	0.17	BT108	1.45	CD4052	0.75
IR3403	5.00	2SC1124	1.26	2SD24	2.29	AN320	5.47	BC147	0.08	BD175	0.60	BF200	0.37	BT119	1.76	CD4066	0.38
1S1555	0.20	2SC1129	0.34	2SD257	2.94	AN321	2.25	BC148A	0.10	BD179	0.49	BF218	0.36	BT120	2.17	CD4069	0.29
1S44	0.10	2SC1131	0.50	2SD292	2.59	AN322	5.85	BC148B	0.13	BD181	0.99	BF224	0.17	BT121	2.48	CD4070	0.66
1S5012A	0.81	2SC1158	3.33	2SD313	2.59	AN331	4.59	BC148C	0.11	BD182	0.99	BF237	0.65	BT123	1.98	CD4081	0.35
1S921	0.10	2SC1162	1.05	2SD325D	1.95	AN337	5.37	BC149	0.11	BD183	0.99	BF240	0.17	TBA970	3.06	CD4093	0.72
2N1303	0.38	2SC1172	2.22	2SD348	16.13	AN340P	1.17	BC149B	0.13	BD184	1.21	BF241	0.17	BT151-800R	1.15	CD4511	1.10
2N2219A	0.40	2SC1195	3.26	2SD350	5.20	AN355	5.98	BC153	0.14	BD187	0.53	BF245	0.50	BTT6018	2.42	CD4528	2.04
2N2222	0.38	2SC1212A	1.97	2SD350A	2.80	AN362	1.75	BC154	0.14	BD189	0.69	BF245A	0.52	BTT8124	4.89	CD4556	1.47
2N2646	0.80	2SC1213	0.89	2SD353	7.50	AN370	3.95	BC159	0.36	BD190	0.69	BF245B	0.49	BU106	2.48	CR02AM-8	1.55
2N2904	0.36	2SC1226	1.46	2SD389	2.41	AN5010	5.70	BC160	0.40	BD201	0.53	BF246A	2.52	BU108	1.50	CV12E	3.07
2N2905	0.43	2SC1293	0.90	2SD401	2.55	AN5111	2.92	BC161	0.28	BD202	0.60	BF255	0.20	BU109	2.65	CX095D	3.14
2N2906	0.38	2SC1306	1.98	2SD414	1.98	AN5120N	4.50	BC168	0.36	BD203	0.50	BF256	0.28	BU110	5.69	CX104	9.64
2N2926	0.15	2SC1316	4.10	2SD471	2.13	AN5132	4.39	BC169C	0.16	BD204	0.61	BF256LB	0.42	BU111Y	4.16	CX108	10.50
2N3053	0.27	2SC1317	0.87	2SD560	2.95	AN5250	3.98	BC170	0.16	BD207	1.79	BF256LC	0.42	BU125	2.48	CX109	7.86
2N3054	0.99	2SC1364	0.49	2SD588A	2.36	AN5435	3.08	BC171	0.11	BD208	1.23	BF257	0.34	BU126	1.55	CX130	8.76
2N3055	0.61	2SC1383	1.20	2SD600	3.25	AN5610	7.43	BC172	0.13	BD222	0.49	BF258	0.36	BU137	9.25	CX134	11.04
2N3442	1.56	2SC1391	2.45	2SD601R	0.65	AN5612	4.12	BC172B	0.27	BD225	0.49	BF259	0.34	BU205	1.08	CX136	11.49
2N3702	0.14	2SC1398	0.94	2SD613	1.03	AN5613	4.63	BC173	0.17	BD228	0.63	BF262	0.57	BU206	1.27	CX139	11.83
2N3703	0.14	2SC1413A	3.05	2SD621	12.85	AN5630	3.95	BC174B	0.27	BD229	1.05	BF263	0.57	BU207	1.65	CX157	4.84
2N3705	0.16	2SC1446	1.25	2SD636	0.55	AN5701N	1.66	BC177	0.20	BD232	0.50	BF271	0.34	BU208	1.12	CX158	4.10
2N3706	0.14	2SC1447	2.07	2SD639-R	0.85	AN6250	2.95	BC178	0.26	BD234	0.42	BF273	0.20	BU208/02	1.97	CX177	6.75
2N3707	0.16	2SC1475	0.37	2SD655	0.98	AN6300	7.00	BC179	0.26	BD237	0.47	BF274	0.20	BU208A	1.12	CX187	5.26
2N3711	0.11	2SC1505	1.00	2SD657	2.85	AN6310	8.74	BC182	0.09	BD238	0.39	BF324	0.35	BU208D	1.95	CX755	12.95
2N3771	2.04	2SC1514	1.41	2SD661A	0.80	AN6320N	4.28	BC182L	0.10	BD239	0.45	BF336	0.33	BU209	1.93	CX885A	6.85
2N3772	1.71	2SC1573Q	1.25	2SD731	2.45	AN6340	15.18	BC182LB	0.14	BD240	0.37	BF337	0.40	BU226	2.95	DEC1	2.20
2N3773	2.29	2SC1578	8.74	2SD773	0.33	AN6341	5.98	BC183L	0.11	BD241	0.39	BF338	0.44	BU326	2.00	DEC2	2.20
2N3819	0.42	2SC1583	1.17	2SD811	5.54	AN6342	1.61	BC183LB	0.26	BD242	0.39	BF355	0.49	BU326A	2.20	DS3486N	4.33
2N3823	1.17	2SC1617	3.89	2SD823	1.98	AN6363	16.00	BC184	0.13	BD243A	0.37	BF362	0.66	BU326S	2.20	DS3487N	4.33
2N3904	0.62	2SC675	1.41	2SD837	1.56	AN6371	9.24	BC184L	0.14	BD243C	0.79	BF363	0.60	BU406	1.49	E1222	0.40
2N3908	0.62	2SC1678	1.98	2SD841	3.65	AN6387	7.95	BC184LB	0.26	BD244	0.51	BF371	0.50	BU406D	1.79	E5024	0.28
2N4101	1.33	2SC1741	1.25	2SD856	2.25	AN6531	1.95	BC186	0.27	BD244C	0.79	BF391	0.25	BU407	0.82	E5386	0.25
2N4240	3.30	2SC1810	1.70	2SD857Q	1.84	AN6551	1.35	BC187	0.28	BD245C	0.99	BF417	0.84	BU407D	1.09	E9003	0.46
2N4444	1.73	2SC1815	0.66	2SD882	1.50	AN6552	0.68	BC204	0.16	BD246C	0.89	BF418	1.87	BU412	9.15	E9005	0.50
2N5293	0.50	2SC1826	0.65	2SD894	1.50	AN6610	2.40	BC207	0.14	BD253	1.05	BF422	0.29	BU426A	1.67	ESM310BP	4.15
2N5294	0.50	2SC1829	2.22	2SD898	5.45	AN6677	8.95	BC212	0.11	BD278A	0.80	BF423	0.52	BU500	1.95	FND500	5.78
2N5296	0.49	2SC1875	5.19	2SK105H	2.15	AN7111	1.45	BC212B	0.26	BD317	2.60	BF450	0.35	BU508A	1.75	GC374	1.65
2N5297	0.50	2SC1881K	2.98	2SK152	2.95	AN7114E	5.94	BC213L	0.10	BD318	2.85	BF451	0.29	BU536	5.80	GD243	4.95
2N5298	0.61	2SC1893	3.02	2SK34	0.76	AN7115	2.55	BC213LB	0.15	BD375	0.42	BF457	0.41	BU608	2.65	GF758	0.84
2N5771	1.18	2SC1906	0.98	2SK41	1.07	AN7120	4.65	BC214	0.10	BD380	0.76	BF458	0.39	BU705	4.07	GH3F	1.82
2N6109	1.58	2SC1921	1.37	2SK79	2.98	AN7145	2.80	BC214LB	0.26	BD410	0.52	BF459	0.52	BU806	1.79	HA11215	4.50
2N6130	0.72	2SC1923	1.07	40408	0.50	AN7146	4.35	BC225	0.40	BD433	0.47	BF460	1.56	BU807	0.80	HA11211	2.53
2N6133	1.25	2SC1929	2.25	40594	1.53	AN7151	2.26	BC237	0.10	BD434	0.49	BF469	0.31	BU826A	2.15	HA11225	4.29
2N6180	0.95	2SC1942	5.70	40636	1.43	AN7156	2.85	BC237BJ	0.12	BD435	0.49	BF470	0.55	BUW84	1.39	HA11226	8.71
2N6292	1.65	2SC1945	4.53	4EX581	0.80	AN7158	6.75	BC238	0.10	BD436	0.60	BF471	0.31	BUX84	1.00	HA11229	2.88
2N696	0.43	2SC1959	0.45	741	0.30	AN7218	1.64	BC238A	0.13	BD437	0.49	BF472	0.33	BUX85	1.10	HA11235	2.48
2N698	0.43	2SC1957	1.09	7805-T022	0.63	AN7223	4.25	BC238B	0.13	BD438	0.40	BF479	0.61	BUY69A	2.04	HA11124	5.25
2SA1006	1.50	2SC1953	1.93	7806	0.73	AU107	3.50	BC239	0.12	BD441	1.42	BF480	1.38	BY126	0.13	HA11244	2.82
2SA1011	1.65	2SC1962	1.93	7808	0.85	AU110	2.25	BC239B	0.25	BD442	0.66	BF491	1.99	BY127	0.13	HA11251	4.47
2SA1015	0.49	2SC1969	3.10	7812-T022	1.16	AU113	5.25	BC251A	0.12	BD509	1.42	BF495	0.64	BY133	0.11	HA1125	4.29
2SA1012	1.25	2SC1983	8.35	7815	0.64	AY105K	2.08	BC294	0.50	BD510	1.07	BF506	0.43	BY164	0.47	HA1137W	2.87
2SA1020Y	0.86	2SC1985	1.55	7818	0.92	AY106	1.09	BC300	0.35	BD519	1.50	BF509	0.41	BY176	0.52	HA1138	5.03
2SA1027R	0.45	2SC2009	0.34	7824	0.64	BA524	8.21	BC301	0.45	BD529	1.32	BF523	0.24	BY179	0.62	HA11414	5.65
2SA473	0.75	2SC2029	2.33	7905	0.80	B250	2.65	BC302	0.53	BD530	1.18	BF532	0.45	BY182	1.05	HA1144	7.87
2SA766S	4.95	2SC2028	2.11	9368	10.70	B40	1.55	BC303	1.04	BD533	0.67	BF596	0.18	BY184	0.47	HA1156	1.16
2SC1173Y	1.25	2SC2063	0.99	AA133	0.12	BA130	0.14	BC307	0.18	BD534	0.53	BF597	0.27	BY187	0.77	HA1160	4.78
2SC1474	1.25	2SC2078	0.95	AC133	0.12	BA1310	1.98	BC307A	0.14	BD535	0.79	BF694	0.22	BY189	1.79	HA1166	5.25
2SC1509	1.35	2SC2073	1.54	AC123K	0.43	BA1320	1.38	BC308	0.18	BD536	0.61	BF757	0.59	BY198	1.62	HA1166X	5.36
2SD1391RL	3.95	2SC2085-Q	1.40	AC127	0.27	BA1322	3.95	BC308A	0.11	BD537	0.74	BF759	0.47	BY201/2	1.50	HA1167	5.36
2SA1095	4.10	2SC2091	1.30	AC128	0.34	BA1330	2.75	BC309	0.17	BD538	1.45	BF761	1.05	BY203/20	0.59	HA11706	9.50
2SA1103	6.55	2SC2141	1.86	AC138	0.24	BA145	0.19	BC317A	0.13	BD544B	0.83	BF762	0.75	BY207	0.22	HA11705	8.00
2SA329	0.40	2SC2166	1.98	AC141	0.29	BA148	0.33	BC327	0.15	BD598	1.25	BF869	0.47	BY208	0.46	HA11703	4.95
2SA351	1.17	2SC2216	0.69	AC142K	0.44	BA154	0.40	BC328	0.11	BD677	0.53	BF870	0.30	BY210-400	0.18	HA11701	4.56
2SA489	1.17	2SC2233	2.20	AC151	0.28	BA155	0.12	BC337	0.09	BD679	0.57	BF959	0.42	BY210-600	0.27	HA11710	9.50
2SA490	2.25	2SC2236	1.65	AC176	0.30	BA156	0.05	BC338	0.34	BD680	0.76	BF960	0.69	BY210-800	0.34	HA11713	8.13
2SA493	2.25	2SC2278	1.14	AC179	0.28	BA159	0.15	BC368	0.24	BD681	1.48	BF970	0.69	BY218	1.64	HA11711	20.16
2SA562	0.57	2SC2314	2.17	AC183	0.72	BA182	0.24	BC440	1.09	BD696	2.47	BFR39	0.44	BY223	1.23	HA11715	8.13
2SA564	0.58	2SC2335-KI	10.41	AC187	0.39	BA222	1.66	BC441	0.44	BD699	3.49	BFR61	0.50	BY224-600	1.88	HA11714	7.76
2SA614	4.88	2SC2551	1.26	AC187K	0.43	BA302	1.24	BC454	0.36	BD700	3.70	BFR62	0.50	BY225-100	1.13	HA11716	13.10
2SA628	1.14	2SC2565	3.72	AC188	0.25	BA311	1.32	BC460	0.42	BD707	1.06	BFR79	0.29	BY226	0.25	HA11725	18.26
2SA639S	1.50	2SC2570	1.85	AC188-01	0.49	BA312	0.97	BC461	0.47	BD709	1.12	BFR81	1.65	BY227	0.49	HA11725MP	16.00
2SA659	0.49	2SC2577	1.75	AC188K	0.43	BA313	0.76	BC462	1.15	BD710	0.80	BFR86	1.08	BY228	0.60	HA117555P	6.23
2SA673	1.27	2SC2578	6.75	AC193K	0.65	BA317	0.08	BC463	0.64	BD809	0.85	BFR89	1.63	BY229-1000	1.12	HA11781	8.90
2SA684	1.61	2SC2671	1.99	AC194K	0.65	BA318	0.09	BC477	0.37	BD810	0.69	BFR90A	1.30	BY229-600	0.92	HA1180	5.15
2SA697	0.82	2SC2826	2.07	AD140	1.06	BA328	4.77	BC478	0.32	BD879	0.74	BFT42	0.43	BY255	0.69	HA1196	7.43
2SA699	1.75	2SC288A	1.85	AD143	1.25	BA333	1.37	BC479	0.41	BD880	0.79	BFT43	0.43	BY295-600	1.03	HA13001	6.25
2SA715	0.95	2SC3153	5.26	AD145	1.60	BA335	6.27	BC532	0.28	BD895	2.31	BFT84	0.40	BY298	0.20	HA1306	2.26
2SA747	8.26	2SC372	1.40	AD161	0.56	BA5102A	3.78	BC546	0.17	BD899	2.48	BFW10	0.60	BY299	0.60	HA1338	7.50
2SA748	1.36	2SC373	1.16	AD162	0.45	BA511	2.92	BC547	0.10	BD901	0.79	BFX29	0.34	BY407	0.84	HA1339	2.33
2SA817	0.65	2SC383	1.33	AD262	1.25	BA514	2.20	BC548	0.10	BD902	0.84	BFX84	0.37	BY409	1.49	HA13402	7.87
2SA818	1.82	2SC388	0.50	AF114	2.47	BA521	2.52	BC549	0.10	BDW83C	1.56	BFX85	0.41	BY448	0.69	HA13342	2.65
2SA835	2.50	2SC394V	0.81	AF115	1.24	BA524	8.94	BC550	0.40	BDW84C	1.56	BFX86	0.36	BY713	1.10	HA13365	4.02
2SA836	0.89	2SC403C	0.39	AF118	1.20	BA526	7.98	BC556	0.16	BDX32	1.75	BFX87	0.55	BYW19/1000	0.69	HA1366WR	1.86
2SA844	0.35	2SC41	2.19	AF127	0.50	BA527	2.98	BC557	0.10	BDX53A	4.93	BFX88	0.34	BYW56	0.34	HA1367	4.32
2SA872	0.70	2SC458	0.39	AF139	0.53	BA532	1.56	BC558	0.10	BDX53B	3.35	BFX89	0.44	BYX10	0.29	HA1368R	2.45
2SA884	2.15	2SC495	0.92	AF178	1.45	BA536	2.95	BC559	0.10	BDX54B	2.16	BFY50	0.32	BYX55-600	0.19	HA1368	1.90
2SA937R	0.97	2SC515A	2.85	AF179	0.55	BA6209	4.75	BC559B	0.11	BDX62A	2.15	BFY51	0.50	BYX71-600	1.25	HA1370	3.71

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HA1374	4.80	LR3419	9.37	NE565N	1.33	SKE4F2/08	1.24	STK3042	11.05	TA7312P	2.45	TD62105P	2.50	TDA3560	5.25	TUA2000	8.98
HA1377	4.98	LR3471	9.37	NE645BN	3.35	SKE4F2/06	0.85	STK3044	5.75	TA7313AP	1.50	TD62104P	2.50	TDA3571Q	2.97	TV106	1.86
HA1389R	2.05	LU1141	7.27	NP1106	5.61	SKE4F2/10	1.24	STK4019	4.50	TA7314	5.94	TD62706P	4.50	TDA3576	7.09	TY6010B	2.97
HA1389	2.39	LU52012	5.95	OA202	0.11	SKE4G2/02	0.96	STK430	11.75	TA7323P	3.15	TDA1001B	2.31	TDA3590	5.79	U05G	1.14
HA1392	3.90	LU52011	4.95	OA47	0.14	SKE5F3/10	1.60	STK433	4.95	TA7325P	1.15	TDA1003A	2.25	TDA3591	6.45	ULN2204	11.45
HA1394	3.95	LU03112	12.37	OA91	0.09	SKS1/10	2.15	STK4332	8.25	TA7339P	1.60	TDA1005A	2.22	TDA3650	7.50	UPA53C	4.94
HA1397	3.76	M193	12.75	OA95	0.12	SL1310	3.14	STK435	5.94	TA7340P	5.06	TDA1006A	2.11	TDA3652	5.44	UPC1003	5.95
HA1398	3.98	M21C	1.00	OC28	2.95	SL1430T	1.98	STK4352	12.25	TA7607AP	13.90	TDA1010AF	4.25	TDA3651AQ	2.96	UPC1009C	6.32
HA1406	2.07	M23C	0.83	OC29	2.15	SL414	3.69	STK436	7.21	TA7609	3.28	TDA1011	2.98	TDA3651	3.30	UPC1025H	2.90
HA1452	1.63	M293	9.15	OC36	1.28	SL432A	3.44	STK437	7.80	TA7611AP	4.80	TDA1010	1.15	TDA3651A	2.75	UPC1026C	1.24
HBF4030AF	2.48	M51102L	6.35	OC44	0.35	SL439	2.48	STK4372	3.85	TA7616P	5.25	TDA1011A	3.25	TDA3950	4.98	UPC1028H	2.00
HD14538	2.07	M5115P	5.24	OC45	0.18	SL471	4.78	STK439	8.31	TA7622AP	8.94	TDA1028	2.45	TDA4050B	3.95	UPC1020H	2.77
HD38702-A2	7.45	M51203L	3.15	OC72	0.44	SL480	3.98	STK441	11.28	TA7628P	5.98	TDA1034B	2.42	TDA4280	7.20	UPC1032H	0.62
HD38750A53	8.95	M51231P	3.04	OC75	0.44	SL490	2.37	STK443	10.29	TA7629P	7.50	TDA1035S	2.95	TDA4290	4.47	UPC1042C	8.95
HD38750A-7	7.25	M51231P	3.04	ON236	1.06	SL901B	8.32	STK457	13.45	TA7630P	2.98	TDA1035T	2.55	TDA4400	2.27	UPC1156H	2.96
HD38800A50	14.09	M5134-9341	4.13	ON782	1.98	SL918A	6.98	STK460	14.83	TA7640AP	1.55	TDA1037	1.98	TDA4420	4.02	UPC1158	5.84
HD44801A05	18.25	M51353P	5.25	OT121	1.45	SN16861AN0	4.95	STK461	9.68	TA7672P	2.25	TDA1037D	2.05	TDA4422	8.32	UPC1161C	4.50
HEF4001BP	0.67	M51381P	4.50	PT6042	2.45	SN16862AN	2.98	STK463	11.53	TA7676P	2.81	TDA1044	2.62	TDA4427S	9.00	UPC1182H	1.82
HISH1010	8.59	M51393AP	7.78	PT8504	4.98	SN16966N	10.25	STK466	11.77	TA7726P	10.25	TDA1047	4.10	TDA4431	2.27	UPC1186H	1.05
HISH1004	6.00	M51394P	11.97	R1038	2.19	SN29717N	7.19	STK4833	16.95	TAA320A	1.27	TDA1059B	0.98	TDA4440	2.87	UPC1181H	1.25
HISH1002	9.50	M5142P	5.49	R1039	2.19	SN29716N	3.66	STK501	6.32	TAA350A	6.45	TDA1054M	1.21	TDA4442	4.75	UPC1185H	2.94
HM6231	9.81	M5144P	4.25	R2008B	1.33	SN29715N	6.04	STK502	5.74	TAA570	1.74	TDA1060	2.60	TDA4500	6.30	UPC1188	6.95
HM6232	8.89	M51513L	2.55	R2009	1.98	SN29713N	5.56	STK5314	9.48	TAA621AX1	2.65	TDA1082	3.25	TDA4600	2.84	UPC1213C	0.99
HM6251	5.70	M51515BL	3.23	R2010B	1.33	SN29722	11.95	STK5730	3.95	TAA621A12	2.14	TDA1151	1.22	TDA4610	4.80	UPC1212C	1.72
HM7103	2.46	M51517L	3.71	R2029	1.33	SN29723AN	7.65	STK7216	12.67	TAA661B	2.62	TDA1170S	2.25	TDA4620	4.78	UPC1225H	3.25
HM9032	3.22	M5192	2.20	R2030	1.33	SN29764AN	1.38	STK772	6.95	TAA691	8.58	TDA1190	2.11	TDA5500	4.78	UPC1230	5.24
HM9012	3.22	M5194AP	5.74	R2257	3.71	SN29767	4.98	STR1096	5.20	TAA700	3.75	TDA1190Z	3.96	TDA5700	2.60	UPC1238	3.15
HM9015	3.24	M5231L	1.95	R2265	1.49	SN29770BN	4.24	STR4090	11.98	TAA930	4.87	TDA1200	1.50	TDA7270S	2.25	UPC1263	3.45
HT4207	17.16	M53274P	1.33	R2305	1.18	SN29772BN	4.91	STR440	7.85	TAA970	2.83	TDA1235	3.88	TDA8190	3.47	UPC1277H	5.85
HT4208	18.25	M54532P	2.15	R2322	0.59	SN29771BN	3.25	STR441	6.50	TAA110	2.52	TDA1236	4.30	TDA9403	3.15	UPC1278H	4.85
IN5401	0.11	M54544L	4.75	R2323	0.76	SN29791	1.67	STR451	4.95	TAG232-600	0.73	TDA1270	3.55	TDA9503	2.92	UPC1351C	1.81
IR2403	4.25	M58478P	6.75	R2354A	2.01	SN29798N	5.56	STR453	8.16	TAG626-600	1.06	TDA1327A	1.33	TDA9513	5.44	UPC1350C	1.40
IR2C05	4.25	M58485P	12.45	R2354B	2.01	SN2709	0.44	STR454	7.50	TBA120AS	1.24	TDA1412	1.05	TDB1033	6.68	UPC1353	7.85
IR3P06	2.25	MA06	1.07	R2443	0.88	SN7400N	0.34	STR6020	8.31	TBA120SB	1.05	TDA1420	2.55	TDE1081	6.61	UPC1355C	2.13
IR3P08	4.95	MA8001	0.82	R2461	1.50	SN7401N	0.36	T6029V	5.75	TBA120T	0.95	TDA1440	3.45	TE626	1.49	UPC1363	4.20
IR94558	6.25	MA8003	1.16	R2540	2.31	SN7402N	0.65	T6035V	0.73	TBA120U	2.50	TDA1470	3.16	TEA1002	3.47	UPC1362	2.98
IS751	2.85	MB3705	1.98	R2540X	3.30	SN7404N	0.24	T6036	0.67	TBA120A	1.05	TDA1470P	4.25	TEA1009	1.86	UPC1365C	6.98
ITT425	0.18	MB3712	1.85	R2615	0.67	SN7408N	0.27	T6037	2.11	TBA1440	2.03	TDA1506	7.45	TEA1014	3.30	UPC1366	7.25
IZ0003GE	5.37	MB3713	1.69	RCA16029	2.01	SN7410N	0.27	T6044V	0.97	TBA1441	1.62	TDA1510	5.90	TEA1020SP	8.21	UPC1360C	4.51
IZ0020GE	5.93	MB3730	3.25	RCA16600	1.38	SN74121	1.60	T6045	1.20	TBA1440G	5.20	TDA1512	2.98	TIC106C	0.61	UPC1378H	4.25
K174YP	3.46	MC13002	3.55	RCA16802	1.08	SN7413N	0.37	T6049	1.45	TBA1441	2.80	TDA1515	16.60	TIC106M	0.77	UPC141C	3.75
KA2101	2.92	MC1310P	2.25	RCA17074	6.60	SN74141N	2.65	T6052V	0.87	TBA240A	3.99	TDA1559	3.15	TIC116Y100	2.07	UPC1458	8.66
KC581C	6.32	MC1327P	1.33	RCA17376	1.58	SN74151AN	1.51	T6058	3.08	TBA395	1.10	TDA1670	4.48	TIC44	0.72	UPC151C	2.95
KC582C	3.97	MC1330P	1.69	RCA17524	0.83	SN74154N	1.27	T6059	0.65	TBA395Q	1.10	TDA1770	6.85	TIC45	0.77	UPC2002	1.48
KC583C	5.54	MC1350P	1.61	RCA17523	0.83	SN74190	2.00	T9003V	1.25	TBA396	0.80	TDA1905	1.76	TIC47	0.35	UPC30C	2.51
L200CV	1.69	MC1351P	3.96	RCA2060	2.00	SN7420N	0.34	T9005V	2.38	TBA400	2.39	TDA1908	2.87	TIP120	1.06	UPC324C	4.70
LA1201	1.02	MC1352P	2.50	RGP01-15	0.70	SN7430	0.49	T9011V	0.49	TBA440P	2.45	TDA1940	1.95	TIP110	0.53	UPC32C	4.94
LA1210	1.56	MC1357P	2.15	RGP10	0.50	SN7440N	0.27	T9013V	7.96	TBA480Q	1.30	TDA1950	4.75	TIP112E	0.85	UPC339C	4.90
LA1230	2.87	MC1358P	1.55	RGP30M	0.59	SN7472	1.54	T9014V	2.60	TBA500P	6.58	TDA2005	5.08	TIP112	0.88	UPC41C	4.10
LA1320	2.87	MC14001	2.40	RT402	1.58	SN7474N	0.44	T9016	1.02	TBA510	2.11	TDA2006	1.55	TIP117	0.95	UPC4558C	2.15
LA1352	1.75	MC14013	0.41	RT905A	2.38	SN7490AN	0.93	T9019W	1.98	TBA520	1.84	TDA2004	2.27	TIP121	0.87	UPC474	5.11
LA1357N	11.07	MC14493P	11.95	S1299	5.74	SN74LS26N	0.53	T9034V	1.38	TBA520Q	1.68	TDA2002	0.90	TIP126	0.73	UPC554C	1.85
LA1363	7.25	MC14494P	2.15	S175	31.48	SN76001N	1.65	T9035V	2.33	TBA530	1.30	TDA2003	1.75	TIP132	1.40	UPC566H	2.95
LA1364	3.02	MC14497	3.65	S2062D	2.07	SN76013ND	2.48	T9051	7.45	TBA530	1.30	TDA2010	1.85	TIP137	1.50	UPC574	3.25
LA1365J	3.44	MC14510BAL	3.75	S2800D	5.54	SN76023N	5.15	T9054V	1.15	TBA540	1.15	TDA2020	2.77	TIP29	0.66	UPC575C2	2.40
LA1385	1.94	MC14511BCP	1.10	S2802	3.47	SN76023ND	3.96	T9057V	0.70	TBA540Q	1.15	TDA2030	1.99	TIP29055	0.95	UPC576H	2.58
LA1387	7.60	MC14528BCP	2.70	S2818	4.05	SN76033N	4.15	T9062V	0.49	TBA560C	1.40	TDA2140	1.59	TIP29A	0.46	UPC577H	1.25
LA3155	1.25	MC1712	3.88	S3702S	6.15	SN76110N	0.98	T9064	1.51	TBA560CQ	1.60	TDA2150	6.20	TIP29B	0.63	UPC578C	7.35
LA3301	1.65	MC5192	13.50	S40W	10.89	SN76115AN	1.61	TA6002	4.35	TBA570Q	1.60	TDA2151	2.07	TIP29C	0.40	UPC580C	4.13
LA3350	1.43	MC7724CP	3.49	S6080B	8.80	SN76131	1.92	TA7027	4.80	TBA570A	1.71	TDA2160	4.01	TIP29D	0.75	UPC587C2	1.34
LA3361	1.23	MC7818C	2.18	SA8063	5.17	SN76227N	1.33	TA7050	1.74	TBA641A12	4.13	TDA2161	1.85	TIP3055	0.75	UPC592H	2.15
LA3365	3.98	MCR100/7	1.65	SAA1006	1.75	SN76226DN	1.98	TA7051	1.74	TBA641B72	3.03	TDA2170	3.45	TIP30A	0.41	UPC595	2.95
LA3390	4.25	MCR106-5/6	0.95	SAA1020	4.76	SN76228N	3.27	TA7054	2.55	TBA651	1.76	TDA2190	4.95	TIP30C	0.16	UPC596	1.98
LA4030P	4.20	MCR220/7	2.28	SAA1025	4.40	SN76242	8.95	TA7060AP	0.71	TBA673	2.60	TDA2270	4.65	TIP31A	0.34	UPD1514C	8.95
LA4031P	3.20	ME0402	0.17	SAA1024	2.81	SN76243	5.23	TA7061AP	1.27	TBA700	1.85	TDA2510	7.85	TIP31B	0.38	UPD2819C	4.98
LA4032P	2.35	ME0404/2	0.47	SAA1075	6.25	SN76396	2.90	TA7069	3.13	TBA720	1.55	TDA2520	2.37	TIP31C	0.50	UPD4013B	4.00
LA4100	1.25	ME0411	0.28	SAA1121	5.14	SN76533N	2.47	TA7070P	1.83	TBA730	3.55	TDA2522	3.46	TIP32A	0.53	UPD4066B	4.95
LA4101	1.30	ME6002	0.26	SAA1124	3.25	SN76532N	2.95	TA7072P	2.57	TBA750Q	2.90	TDA2524	4.50	TIP32B	0.69	UPD553-164	19.25
LA4102	2.81	ME6102	0.28	SAA1130	4.99	SN76545	4.87	TA7073P	5.86	TBA760	1.71	TDA2521	3.71	TIP32C	0.40	UPD8049C-1	10.85
LA4112	1.56	ME8001	0.34	SAA1174	7.77	SN76546N	3.47	TA7074P	1.98	TBA800	1.20	TDA2525	3.90	TIP33	0.85	X0007TA	4.68
LA4125	2.25	ME0411	0.75	SAA1250	4.25	SN76549	2.59	TA7076P	7.80	TBA810S	1.61	TDA2532	2.50	TIP33A	1.05	X0022CE	5.75
LA4138	3.45	MJ2501	3.30	SAA1251	9.85	SN76570	3.08	TA7089P	3.10	TBA810T	1.50	TDA2530	2.70	TIP33C	0.80	X0029CE	7.09
LA4140	1.15	MJ3001	1.76	SAA11351	4.95	SN76611	2.59	TA7092P	8.65	TBA810AS	1.00	TDA2541	2.48	TIP34	3.54	X0031CE	4.95
LA4192	4.29	MJ481	1.53	SAA3027P	10.03	SN76620	2.58	TA7093P	3.99	TBA820	1.52	TDA2540	2.15	TIP41A	0.49	X0035TA	5.98
LA4220	1.62	MJ802	5.45	SAA5000	2.95	SN76660N	2.48	TA7102P	5.88	TBA820M	0.82	TDA2545Q	5.94	TIP41B	0.65	X0040TA	4.50
LA4250	6.75	MJE2955	1.89	SAA5010	5.39	SN76666N	1.41	TA7108P	1.61	TBA890	2.50	TDA2560	2.17	TIP41C	0.49	X0042CE	4.35
LA4400	3.92	MJE3055	1.65	SAA5012	5.20	SN76708	4.86	TA7109	3.71	TBA920	1.89	TDA2575A	0.50	TIP42A	0.49	X0043CE	2.75
LA4420	1.72	MJE340	0.49	SAA5020	5.78	SN76709N	13.50	TA7122B/P	0.92	TBA920Q	2.31	TDA2571AQ	3.60	TIP42B	0.53	X0056CE	5.11
LA4422	1.72	MJE520	0.49	SAA5030	8.25	SN76707N	5.11	TA7124P	2.34	TBA940	1.87	TDA2576A	2.85	TIP42C	0.53	X0057GE	6.00
LA4430	1.56	ML231	3.33	SAA5050	7.74	SN76705N	1.34	TA7129P	1.50	TBA950	1.84	TDA2571A	3.66	TIP47	0.65	X0062CE	6.52
LA4440	4.95	ML232B	2.15	SAB1009B	5.98	SN76730	5.35	TA7130P	1.27	TBA970	3.56	TDA2578A	4.95	TIP48	0.92	X0065CE	6.25
LA4445	7.25	ML237B	2.51	SAB3011	7.34	SN76810N	0.60	TA7136AP	1.27	TBA990	1.82	TDA2576A+K	12.35	TIP49	3.61	X0074GE	10.08
LA4460	2.32	ML238	5.77	SAB3013	5.61	SN76832N	3.25	TA7137P	0.98	TBA990Q	1.68	TDA2581	2.25	TIP55A	3.65	X0077GE	15.96
LA4461	2.95	ML923	3.35	SAB3021	7.90	SN94041	5.54	TA7141AP	3.87	TC4001BP	3.25	TDA2582	2.18	TIS43	1.43	X0079CE	4.95
LA4505	7.25	ML926	3.98	SAB3024	6.36	SN94042	4.35	TA7146	2.50	TC4011BP	3.50	TDA2591	2.50	TIS90	0.28	X0092CE	4.95
LA5112N	2.98	MM5314N	4.02	SAB3209	5.82	SP8385	0.55	TA7146P	4.23	TC4013BP	3.75	TDA2594	3.26	TL011CP	1.55	X0096CE	5.98
LA7020	7.33	MM5316N	4.25	SAB3210	3.49	SPS5384	1.98	TA7148P	1.67	TC4016BP	3.15	TDA2593	2.47	TL072	2.85	X0109CE	11.25
LA7025	10.21	MM5318N	3.11	SAF1032P	5.50	ST1702L	0.99	TA7149P	3.26	TC4053BP	4.34	TDA2591Q	0.83	TL494CN	6.74	X0113CE	2.07
LA7027	9.35	MM5369N	2.01	SAF1039	3.35	STA401	6.76	TA7152P	1.91	TC4069	1.52	TDA2595	3.65	TL072CP	2.55	X0195CE	4.00
LA7040	9.20	MM5387AA/N	6.20	SAS5010	8.39	STA441C	2.75	TA7153P	7.47	TC4071BP	2.76	TDA2600	5.50	TMP4320	15.00	X0204CE	8.74
LA7042	4.25	MM5841N	6.64	SAS560S	2.26	STA471C	7.56	TA7161P	5.45	TC4081BP	3.25	TDA2611AQ	2.98	TMS1024NLL	11.25	X0261CE	8.75
LA7800	2.65	MN1400VL	9.96	SAS560T	5.42	STK0029	5.54	TA7162P	3.25	TC40H000	1.98	TDA2612Q	4.68	TMS1025N	11.25	X1222AF	3.63
LA7801	4.15	MN1405	9.52	SAS570T	5.42	STK0039	5.35	TA7169	9.54	TC4514BP	4.15	TDA2611A	1.25	TMS3720ANS	19.50	IX0111CE	2.95
LB1274	3.08	MN1435VX	12.95	SAS570S	2.61	STK0040	12.00	TA7172P	1.41	TC9002BP	13.10	TDA2610	2.79	TMS3748NS	14.95	Y969	0.82
LC7800	9.20	MN6016A	20.56	SAS580	2.85	STK0050	7.67	TA7176P	2.48	TCA270Q	1.71	TDA2620	2.15	TMS3755	13.65	TDA3310	2.15
LD3120	1.13	MP1192	5.07	SAS6600	1.33	STK0080	9.16	TA7193AP	6.67	TCA270S	2.15	TDA2630	1.96	TMS3894NL	19.25	ZPY120	0.95
LD3150	2.25	MP2794	4.00	SAS660	2.97	STK011	3.96	TA7193P	5.50	TCA270SQ	1.65	TDA2631	2.73	MS5102NLL	6.25	ZTK33	0.43
LM1017N	4.29	MP2812	5.07	SAS6700	1.33	STK013	9.25	TA7201P	2.71	TCA290A	2.39	TDA2640	2.59				
LM1877	10.92	MP8512	1.57	SAS670	3.96	STK014	9.80	TA7203P	2.18	TCA420A	2.16	TDA2652	13.45				
LM224	1.75	MPC596	2.13	SAS6710	1.33	STK015	7.75	TA7204P	2.16	TCA440	2.25	TDA2653	3.65				
LM2808	6.25	MPF256C	0.60	SBA750	1.61	STK016	6.94	TA7205P	1.38	TCA530	2.24	TDA2654	6.18				
LM2877	5.25	MPS6570	0.48	SC84203	19.35	STK022	5.25	TA7206P	6.35	TCA640	7.36	TDA2670	2.54				
LM317CKC	1.38	MPSA42	0.65	SC9504P	1.95	STK025	12.50	TA7207P	3.34	TCA650	2.04	TDA2680	3.20				
LM324N	0.75	MPSA56	0.27	SDA2006	18.95	STK031	12.95	TA7208P	2.15	TCA660B	3.30	TDA2690A	2.65				
LM339N	0.80	MPSA92	0.49	SDA2112/2	12.85	STK040	9.40	TA7210P	3.58	TCA730	3.81	TDA2740	6.00				
LM340K	11.85	MPSU05	0.86	SG264A	5.26	STK043	13.44	TA7214P	3.63	TCA750	2.25	TDA2780AQ	5.14				
LM342P	1.62	MPSU10	1.56	SG613	8.75	STK054	7.13	TA7215P	2.58	TCA800Q	6.95	TDA2795	2.78				
LM342P	1.62	MPSU56	0.78	SG629	8.27	STK058	18.25	TA7217AP	1.45	TCA830S	2.38	TDA2791	2.5				
LM342P	1.62	MPSU60	1.98	SG6533	11.96	STK077	7.67	TA7222	1.95	TCA890	5.44	TDA2910	13.25				
LM348N	2.15	MR818	0.33	SI-1020H	10.89	STK078	8.52	TA7226	3.57	TCA900	2.04	TDA3000T	2.55				
LM380N	2.80	MR854	0.72	SI-1125HD	17.63	STK080	16.50	TA7227P	2.81	TCA910	1.65	TDA3300B	6.98				
LM384N01	3.25	MR914	1.20	SI1125H	7.50	STK082	11.86	TA7229P	4.45	TCA940	1.80	TDA3330	3.30				
LM567CN	1.71	MSM5816RS	17.35	SI1225HD	17.73	STK086	13.59	TA7230P	4.98	TCA940E	2.93	TDA3506	7.98				
LM6402/011	10.23	MSM5840H	9.25	SI1630HD	21.98	STK1039	5.75	TA7232P	6.60	TCE330	3.89	TDA3501	7.25				
LM6402A093	10.15	MVS460-02	0.61	SI6900	12.00	STK2110	7.33	TA7233P	6.40	TCEP100Q	10.25	TDA3500	4.25				
LM748	1.82	NE542	2.50	SKE1/02	1.85	STK2145	16.25	TA7240AP	7.83	TCEP100	9.61	TDA3510	6.55				
LM8360	3.87	NE545B	4.86	SKE2F1/04	1.39	STK2230	7.70	TA7245P	7.50	TD3406AP	3.98	TDA3520	9.71				
LM8361	3.57	NE555	0.38	SKE2G3/04	1.05	STK2240	14.40	TA7270	7.50	TD3F800R	3.92	TDA3540	6.99				
LR2612	11.95	NE556	0.95	SKE4F1/06	0.73	STK2250	18.95	TA7310P	2.15	TD3F900H	4.16	TDA3541	3.80				

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Dogs can Fly

Les Lawry-Johns

They say that pigs can't fly. Well dogs can, and Zeb did last Saturday night. We were in the lounge above the shop and I was nodding off as usual, having had one or two. Now over the shop front we've an awning to keep the sun off the windows in the summer. There was a sudden commotion outside and Honey Bunch raised a window to see what it was all about. Two chaps on the other side of the road were shouting and shaking their fists at the world. They saw H.B. and shook their fists at her. Zeb was watching and didn't approve of this. In a flash he leapt out of the window, on to the awning and in one more mighty leap he was across the road, confronting the lads with bared teeth. They didn't hang around after that and the next job was to get Zeb back. He came in and bounded upstairs with tail wagging to prove that his incredible flight hadn't hurt him. The two fellows weren't the only ones to get badly shaken. H.B. and I were as well at the thought of what could have happened.

First Ordeal

The reason I'd been nodding off was partly because the whole day had been horrible. It started first thing in the morning when a Ferguson TX10 was brought in. I started on it right away, removing the rear cover and checking the supply to the right side fuse. Nothing. So I checked the plug fuse and the continuity to the on/off switch then to the right side fuse. Everything was in order. I then realised that I hadn't plugged in the bench supply.

When power was applied to the TX10 the sound came through loud and clear but the LED on the tube base panel didn't light up. There was e.h.t. so I concluded that the trouble was on the tube's base panel or the supplies to it. The voltages were present however and the tube's cathodes were high. The LED had failed. I looked for one but couldn't find any. My ordering had gone wrong. Stan from SEME was at fault for not reminding me. I won't forget to have a go at him. But what to do? We want a voltage drop of about 3V. I stuck in a 75Ω resistor and got this, but there was still no raster. I checked the transistors on the panel and came to the conclusion that one of the BF460s was leaky. Once again I couldn't find one, so in desperation I fitted a BD410. This worked and I got a nice picture – for ten minutes. Off it went and I pondered. The BD didn't have the slope, so it had to be a BF like me. I fitted a BF338 with a heatsink. Good enough for the G8, good enough for the TX10. It worked all day and was collected at five o'clock.

The ITT CVC32

The next horror was an ITT CVC32 with no field scan below the centre line and only about three inches of picture above it. I dived for the field output transistors and found one with funny readings. After changing it I expected to have a full field scan. It remained as before, with nothing below the centre line. I tried a new field timebase subpanel but this made no difference. I checked all the electrolytics associated with the output stage, then carefully checked the subpanel above the scan coils. They were without fault. Further checks of just about everything relevant still produced no result. The scan coils were the only thing left. They measured all right but I still suspected them. The set is still here, standing around doing nothing because the customer won't accept the estimate for fitting a new set of scan coils. I'm waiting to find a yoke somewhere.

The GEC C2110

My next failure concerned a C2110 series GEC set. The complaint was that the set would work perfectly for hours, then suddenly roll and following this produce a bright blank raster. It didn't do this for me. The picture rolled and pulled for a short period before going bright cyan, i.e. red remained normal but the tube's green and blue cathode voltages both fell. Investigation showed that the 12V line was missing as the spring-loaded resistor on the right-hand side had pinged open. As soon as this was soldered back the picture returned to normal for another few hours. I changed the field scan panel, also the audio panel in case it was loading the 12V supply. No luck. The screen became bright for a few seconds before the resistor pinged open again. I looked for a video panel but couldn't find one. In fact I'd had this set for some days as the owner was away. He came and collected it on the Saturday, showing no surprise that the cause of the fault hadn't been located. I suggested he took it to Geoff in Moon Lane. He did but wouldn't accept the estimate Geoff gave him. Where it went after that I don't know – unless he uses if for only a couple of hours at a time.

Pye Portable

Our next case was a Pye colour portable fitted with the Philips CTX chassis. The mains fuse had shattered and there were open-circuit tracks to and from the bridge rectifier. This had gone short-circuit and the 4·7Ω surge limiter resistor had gone open-circuit. I fitted a KBL08 bridge, a new fuse and a 4·7Ω resistor and wired across the open-circuit tracks. The set then came on but was tripping. Investigation revealed a short-circuit diode in the line output stage. Question: why did the diode fail with the minor explosion the customer reported? Any ideas? I kept the set on test for a day or two as a precaution.

Barry's Sanyo

Barry, a friend of mine in the CID, asked me to have a quick look at his 26in. Sanyo colour set. Now sets from the far east frighten me so I don't normally take them in and I don't keep spares for them. I said I'd have a look however and I did. Not so far eastern as it turned out, probably made in Sanyo's Spanish plant. The fuse was shattered and the BUY69 chopper transistor was short-circuit. The switch-off thyristor was open-circuit – it's the discrete component version of the Siemens self-oscillating chopper circuit. I put in a BU326 transistor and a BT116 thyristor. With a new fuse installed I confidently switched on. Nothing. The BU326 wasn't being switched on. Everything was in order in the start-up circuit so, not having experience of these sets, I carefully put the shorted BUY69 and the thyristor back, refitted the blown fuse and suggested to Barry that he took the set to a cleverer chap than I, such as Geoff up Moon Lane.

"Ha!" said Barry, "I'm going to tell that magazine you

write for you're not the clever fellow you tell them you are!"

"Don't worry – they know it already!"

The Last Ordeal

I thought that the misery must be over. It wasn't. A couple I know quite well brought in a 20in. Fidelity set.

"It's gone dead. Someone's had a look at it but said they couldn't get the chip." Apparently it belonged to their son.

I whipped the back off and was confronted with an early ZX2000 chassis. Tapping the line output transformer I commented that "this is the weak link in these sets". I connected the meter to its feed resistor and got a short-circuit reading. "Instant diagnosis" I smirked.

I gave them an estimate and they popped off to consult their son, promising to phone within the hour. I thought I'd make sure and removed the transformer – no easy matter. It was shorted so I took a 3000 series transformer off the shelf and fitted the little base panel so that it would fit the 2000 chassis. I fitted it nicely and removed the focus and first anode controls from the tube's base panel, wiring the leads from the transformer directly to the base panel as the controls are on the transformer (in case you didn't know).

I fitted the e.h.t. cap and switched on, expecting to hear the rustle of e.h.t. All I heard was the h.t. humping unhappily. I looked closely at the panel and found that the 10Ω h.t. smoothing resistor had been removed. I'd made the test from the 4·7Ω resistor between the 10Ω one and the transformer. Clever me. So I fitted a 10Ω resistor and switched on again. Hump, hump.

I then checked more carefully and found that the previous repairer, not suspecting the transformer, had had a good go at the h.t. supply and that the circuit now didn't agree with the circuit diagram at all. At this point I lost patience. I removed the new transformer, refitted the old one and the controls and wrapped it all up just as I'd found it. When they phoned I told them it had been messed about with and that I hadn't the patience to sort it out. Sorry readers, very sorry – but it was late and I wanted my bath and a drink. I had both and then had to put up with a flying dog. What a life.

Letters

TVRO DISH INSTALLATION

The advice on using the sun to find due south, given in Part 1 of your satellite TV installation feature, seems to me to require some qualification. It takes no account of the so-called "equation of time", which gives the difference between the time read by a sun dial and clock time. The order of the difference can be seen from the mean between the sunrise and sunset times published in many daily newspapers. With a maximum value of about 18 minutes in November, the changes are of the same magnitude as those shown in Table 2 for different locations in the British Isles.

L.G. Whitehead, C.Eng.,
Theydon Boise, Essex.

Harold Peters comments: I have seen obscure references to this but decided to keep things simple. My readings certainly work out in practice here in East Anglia. Perhaps other readers would like to comment on this?

Mention should also be made of "sun outrages", which occur in late autumn and early spring when the sun follows the orbital plane, heating up a LNB with more s.h.f. than it can handle. The result is a noisy picture – also the possibility of a blown LNB. Even replacing a LNB can be a hazard at such times, due to the sun being focused on one via the dish.

RESISTOR PROBLEMS

Gordon Haigh's article on resistor troubles prompts me to make the following comments on the subject.

The convergence potentiometers used in some sets (the GEC C2110 series for example) have a tendency to burn out, particularly when an attempt is made to adjust them. The two line tilt controls in the C2110, P501 and P502, are used as simple variable resistors. These two controls are very often set so that less than half the track is in circuit, the power dissipation being confined to that section of the track – hence the tendency to burn out. Reliability can be improved either by using lower potentiometer values or by connecting a suitable value resistor in parallel with the original control. Where both ends of the track are in circuit, try a slightly lower value potentiometer with series resistors at either end to maintain the correct circuit resistance. These modifications will restrict the range of adjustment but the reliability will be improved.

A similar situation often occurs with the height control in a valve field timebase, particularly where the value of the control is 2MΩ or thereabouts. This can be replaced with one of a lower value – after checking the values of any series resistors and also the valve.

Finally a digression. My Feathertouch ITT CVC9 has recently been changing channels intermittently. I was just about to collect some tools when I noticed a fly walking about on the touch pads – perhaps it thought the red lights were strawberry jam or something! I've subsequently observed the same thing happen on a number of occasions. The only cure is to hang a small book over the front edge to cover the channel selector. This is worth bearing in mind if a customer complains of intermittent channel changing, particularly during the summer months.

S. Pearson,
Chipping Norton, Oxon.

UNUSUAL HUM PROBLEM

The problem with a Rank set fitted with the A823 chasis was a 50Hz hum bar. Closer inspection revealed that it was a slowly moving, sharply defined band of modulation on the field scan.

Theory number one was that the thyristor power supply was the cause. A new choke and electrolytics failed to fix it however. I admitted defeat and substituted an old faithful Thorn 3500 – only to get identical symptoms! We eventually discovered that the fault was present only when a newly acquired Philips G8 in a room twelve yards away was switched on.

Theory number two was interference via the mains supply, but examination of the mains filter capacitors and even trying a second G8 failed to cure the trouble.

Theory number three was that a magnetic field generated by the house mains wiring deflected the beam. This

seemed to be the case as the symptom could be made to come and go, on a monochrome portable, by juggling with the set's orientation.

Plugging a mains extension lead from the "transmitting" G8 into various mains sockets showed that some caused interference while others didn't. On further examination it appeared that following house extension work the ring main didn't join to form a complete loop between the two sets of sockets. The problem was cured by adding approximately one foot of cable to (I believe) complete the ring.

The above doesn't explain the fault mechanism completely however, as one would expect the magnetic fields from the live and neutral wires to cancel regardless of whether a ring main was present. Can anyone offer a better explanation – or has anyone suffered from similar effects?

J.C. Sparks,
Maghull, Merseyside.

PANASONIC TC202G

This set had been out for some three years with no problems. Then the customer started to complain about teletext lines approximately an inch down – he said they had started a week previously. After a couple of hours wasted checking components in the field timebase I decided to get in touch with Panasonic. Sure enough there's a modification – shunt D603 with an 0·47μF capacitor. This cured the fault perfectly, but why the condition started virtually overnight is anyone's guess.

J.K. Potts,
Stockport, Cheshire.

Editor's note: This modification was included in our May 1985 feature "Dealing with Teletext Interference".

DX-TV POWER SUPPLY

I've noticed in *Television* articles on DX-TV equipment where two separate power supplies are used, one to obtain 5V and/or 12V for the tuner, i.f. stages and modulator and the other to obtain a 33V tuning supply. A more attractive and considerably cheaper solution is shown in Fig. 1. It consist of a standard 20V supply with 12V and 5V regulators plus a voltage multiplier with a stabiliser diode.

The twin-ganged 22kΩ potentiometer is wired so that rotation of the common shaft increases the value of one resistor while reducing that of the other, thus maintaining a constant load on the supply as the tuning is varied.

R.T. Irish,
Totnes, Devon.

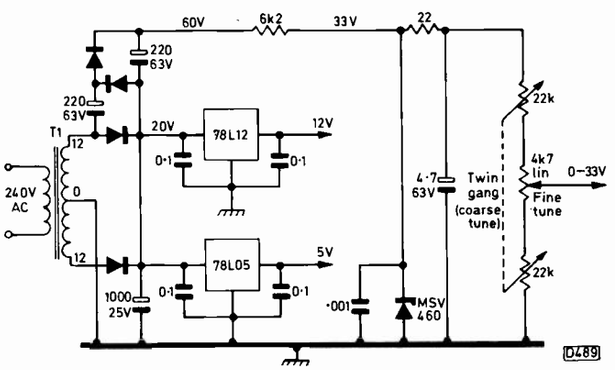

Fig. 1: DX-TV power supply designed by R.T. Irish. The MSV460 is available from Maplin Electronic Supplies (order no. UF29G). Diodes type 1N4003. T1 rating 6VA.

McMICHAEL MEMORIES

As Chas E. Miller pointed out in his article last January, the "McMichael Story" came to an end when GEC decided to close the McMichael plant at Slough in the mid-fifties. Founded in the mid-twenties by the Australian Leslie McMichael, the plant had operated for around thirty years, originally producing components as well as receivers – veterans will recall "Dimic" coils. Slough was the home of at least six early radio companies – KB were there before going to Footscray, and early Decca sets were made at a woodworks.

I left a dealer to join McMichael in 1934 and found their products better than most. There were good portable radios and mains superhets with twin speakers. They also made cabinets. A new design team headed by an ex-Cossor engineer called Thompson came on the scene in 1935. This produced a new style chassis and a change of presentation – the bow-fronted cabinet that endured into the fifties. A.C./D.C. receivers also appeared. Another innovation was a production manager with a rate fixer in attendance. They caused chaos between them and were eventually dismissed.

I was the first resident of Macs' (as we locals called the firm) first test cabin, putting radiograms through their paces. For easy handling of the grams it had a wall built on a turntable, but I had squatter trouble due to the canal beside the works. Each morning, at the first turntable movement, a large rodent would bolt from under the cabin – on one occasion one ran up my warehouse coat. This idyll was interrupted when I refused to pass machines with faulty tuning drives. I got the sack over that but two weeks later they asked me to return.

In slack times I migrated to R and D and can remember some dreadnought size TV gear though no TV sets were made at Macs before the war. My introduction to TV came in 1938 when I returned to a dealer. The 1939 slump sent me into aircraft work until I rejoined Macs in 1950. Work for various ministries had been carried out during the war but by the fifties consumer products were doing well. R.G. Holmes was at the time chief engineer of domestic R and D. He was a very active RSGB member and had a lady TV engineer in his team – a rarity then. Previously he'd been with Burndept-Vidor, to whom he returned in about 1953.

Several engineers followed Mr. Holmes. Before the Sobell takeover I'd been concerned mainly with radio work, also ministry testing – a lot of equipment went to Woomera. I left the firm in 1961 when I was bitten by an ecology bug and went out into the sticks to a mansion used for R and D work, but I had enjoyed most of the time I'd spent at Macs. Most importantly it was there that I met my own H.B., who ran an assembly line and subsequently took charge of me!

William Harrison,
Windsor, Berks.

BRING BACK TEST CARD F

Following Keith Lane's letter in the June issue on the lack of test cards and the subsequent responses in the August issue I'm prompted to comment on this subject.

The BBC discontinued regular transmissions of Test

Card F in favour of sample Ceefax pages during May 1983. It would appear that the blame for this lies at the door of BBC Presentation. Someone seems to be deluding himself (but not the viewing public) that if boring, repetitive sample teletext pages are transmitted instead of the test card a claim for extended hours of broadcasting can be established. Since 1983 the BBC has proudly listed "Pages from Ceefax" in the *Radio Times* and the press as if teletext is an extra programme. Test card transmission times were never listed in this way. In reality these Ceefax pages are just downright infuriating for all the reasons mentioned by Keith Lane. Even the jolly test card music has been toned down to the point of drabness!

After regularly transmitting a test card over the past thirty odd years the BBC calmly dismissed trade test transmissions as being irrelevant. In fact the BBC's Engineering Information Department has advised that the test card "should never be used for aligning TV receivers". Worse still, that a permanent impression could be burnt on to the tubes of all those brand new sets on display in showrooms. If that's the case there will be a lot of TVs around with the word "Ceefax" neatly etched in the left-hand corner!

It seems odd that a fully digital version was developed if the test card serves no practical purpose. For some strange reason this is normally transmitted only between 0815-0900 on BBC-2. How many TV service engineers are at work at this time? As soon as 0900 arrives bang goes the extremely useful test card and we're left with boring Ceefax.

If the idea is to boost sales of teletext receivers the broadcasting authorities should think again. I know of at least a couple of cases where viewers are under the impression that they are already equipped for teletext because these pages appear on their standard sets. If the breaks between programmes are filled with Ceefax and Oracle why should anyone bother to buy a teletext receiver? And the impression given is hardly favourable when viewers at 5.00 p.m. see the lunchtime news. As far as costs are concerned, perhaps someone could explain why, when trade test transmission hours were slashed to a couple daily in the early 70s to save cash, the money has now been found to keep the transmitters on air throughout the day in the hope of boosting teletext?

As far as the BBC is concerned it seems to be Presentation that's at fault. Perhaps all TV service engineers who, like Keith Lane, are infuriated by the discontinuation of test card F should send their complaints to the following address: Head of Presentation – Television, BBC, Television Centre, Wood Lane, London W12 7RJ.

Keith Hamer,
Derby.

LABGEAR TEXT ADAPTOR

I was extremely interested in Mr. Winston's letter on the subject of Tifax decoders in the August issue. I've been using a Labgear text adaptor unit and after clearing a number of faults in other parts of the circuitry enjoyed consistent results – apart from BBC-2 that is (missing lines and lines from another page left in). Considerable time and effort were spent in improving what was already a good BBC-2 signal. I even made up two traps in case the cause of the trouble was the proximity of two Marconi long-range radar scanners at Jersey airport, but the letter explains all. I'm now looking for a suitable replacement decoder. A friend who has the same unit had come to accept the fault "as one of those things". I'm sure that Mr. Winston's letter will be of reassurance to many who have been puzzled that the faults won't yield to logical fault finding.

G.R. Goldsmith, Eng. Tech.,
St. Brelade, Jersey.

EX-RENTAL TIFAX DECODERS

I've been using a Tifax XM11 decoder in a Thorn 3000 receiver for some time. In the mid-seventies the rental company I work for produced a retrofit package to convert 3500 series chassis for teletext reception. As these sets are now obsolete the decoders are readily available. After experiencing the symptoms your readers have described I tried another one in my set, also a replacement tuner and i.f. panel. I became convinced that the problem was due to the transmission rather than reception of the signal – reception problems with these decoders usually show up as incorrect text, but with the replacement decoder I had exactly the same problems as before, mainly on BBC-2. HTV had problems for a few weeks but then seemed to clear. I've learnt to live with the effect mainly by avoiding BBC-2. Waiting for a page to come round again and clear itself takes too long – it usually requires several goes before all the missing lines are there. Otherwise, apart from *very* faint vertical striations in the background of the picture, the results are excellent. I've noticed that these striations are also apparent with Thorn 9600 series receivers.

I'm sure that many people must still be using these decoders. They were fitted in many Ferguson sets that are still in use, with ultrasonic remote control. Incidentally I never use page 100.

Martin Cole,
Weston-Super-Mare, Avon.

PROBLEMS WITH TELETEXT

I would like to make the following comments in response to Mr. Winston's letter in your August issue.

Mr. Winston suggests that there are very few XM11s left in the field and that they are probably owned by TV enthusiasts. I don't think this is the case. The company I work for has about ten ITT receivers in the field using XM11 decoders (ITT Models TX791 and TX792), all owned or rented by ordinary customers. We are only a small company, so the number of XM11s in use across the country could be quite large. A more plausible reason why the BBC didn't get a response to the "XM11 only" row of text is that in my experience most people with teletext sets don't use text and would therefore not have seen the row of text in question. On a number of occasions when I've switched to text in a customer's home they've begun to ask questions about it, leading me to believe that they've not been using teletext.

Last week I had two teletext sets in the workshop. One was an ITT TX792 with the usual dry-joints causing intermittent field scan problems (ITT CVC30 chassis). The other was a Mitsubishi CT2206TX with low contrast due to a leak in C210 (0·01μF) which decouples the d.c. contrast control potential applied to IC201. Both sets have a mechanical arrangement on the tuning potentiometer flap to operate the a.f.c. switch. In both cases the a.f.c. was switched off, with the result that text could not be decoded correctly though the tuning was "near enough" to

produce acceptable pictures. These two customers could not have been using teletext.

Oracle set up a panel of 26 "eagle eyed" viewers to inform them of problems on the Oracle network. In my area (YTV) one of the "What's on" regional pages some weeks ago showed information for the HTV region. This wrong page was on for five days running and was corrected only after I phoned the Oracle editorial office in London. The correct page appeared in less than half an hour after phoning. So what were YTV's "eagle eyed" viewers doing for five days? Not watching teletext, that's for sure! I understand that the Oracle viewers panel has free access to Oracle.

A friend of my wife was at our home recently when a newsflash appeared on our TV. She was most impressed with this. She has a teletext receiver but didn't know that every teletext set is capable of this (except ITT Digivision). I had to explain to her how to "program" her set to receive newsflashes.

On the subject of newsflashes, it would be appreciated if BBC-2 Ceefax could change their newsflash page to 150, as Ch. 4 did. After all BBC-2 now has a page 100, presumably for the benefit of those decoders that initialise on 100. Also all four channels have standardised on 888 for subtitles. So why be the odd one out on newsflashes?

When faults occur on teletext we very seldom get complaints from our customers. This again suggests that few people use teletext – we soon get calls when faults affecting the quality of the picture or sound occur.

Oracle don't seem to take any notice of my comments either. I've written three times in response to messages on pages 198/598 requesting viewers comments but have not received any reply. Faults and errors are still present. Ch. 4 still occasionally shows the text from the page after the one requested, the Oracle post code on page 223 on Saturdays and Sundays is wrong (WIV ILL should be W1V 1LL), and the Oracle clock in London is not always locked to Rugby MSF. This latter results in different times on the national and regional magazines. It's annoying with my XM12 decoder as this takes the data for the time display from all the magazines not, as with the Mullard decoder, just the one called up. So when the national and regional clocks are out of sync my display flashes between the two times. At the time of writing MSF Rugby (60kHz) is off the air for annual maintenance, but Oracle lose Rugby even when it's transmitting correctly – I can check this with my own "Rugby" clock. The TV programme pages are usually not updated when there are late changes in the schedule. Surely this shouldn't be too difficult to arrange? There's always the usual crop of typing errors, but as most pages change daily the only way to get them corrected is to phone, when they are corrected very quickly. But why should they be there in the first place?

Coming back to the XM11, it's obvious that the broadcasters are hoping that these decoders will just "go away" as they do not attempt to make sure that the display with the XM11 is free from spurious characters and graphics shapes. These can't be seen on decoders with background colour as they are of the same colour as the background. If the mix button is pressed however these characters can be seen – provided the decoder mixes in colour. The XM12 doesn't mix in colour unless it's fitted with the later character generator chip (TX121A). The TX121 mixes in white, showing all character and graphics except of course background colour.

Regarding my earlier comment on the teletext newsflash not working with ITT Digivision sets, the receiver I'm referring to is the one fitted with the eight-page memory. When a page is selected on these sets the next consecutive seven pages are stored. By pressing the up and down buttons these pages can be displayed instantly. If the newsflash (150/520) is selected however the newsflash appears as normal but when the update button is pressed the page header appears in green, i.e. search mode, and when the page is recaptured it's as before. It cannot be removed form the display unless "picture" is selected. But this defeats the object of the newsflash update facility. The information book tells the user how to get subtitles but doesn't mention newsflashes. But again, no complaints from customers.

The fact that many people have teletext sets but don't use the text option could be because a lot of people wanting sets with remote control have been sold teletext sets. My company and, I suspect, many others have done this: it reduces the number of models we have to stock. We are now stocking teletext convertible models however (ITT FST mostly). This presents another slight user problem. The remote control handset has all the text function buttons and if the user inadvertently presses the text button on a receiver not fitted with a teletext decoder the receiver won't change channel until either the set is turned off and on again or the picture button is pressed. Hopefully this customer finger trouble is now being explained by the showroom staff, thus preventing wasted service calls.

In conclusion, while teletext was a brilliant UK invention it hasn't been without its problems. One customer has told me that by the time the page he wants appears he's fed up with waiting and has gone back to watching "normal TV". Has anyone else noticed that the Ceefax transmission rate slows down dramatically at times?

After my first letter was published in *Television* I received phone calls and letters from the IBA, the BBC and YTV. I hope that this letter is seen by Oracle and Ceefax and that the various problems mentioned will be sorted out.

L.D. Sears, Chief Engineer,
Hepworth and England Ltd.,
Batley, W. Yorkshire.

TIFAX PREFERRED

I bought a Tifax XM11 decoder in September 1977 and installed it in a Sony KV1330UB, where it has given excellent service until exhibiting the problems mentioned in your pages, i.e. some lines missing on certain channels. At present BBC-1 is always correct, BBC-2 gives every fifth line missing, ITV sometimes misses every fourth line but on reselecting the page it may be complete, and Ch. 4 is correct. It also seems that for a given page the same lines are always missing.

I agree that putting a message on page 100 is not a good way of attracting attention, as few people select that page at switch on. A flashing message near the top of page 102 on BBC-1 (news index) would have been better.

As far as solving the problem is concerned, how about making the datacast line the last data line in each field rather than burying it amongst the teletext lines?

It would be a pity to have a to junk all the XM11s in use. Personally I prefer the Texas character generator format to that used in the Mullard decoder, and the loss of the extra features is no great problem.

G.L. Steer,
Chessington, Surrey.

Satellite TVRO Installation

Part 3

Harold Peters

In this instalment we'll get down to the finer details of satellite TV reception – we'll keep the maths as simple as possible however. Let's start with the signal.

Satellite Footprints

Maps of a satellite's footprint are presented in one of two ways: either the transmitted power or the ground field strength. The two are related as follows: EIRP (effective isotropic radiated power) in dB above 1W minus the path loss equals the PFD (power flux density) in Watts per square metre. For most of the UK the EIRP seen from Eutelsat-1 is 49dBW (see Fig. 1 last month). Since the path loss is 163dB the PFD is -114dBW/m^2. So the footprint contour could equally well be labelled 49 or -114. Why is the attenuation in free space quoted as 206dB which differs from our path loss by 43dB? Simply because the attenuation in free space is measured at a point source, the 43dB gain being the signal collected on a one square meter surface such as a dish, assuming no losses.

Dishes

Spun aluminium or fibreglass dishes are the most efficient, but even so have an efficiency of only 55 per cent. Here are some typical gain figures:

1·5m diameter dish (1·76m^2), 43dB gain, beamwidth 1·25°.

2m diameter dish (3·14m^2), 46dB gain, beamwidth 1°.

3m diameter dish (7m^2), 50 dB gain, beamwidth 0·5°.

4m diameter dish (16m^2), 53·5dB gain, beamwidth 0·3°.

Notice how the beamwidth decreases as the dish diameter increases, just as with a telescope, making signal capture more difficult and precise a matter.

The gain of a petal dish is 2-3dB lower than that of a solid type, and slack assembly can worsen this figure. The gain of an offset dish is 1-2dB better than that of a centre-fed dish. Dishes for the C band (Gorizont) don't work as well at 11GHz because their focusing becomes somewhat astigmatic at the higher frequencies. Oddly enough, mesh dishes are no better in wind than solid ones. Mesh size varies with the band: one maker's C band mesh has about 100 holes to the inch while his Ku band mesh is about 325 holes to the inch.

Table 1. Essential data and formulae.

True south is 7° to the right of magnetic south.

Decibel calculations are in wattage terms (i.e. 10 log A/B). So one dB can make quite a perceptible difference.

Azimuth = Arc tan (tan A/sin B), where A is the longitudinal difference between the site and the satellite and B is the latitude of the observer. Worked example: for Eutelsat 1 Birmingham is 18·4°E of south or 161°W of true north.

Elevation = Arc tan [(cos C − 0·151269)/sin C], where C = Arc cos (cos A × cos B). Worked example: for Eutelsat 1 Birmingham is at 28·5°.

Polar mount declination = Arc cos [(1·81 × sin latitude)/(3·36 − cos latitude)] × 0·5. Worked example: Birmingham = 6·9°.

Path loss: power flux density = $P/4\pi r^2$, where P is the satellite's EIRP and r is the distance in metres. The result is given in W/m^2. Worked example for Birmingham on Eutelsat 1:

Distance = 38,750km or $3{\cdot}875 \times 10^7$m.

Log 4 = 0·6021, log π = 0·4971. 2 × log 3·3875 = 1·177, 2 × log^7 = 14. Total 16·3 × 10 = 163dB path loss. EIRP is 49dBW, less 163dB path loss = -114dBW/m^2.

PFD to field strength conversion: -114dBW/m^2 = 4 picowatts per m^2. Watts = V^2/R, where R is the impedance of free space which is 377Ω. Crossmultiplying we get 38·8μV/m^2. Note that heavy rain reduces the PFD by up to 2dB.

Noise factor in dB is 10 log(T/290 + 1)dB where **T** is the noise temperature in °K.

Noise

Noise is if anything more important than gain. A carrier-to-noise ratio of 10dB with f.m. gives the same order of picture quality as a 38dB signal-to-noise ratio with a.m. Calculations give the theoretical noise produced by a current satellite receiving system as -122dBW, so with a minimum carrier-to-noise ratio for a decent picture of 10dB the collected signal ought to be -112dBW. The PFD (power flux density or field strength) of Eutelsat 1 is -114dBW/m^2, to which must be added 3dB to allow for a dish efficiency of around 55 per cent. This gives us a figure of -117dB, some 5dB short. At 3dB/m^2 of dish area we thus need a dish of about 2m diameter – which ties up with the practical and common use of 1·8m (6ft) dishes.

As with a standard TV set the important noise is that at the front end, which with a satellite receiver means the LNB. Perversely, noise temperature is the parameter most often quoted. This is given in degrees Kelvin, absolute zero being 0°K. The figure to remember is 290°K (17°C or 65°F) which is a noise factor of 3dB.

This needs qualifying. Noise factor is the ratio of the noise added to a system by a device (such as an LNB) compared to the noise added at the same temperature by a pure resistor of like impedance. Put the other way round, noise temperature is how hot or cold the resistor

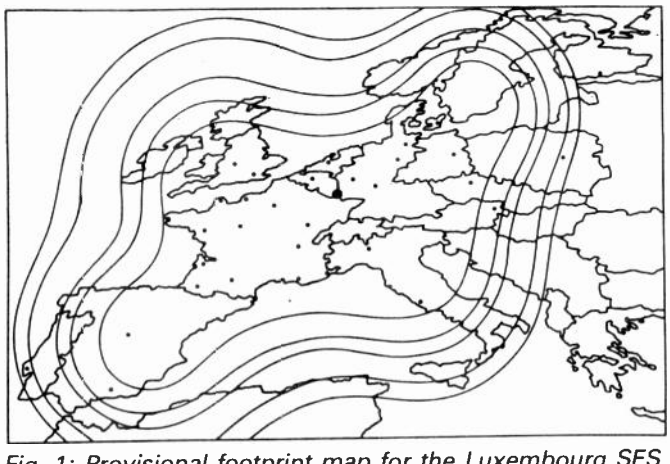

Fig. 1: Provisional footprint map for the Luxembourg SES Astra satellite at 19°E. The EIRP within the centre contour is specified as 50dBW. Astra will have sixteen channels within the band 11·2-11·45GHz.

would have to be to give the same noise as the device, e.g. amplifier. Since resistors are dead quiet at 0°K, at this temperature the noise is 0dB. We can expect noise factors of 3dB with only the cheapest of current LNBs.

The improvement in system performance is better than the noise factor suggests, since the true improvement in dBs is that of the dB difference of the noise temperatures (see Hugh Cocks' excellent explanation in the April 1985 issue).

Provided the carrier-to-noise threshold is exceeded, certain economies are possible. A "better than normal" LNB will enable a smaller dish to be used. This trade-off is quantified as the G/T, or figure of merit. G is the system gain and T the total noise temperature, the ratio being expressed in dB per degree Kelvin (dB/°K). Since receiver specifications seem to be fairly similar, the simple table of satellite EIRP against dish size for low and high noise factors (see Table 2) is all you need in order to get by.

Splitting the Signal

With four programmes coming in simultaneously using one polarisation it's tempting to split them and run to more than one receiver, especially to create showroom interest. This is easy to do at the first i.f. (900-1,400MHz) and if only a two-way split is required a passive splitter can be used. Remember that the LNB receives its d.c. supply from a single set, so a d.c. block must be included between the splitter and the other set. Active spitters will divide the signal many ways, lifting the signal back to unity gain without adding appreciable noise. They provide a d.c. feed for the LNB while blocking the d.c. from the receiver bank.

Programmes and Politics

The currently available channels are listed in Table 3. At the moment only Sky is scrambled. TV5 is in SECAM colour however. The rest use PAL colour encoding. Sky and Music Box use the Wegener stereo sound system, with intercarriers for the left and right channels at 7·02 and 7·2MHz respectively: ordinary mono sound is provided on an intercarrier at approximately 6·5MHz. Europa TV intends to broadcast multilingual sound: English at 6·65MHz, Dutch at 7·05MHz, Portuguese at 7·2MHz, German at 7·38MHz and Italian at 7·56MHz. Some broadcasters use non-standard de-emphasis, resulting in sibilance on sound unless the correct compensation is applied after demodulation.

Scrambling presents a problem. Eutelsat's original dictum was that all programmes should be scrambled. Paradoxically Sky, using Oak-Orion encryption, gets into more European homes than the unscrambled programmes. Decoders are expensive however, and until a cheaper, more readily reproducible system comes up the other channels are likely to remain clear. Collecting subscriptions from TVRO users is a problem that wasn't bargained for at the beginning: unless it can be done in the form of something like an annual licence fee the broadcasters are likely to prefer to get their revenue from advertising or other commercial methods.

Scrambling also adds to the signal something that reduces the available bandwidth, though the cable broadcasting standards are as stringent as those of the BBC and the IBA. Provided the noise performance is good, impairment due to inadequate bandwidth tends to pass

Table 2: Signal margin over threshold.

Dish size	1·2m		1·8m		3m	
LNB noise factor	low	high	low	high	low	high
Satellite EIRP	dB over threshold					
47dBW	4·7	2·8	8·3	6·4	12·7	10·8
46dBW	3·7	1·9	7·3	5·4	11·7	9·8
45dBW	2·7	0·9	6·3	4·4	10·7	8·8
44dBW	1·7	−0·1	5·3	3·4	9·7	7·8
43dBW	0·7	−1·1	4·3	2·4	8·7	6·8
42dBW	−0·3	−2·1	3·3	1·4	7·7	5·8
41dBW	−1·3	−3·1	2·3	0·4	6·7	4·8
40dBW	−2·3	−4·1	1·3	−0·6	5·7	3·8

Low noise factor taken as 220°K (2·5dB), high noise factor 350°K (3·5dB).

Table 3: The software.

Intelsat VA F11

Premiere: Feature films.
Children's Channel: Children's programmes – uses the Premiere transponder during the day.
Screen Sport: Six or more hours of sport every evening.
Lifestyle: Leisure programmes (cookery etc.) on the Screen Sport transponder during the day.
Arts Channel: Pre-breakfast use of the Screen Sport channel for cable networks to prerecord operas, recitals, etc.
CNN: Ted Turner's 24-hour Cable News Network service from Atlanta, USA.

Eutelsat 1-F1

Music Box: Pop music. Programmes repeated every six hours over eighteen hours. Changed daily.
Sky: General entertainment and feature films. Scrambled.
TV5: French general entertainment channel. SECAM colour.
Sat-1: German general entertainment channel.
Teleclub: Feature films transmitted from Switzerland.
Filmnet: Feature films transmitted from Belgium, often with Flemish subtitles. World Public News (WPN) uses the channel in the early morning.
RAI: Italian public service channel. Includes a full teletext service.
Europa TV (formerly Olympus): Joint EBU venture with multilingual sound.

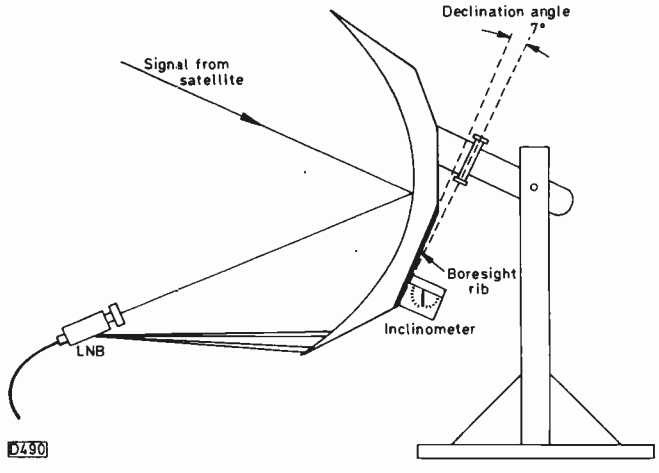

Fig. 2: Setting up an offset dish. The true elevation of the dish is given by the boresight rib, which is usually marked as such on the dish moulding. Declination can be tricky to set: it's a difference of about 7° between the boresight angle and that of the hinge itself.

unnoticed on TVRO systems. This is hardly surprising when you consider that domestic VCRs substantially reduce the resolution of everything they reproduce with little complaint from the millions of users – apart from that of poor sound quality!

Satellite Lifetime

Satellite lifetime cannot be guaranteed. We've already seen the deterioration of the TWTs (travelling-wave tubes) used on Eutelsat-1 for the Sky and Filmnet transponders, though the loss of power has been compensated by increasing the uplink power at the Isle of Dogs Teleport. As a "belt-and-braces" exercise Filmnet has booked a spare transponder on Intelstat VA F11 at 27·5°W just in case this boost doesn't last. The loss of Eutelsat 3 has meant that those wishing to use it must wait for Eutelsat 4, which was originally designated as a "spare" satellite. This one too has been delayed by the troubles with the Ariane rockets. At the moment however there are more spare transponders than there are channels to fill them, especially on the Intelsat birds. Intelsat VA F11 has six transponders available and its capacity could be doubled by half-transponder use (as with Premiere and Screen Sport). In Germany increasing use is being made of Intelsat V F7 at 60°E – your dish has to be almost horizontal for this one. It has four unscrambled German channels including their Musicbox.

DBS

The first DBS (direct broadcast satellites) were due to go up at the turn of the year. The German TV-Sat-1 and the French TDF-1 will be at 19°W, each with four transponders and EIRPs of 62dBW, which is 2ft dish power. Transmissions will be in the higher 12GHz band, with D2-MAC as the transmission system.

Astra

Also due up next spring, at 19°E, is the Luxembourg SES satellite, now called Astra. This will operate in the 11GHz band with sixteen channels and will not insist on MAC or scrambling. It could well upset the applecart for the 12GHz broadcasters since no additional equipment will be required to receive it. The EIRP will be 50dBW, which corresponds to the use of a 90cm dish – or even a 60cm one with a good LNB. Moreover TV-Sat and TDF-1 are both beset by political troubles. The German Lander (state governments) cannot agree on what should go up on TV-Sat and the new French government has yet to arrange new channel allocations. So much remains unresolved.

Receiving DBS Transmissions

For the viewer D2-MAC broadcasts will involve the purchase of a MAC decoder and receiver and, because of the higher band used, another LNB. The use of MAC will also require broadcasters to install new studio equipment, links etc. What seems to have been ignored in all this is the view of "the man in the street", who at the end of the day will have to fork out to keep the services going. Those I've spoken to seem to think that they pay enough already for their viewing. New broadcasters will not find it easy to keep up the quality expected by people who for years have enjoyed the excellence of the BBC and the IBA.

TV Fault Finding

Reports from Les Grogan, Philip Blundell, Eng. Tech., Larry Ingram, Roger Burchett, Keith Hamer, Garry Smith and Michael Dranfield

Panasonic TC2213 (U3W Chassis)

A dark picture with no channel changing or memory storage was traced to the 12V regulator transistor Q552 (2SD762) being open-circuit from base to collector. If there's no memory storage after tuning a station in check first that −24V is present at pin 1 of IC1101 on the remote control panel with the tuning switch in the preset position. If this voltage is present, replace IC1101. If it's absent, check the regulator transistor Q1101 (2SSA684) and for dry-joints at plug E7 by the line output transformer. **L.G.**

Thorn TX9 Chassis

Fuse blowing in one of these sets was found to be due to the mains filter choke L64 shorting between the live and neutral connections. A clue is provided by the fact that the mains fuse blows with the set switched off as the fuse and choke are fitted on the mains side of the on-off switch. **L.G.**

Decca 100 Chassis

I recommend the following procedure for the field engineer faced with a blown 3·15A mains fuse in one of these sets.

First replace the fuse and disconnect the e.h.t. tripler. Check the mains bridge rectifier diodes on the power supply panel with an ohmmeter. It's common to find that two of these are short-circuit. In this event replace all four. Disconnect the crowbar trip disabling link on the power panel and, keeping one hand near the on-off switch, switch on. If the set bursts into life, with normal sound, replace the tripler. Should the set remain dead, with the cause of the fault not becoming obvious, e.g. dry-joints on the convergence panel sometimes burst into flames due to the crowbar being disabled (hence the need to keep one hand near the on-off switch), switch off and feel the line output transformer windings. Replace the transformer if these are warm. If they remain cool, check the S-correction capacitor (C508) on the convergence panel and the line output transistor and EW modulator diodes (D401/2) on the line output panel.

Less common causes of fuse blowing are the TBA920 sync/line generator chip on the timebase panel and the field output transistors. The latter can easily be unplugged for testing.

This should enable the fault to be cleared in 90 per cent of cases. Don't forget to reconnect the link on the power supply panel to restore crowbar protection. **L.G.**

Telefunken 615 Chassis

No raster can be a tricky fault to find with these sets. It's wise first to make sure that the field timebase is working by looking at the screen when the set is switched off. If it has failed the field collapse will be briefly seen – to be sure, turn up the A1 control. Field collapse is usually caused by R291 going open-circuit.

Some models use a TDA3562A colour decoder chip which delays the picture while the auto grey-scale circuit operates. In one case we had the set was permanently in the delay mode. The supplies and the sandcastle pulse were o.k. and video was going into the chip. But only a needle pulse was coming out. The tube's cut-off point is sensed via a transistor in each colour output stage, the feeds being connected together at transistor T464. T464, T465, D516 and D514 were all changed before the culprit was discovered – D515 (1N4148) was leaky. **P.B.**

ITT CVC820 Power Board

This set kept blowing TDA1170 field timebase chips. It was soon found that twisting the chassis caused the e.h.t. and the supplies to rise dramatically, but no dry-joints could be seen. I tried scope checks around the line output transistor and found that the base drive waveform increased when the fault occurred, though the 124V h.t. supply remained constant (the line drive is taken from the chopper transformer). L411 was found to have a broken leadout. **P.B.**

ITT CMR800 Series Module

If you encounter weak field sync in ITT sets fitted with the combined tuner/i.f. module see if the sync returns on a weak signal. If so change C209 (100μF) – it's near the SWAF. **P.B.**

Rank Z718 Chassis

On a normal transmission the picture just looked grotty, nothing very specific. With a test card however it could be seen that all black verticals had a following white smear. 3C48 (100μF) which decouples the supply to the TCA800 colour demodulator/matrixing chip was found to be open-circuit. **L.I.**

Hitachi NP81CQ Mk. II Chassis

We've had several of these sets in recently. The first would intermittently go to standby and it was soon deduced that the signal from the remote control panel was the cause. We found that the μPD1514C chip (IC1401) was running hot and that the voltage across ZD1401 was down to 3V instead of 5V. Replacing this zener diode cured the trouble.

On the second set a thin white line would sometimes appear about two inches from the bottom of the screen – line grouping, not fold-up. Gentle pressure on the field output module cured the problem, but this gets very tiring! Soldering the joints on the mother board didn't help, neither did removal of the module and gently resoldering the pins. A new module had to be fitted to cure the trouble.

The final set caused a bit of confusion due to the symbols on the rear cover. The LA7801 timebase chip had been replaced because of intermittent field collapse and all seemed to be o.k. on the bench. After the set's return to the customer however it was reported that line lock was sometimes very hesitant on changing channels with the handset – the set once refused to lock at all until it had

been switched off and on again. On the set's rear cover there are two holes with rectangular symbols, each containing a vertical or horizontal line terminated with arrows. The vertical one was obviously the field hold control and a tweak on the other appeared to clear the fault. Until the next day, that is. When we consulted the manual we discovered that we'd adjusted the horizontal phase (shift) control. The line hold control is R708 which is adjusted in the conventional manner, with the sync feed disabled (connect a 1μF capacitor from TP701 to chassis).
L.I.

Philips TX Chassis

The problem with this set was bent verticals. The voltages at the video driver transistor TS350 were low while the voltage at the collector of the a.g.c. amplifier transistor TS351 was high. D351 in TS351's emitter circuit read 25Ω each way! **L.I.**

GEC C1401H

The line had a tendency to pull when the tuning was adjusted, but it could just be set up all right with sound, vision and colour. When the aerial lead was disconnected however the colour sometimes dropped out. One of the pulse feedback resistors in the flywheel line sync discriminator circuit, R519 (22kΩ), was found to be open-circuit.
L.I.

Grundig CUC Series Chassis

Intermittent increase in height in a set fitted with the 29504-007.01/05 timebase module was traced to R2784 in the field timebase feedback network being open-circuit at one end. **L.I.**

Rank T20 Chassis

The original fault with this set was intermittent field collapse. The cause was a dry-joint at pin 12 of plug 4Z2. While we were about it we changed the 910Ω resistor (4R16) in the 12V regulator circuit and the 1Ω resistor (5R8) in the line output transistor's base circuit and attended to suspect joints on the line output panel. When we switched on we found that the 36V rail was down to 26V and that the e.h.t. and first anode supplies were low. A great deal of time was spent on checking what we'd done and on panel swapping before we decided it was either a dream or that something quite silly had been overlooked. It had! On some of these sets there's an official modification on the signals panel: an earthing strap is connected from pin 9 on plug 3Z6 to the chassis screw. This strap had shorted across to pin 8, which is the pulse feed from the line output transformer. Moving the lead and remaking the connection cleared the fault.

Another of these sets lead us a dance. The initial fault looked like intermittent field scan reduction to about two-thirds of normal. The field output transistors and plug 4Z2 were checked and heat and freezer were applied but nothing came to light. The only clues we had were that the fault showed up less when the set was warm and that the l.t. rails were a little unsteady. The fault was still present after the holidays (!). We decided to replace some of the items we'd previously changed. When we switched on the line timebase worked briefly then went off. A new timebase drive panel restored normal results so at least we knew where the fault was. We eventually found that the 12V regulator transistor 4VT7 was open-circuit base to emitter. **L.I.**

Grundig GSC100 Chassis

There was intermittent loss of sound and vision, with the c.r.t. heaters still alight and the h.t. present. After two minutes R607 in the start-up circuit would open. Rectifier diode Di511, which is fed by the combi coil, was found to be going open-circuit intermittently. **L.I.**

Rediffusion Mk. 5 Chassis

Like many engineers I suspect, I'm getting more and more Rediffusion sets in for service. Two Mk. 5 colour portables came in recently. The first was dead but tried to start when the board was touched. Pin 1 of IC701 in the chopper circuit is connected to the print by a screw which is then soldered – not very well in this case. Resoldering and adding a link to the body of the i.c. for good measure restored normal operation.

The second set was tripping. Reducing the setting of the first anode preset stopped this and observing the set in the dark revealed absence of the luminance signal. The colour decoder i.c. (IC801, type IX0195) was faulty.

Incidentally, these were both the later version of the Mk. 5 chassis. **R.B.**

Philips CTX-S Chassis

The symptom with this set was an illuminated raster with sound: the brightness control seemed to operate and at certain settings a very faint picture could be discerned. Adjustment of the contrast control had no effect. This latter point gave us a clue. Beam limiting is carried out via the contrast control network, the sensing point being pin 7 of the line output transformer. This pin is decoupled by C2565 (0·039μF) and when this was replaced an excellent picture was obtained. Incidentally C2565 is in an extremely awkward position, hidden between the line output transformer and the heatsink.

A similar fault affects the KT3 series chassis where the relevant capacitor is C565 (0·15μF). **K.H.-G.S.**

Rank Z718 Chassis

This set had no picture – just a bright raster with flyback lines. Our first step was to check 3R55 (120kΩ) which feeds line pulses to the TCA800 chip. It was o.k. but we changed it for good measure. Attention was then turned to the black-level circuit where 3VT10 (BC328) was found to be short-circuit. When this was replaced we were presented with a bright red raster with flyback lines. This second fault was traced to the red output transistor 3VT7 (BF338). **M.D.**

Rank T22 Chassis

A friend of mine asked me to look at this set. He'd bought it cheaply from a local repairer who'd given up trying to fix it – the problem was slight lack of width. On investigation we found that all the transistors in the width circuit had been replaced. I decided to start by checking the effect of the width control. A slight turn and normal width was obtained. Any idea why this hadn't been tried in the first place? **M.D.**

The Operation of Electric Motors

Part 3

Mike Phelan

This month we'll look at the operating principles of those motors that switch the current through either the rotor or the stator and will thus operate from a d.c. supply. The choice of name for this group of motors presents something of a problem. We could call them d.c. motors, but some of them will operate on a a.c. The term "commutator motors" could be used, but repulsion and repulsion-start motors, which operate quite differently, also have commutators but won't operate on a d.c. supply. Furthermore the direct drive motors now employed in many video and audio applications don't have commutators but operate by the same rules! We'll settle for "d.c. motors" and accept the fact that some of them will also operate on an a.c. supply. These motors, used in many first-generation VCRs, also train sets, model cars etc., have a permanent magnet stator and a wound rotor. At this juncture we should point out that with a d.c. motor these items are known as the field and armature respectively. Henceforth we'll refer to them by their proper names.

As we have seen, if a conductor carrying a current is placed in a magnetic field a force will be exerted upon it. This is due to the fact that the current flowing through the conductor creates a field around it, this field repelling or attracting the primary field. In an induction motor the moving primary field is produced by the a.c. supply, the rotor field being induced by the difference in rotational speed between the stator field and the rotor – this never reaches zero. With the synchronous motor this principle is taken a stage further, by using a permanent magnet rotor. If we reverse the roles of rotor and stator the idea will still work, assuming we can devise a method of getting current to the rotor. Two slip-rings will fill the bill: these are copper rings mounted on but insulated from the shaft, and each other, and connected to the windings. Carbon brushes can carry the current to the slip-rings.

We've now created an inside-out synchronous motor, with no advantage and extra complication. If we apply d.c. to this motor the armature (rotor) will line up with the poles of the field (stator). Nothing further will happen, except maybe some smoke from the windings, as the d.c. supply is not very interested in the inductive impedance of these. If we reverse the supply however the armature will turn (in either direction) until it lines up with the next set of opposite field poles. The solution is near! Replace the slip-rings with a commutator (see Fig. 1) and the armature windings will provide two poles (see Fig. 2) which remain more or less stationary as the motor rotates, each winding being transferred from one side of the circuit to the other.

Fig. 3 shows the principle of commutator switching. The two brushes are shown shorting windings A and B. When a brush shorts a winding out the current flowing in it is momentarily reduced to zero. Once the brush has passed the coil the current flowing in it will have been reversed, along with the magnetic field.

For a given design the speed of this type of motor depends on the load and the supply voltage, so for video and even audio applications some form of servo control is clearly obligatory. The first method of speed control used, for audio applications, was a centrifugal governor on the armature. It shorted out one of the windings. This was followed by more sophisticated methods that are still in use today, mainly on cassette deck motors. One such approach is to supply the motor through a series regulator and monitor either the current drawn or the back-e.m.f. produced by the switching of the inductive windings. The result is used to correct the motor's speed by varying the series transistor's base current.

The construction of these motors varies (see Fig. 4). Armatures for d.c. use can be made of plastic. In VCR motors the armature often consists of just the windings encapsulated in epoxy resin. Motors in the "toy" class often used the tripolar form of armature, which allows plenty of space for the windings but isn't a smooth runner.

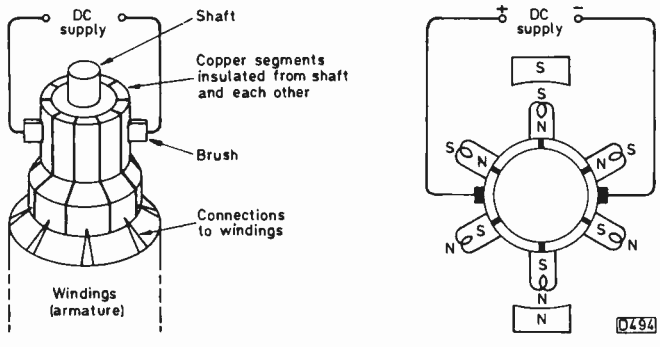

Fig. 1 (left): Basic commutator arrangement.
Fig. 2 (right): Poles provided by the armature windings.

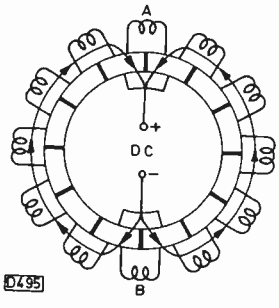

Fig. 3: Principle of commutator switching.

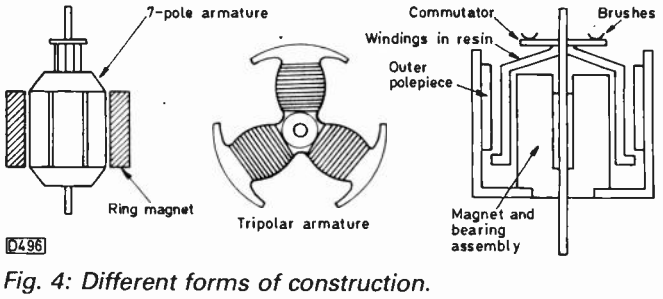

Fig. 4: Different forms of construction.

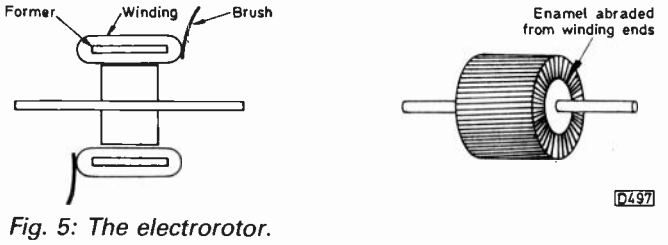

Fig. 5: The electrorotor.

Another oddity was the electrorotor (see Fig. 5) where the commutator simply consists of the ends of the windings with the enamel abraded away! Most modern motors of this type have either a disc or a cylindrical commutator – see Fig. 6. The disc commutator saves on length. Brushes can be made of either carbon or a metallic alloy such as phosphor-bronze. The former has better wearing qualities.

By the very nature of the arrangement the brush gear generates sparks and therefore interference, which is unacceptable for consumer electronic applications. This is easy to remedy however by the expedient of connecting *LC* filters in each lead (see Fig. 7). The coils are usually wound on toroidal ferrite cores and the capacitors are of the ceramic type. Badly worn brushgear can generate interference despite these precautions however. In a VCR the result is an effect similar to that produced by defective static earthing of the video head shaft, i.e. random white flashes on the display.

Brushgear wear is the usual reason for replacing this type of motor. Next month we'll explain how to carry out limited repairs. To round off it's worth mentioning that this type of motor will, with a wound field connected in series with the brushes, operate from an a.c. or a d.c. supply. This type of motor powers most of our electric drills, vacuum cleaners, spin dryers, etc. It's the ideal choice for such applications as, other things being equal, the torque is inversely proportional to the speed. It also lends itself to speed control on a.c. by using a thyristor or triac and varying the firing point. High speeds can be achieved – indeed running this type of motor without a load can result in centrifugal disintegration!

Next month we'll consider different ways of connecting the windings on d.c. motors and how to repair them. Finally a comment on Ian Foskitt's letter last month (page 710). The choice of "universal" as a general name was probably unfortunate, for the reasons he gave. As the opening paragraph in the present article shows however, trying to separate non-induction motors into a group and naming it will either include a class we don't want to include or exclude one we do want to include. Furthermore when we come to direct-drive motors, are these polyphase synchronous motors that generate their own frequency or d.c. (sic) motors with electronic commutation? We are back to the point made in the first article – that basically all electric motors work on the same principle!

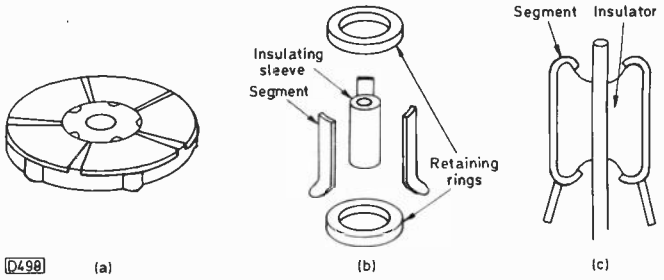

Fig. 6: Types of commutator: (a) disc; (b) cylindrical type A; (c) cylindrical type B.

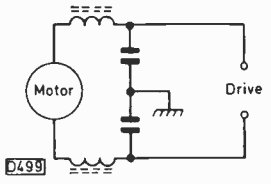

Fig 7: Use of filters to suppress interference.

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NATIONAL PANASONIC TC2201

The trouble is unstable green line tuning. The green band won't stay still – it keeps going wide and narrow.

If the effect is the same on all six channel selector buttons, check the tuning voltage stabiliser D1028 (TVSUPC574J) and the smoothing capacitor C1029 (10μF) before suspecting the a.f.c./magic line chip IC951 (AN320). Note that C1029 is on the power supply panel. If the symptom is confined to some buttons, latchety switches or potentiometers could be responsible. They may have to be replaced but try cleaning them. The tuner could also be responsible. A microammeter connected in series with tuning pin 5 will show whether there's any internal leakage.

SONY SLC7

Whatever mode it's in the machine stops after about two hours, then rewinds fully. No functions other than eject are possible after this. It takes several hours before normal operation is restored. When the tape has rewound fully in the fault condition the tape-end alarm bleeps.

The problem is due to failure of the tape-end sensor – this can be proved by connecting an oscilloscope to pin 5 of connector CN4013. Check carefully for dry-joints at the sensor head on board SY11 before suspecting IC8 (BX342) and its supply voltage (there should be 12V at pins 1 and 10).

GEC C2110 SERIES

The edges of objects in the picture have a blue cast which is most noticeable with dark items against a light background – dark parts are fringed with blue that smears on to whites and pale colours. Also a blue scene background will spill over from left to right. With the red and green guns switched off the blue colour appears "noisy". The set has been fitted with a new tube.

There's probably a fault in the blue output stage. Check the emitter decoupling capacitor C321 (0·001μF), the BF336 output transistor TR301, also R314 (27kΩ) and C319 (33pF) in the feedback circuit. The TBA530Q chip (IC302) could be defective. You might find it necessary to change more than one of these components.

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TELEVISION OCTOBER 1986

SHARP VC7300

The clock works but the head drum motor is running all the time and no functions other than eject and cassette load/unload work.

This symptom is usually indicative of a stuck or faulty UL (unload) or AL (after load) switch. These are SW01 and SW02 on the deck.

SONY KV2704UB

The trouble with this set is bowing at the sides of the screen. The d.c. voltages in the pincushion correction circuit seem to be correct though the waveforms differ in amplitude from those shown on the circuit.

We've come across this fault on several occasions. In each case it has been due to failure of the pincushion output gate-controlled switch Q808 (SG264A). Fortunately this particular GCS is cheaper than most other Sony GCSs.

GRUNDIG 2 × 4 SUPER

There's a very snowy picture on playback despite new heads having been fitted. Also the clock which doubles as a tape used counter on playback is giving wrong readings – the clock chip has been replaced.

If the picture has black flashes check for dirty heads. If the picture is snowy on E-to-E as well check that −22V is present at pin 6 of the modulator connector – the supply comes from pin 22 of the power supply panel. If this voltage is missing suspect a crack in the rear edge of the motherboard, where it's attached to the cabinet. If the tape counter is erratic suspect the optocouplers on the reel motors (swap them over and see if the fault changes). C228/229 (both 2·2μF) are also suspect – they are on the KBD module.

THORN 1690 CHASSIS

The fault is complete lack of line sync. I've tried most things but cannot get it right.

If the field sync is satisfactory the trouble will be confined to the flywheel line sync department. First check the line sync pulse amplifier transistor VT11 (BF199) and its base coupling/bias network C71 (1μF)/R70 (820kΩ). If these are o.k. check the discriminator diodes W6/7 then if necessary the pulse feedback path from the line output transformer. We've known C82 (4·7μF) in the flywheel sync filter network cause this symptom on occasion.

PANASONIC NV7000

On occasions the picture suddenly goes very smeary, with a distinct double image. This usually occurs when the solenoids operate on selection of cue or review. Selection of review (but never cue) a second time will usually restore a normal picture. There's also a faint green cast to the picture and when selecting the frame/still modes the frame usually slips several times before settling – often with noise bars at the top of the picture.

The first fault would appear to be due to a dry-joint. We've seen similar effects due to a dry-joint around the head amplifiers and suggest you check around here, resoldering all the joints. Check also for a dry-joint

around IC3004. The second fault sounds like excessive noise on playback – this is often described as a green cast though the problem could be due to the TV set rather than the VCR, especially if the colour is turned up high. If the original head drum is still fitted it's likely that this needs replacement. The final fault is probably just a matter of setting up – if this doesn't cure the fault or gives only slight improvement then again a worn head is the most likely cause of the trouble.

TEST CASE

286

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

Like most established workshops we see from time to time equipment that has been in the hands of others. The customer seldom volunteers the information that he has come hot-foot from one of our competitors, though the fact usually becomes clear as the job proceeds! This time the patient was a Panasonic NV2000 VCR and we were told that it had recently had a new set of video heads (upper drum) fitted at great expense. The playback picture now suffered from field judder and intermittent rolling.

Expecting to have to adjust the entry guide or back-tension we took the job on. We found that the judder/rolling effect was present with both self-recorded and library tapes, and our first step was to hook an oscilloscope to TP3010 (the playback f.m. envelope test point) to examine the display during playback of a good tape. The envelope's shape was reasonably flat, and it didn't "tilt" unduly when the tracking control was adjusted. Close examination of the start and finish of each head's f.m. envelope waveform revealed the unusual pattern shown in Fig. 1 however: a strange oscillation or instability was present *on both sides* of the head switching point.

At the optimum setting of the tracking control (for maximum r.f. output) the signal level at the start and finish of each head's sweep sometimes greatly exceeded the general level and sometimes dropped to almost zero, in a random and erratic way. It was reasoned that guide faults (or indeed any mechanical problem) couldn't be responsible: when a head in good condition is in alignment with the centre of its track no mechanical influence could increase its output. Even so the entry and exit guides were examined closely and adjusted and the back-tension was checked. These things had the normal effects on the shape of the f.m. envelope – except for the troublesome portion centred on the switch-over point.

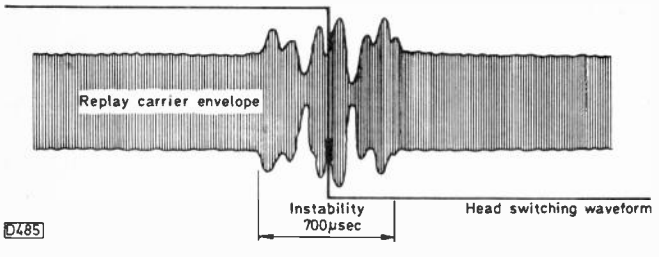

Fig. 1: The unusual conditions at each side of the head crossover point in the f.m. envelope waveform.

The head amplifier chip IC3002 (AN6320N) was next investigated. The switching signal applied to pin 12 was found to be correct, with no visible timing jitter. The four small electrolytic decoupling capacitors associated with the chip were checked by connecting a good one in parallel, but this produced no beneficial effect. Without a very sensitive oscilloscope it's not possible on this machine to examine the A and B head outputs separately – amplification and switching are carried out deep within the chip.

In fact there was nothing wrong with either the electrical circuits on the Y-C panel or the tape path up above. When the cause of the fault was found it was seriously suggested that the previous repairman be hanged by the neck . . . The vital clue to the diagnosis was the fact that the spurious effects took place on both sides of the head switching point, over a total period of about 700μsec – about eleven TV lines. For the solution, see next month's *Television*.

ANSWER TO TEST CASE 285
– page 740 last month –

The subject of last month's troubles was a Sony Model KV1820UB. Its problem, unusual in Sony sets and particularly this model, was tuning drift. It appeared only when the set had been running for a while, and was unaffected by the setting of the a.f.c. switch – and indeed by fitting a substitute tuning potentiometer.

Perhaps the tuner was a more likely culprit than the preset tuning system. Drift is not necessarily caused by leakage in varicap diodes or their decoupling capacitors (you'll recall that we had tried connecting a microammeter in series with the tuning pin): tuners used to drift with temperature long before the advent of varicap diodes – components in the u.h.f. oscillator circuit were responsible. In this case however the tuner wasn't guilty, as would have been obvious had its tuning pin been isolated from the circuit and an external tuning voltage been applied.

The key action in this case was to disconnect R121 (1·5MΩ) which links the a.f.c. voltage to the tuning voltage. With this resistor disconnected very little drift was evident, and that present was steady and gradual. The voltage at the a.f.c. output (pin 8) of IC202 (M5135P) was varying wildly however, especially when a little heat-and-freeze was applied to the top of the chip. Replacing this i.c. completely cleared the trouble. The a.f.c. switch was a bit of a red herring here: in the off position it links pins 7 and 8 of the chip – the outputs from a differential output amplifier.

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4508 PHILIPS E2 CHASS 10.00
2862 PHILIPS G9 10.95
5305 PYE 691 WIRED 5.00
3628 PYE 725 90° 14.65
3629 PYE 731 110° 13.28
3632 RANK A823 5.50
3634 RANK T16A 8.95
3636 RANK T20A 12.95
3726 RANK T26A 15.50
3637 RANK Z179 11.25
3639 RANK Z718 22" 21.75
3770 REDIFUSION MK1 CHAS 9.38
3771 REDIFUSION MK3 CHAS 15.95
3775 SANYO CTP5101 16.50
3643 THORN 1400 SERIES 5.95
3644 THORN 1500 20" 5.95
3645 THORN 1500 24" 5.95
3646 THORN 1590 SERIES 10.85
3647 THORN 1600 SERIES 10.85
3648 THORN 1615 SERIES 8.95
3649 THORN 1690/91 SERIES 10.50
3713 THORN 1790 8.95
3714 THORN 3787 15.23
3652 THORN 3K 3K5 EHT TX 7.98
3651 THORN 3K 3K5 8.96
6172 PHILIPS G8 SPECIAL 7.98
2868 PHILIPS KT3 10.95

EHT TRAYS
5400 BG1895-641 7.50
5403 BG1897-642 7.50
5404 BG2097-642/333 7.50
3663 DECCA 100 7.25
3665 DECCA 1830 3.00
3662 DECCA 80 7.11
3667 GEC 1028/CS108 3.50
3677 ITT CVC45 7.95
3675 ITT CVC5/9 4.00
3678 KORTING HYBRID 7.95
3683 PHILIPS 550 G8 6.60
3681 PHILIPS 570 (5 LEAD) 4.50
3684 PHILIPS G9 4.00
3685 PHILIPS KT3 6.95
3686 PYE 691/697 6.95
3688 PYE 725/731/741 8.91
5395 SEIMANS TVK186/5 9.50
5393 SEIMANS TVK52 8.50
4696 SEIMENS TVK196/17 11.95
5406 TCE 1400 LARGE SCRN 4.95
3696 TCE 1500 17"-19" 5.65
3697 TCE 1500 23"&24" 4.95
3698 TCE 1600 SERIES 2.95
3700 TCE 4000 4.50
3703 TCE 9000 7.85
3699 TCE3000/3500 7.75
3706 TV11 EHT STICK 0.95
3709 TV20 EHT STICK 0.95
5275 TV45 EHT STICK 2.45
3705 UNIVERSAL EHT TRAY U.K. 4.95

TV ELECTROLYTICS
3547 DECCA 10/30 400X2/350V 2.90
3549 DECCA 100 400+800 350/250V 4.65
3548 DECCA 80/100CHAS 100/400V 2.90
5304 FIDELITY ZX2000 330 385V 4.95
5303 FIDELITY ZX3000 220 385V 3.98
3557 ITT CVC20/RRI T20 220/400 1.20
3556 ITT CVC5/9 200X2+25+75ETC 3.26
3560 PHILIPS G11 470UF/250V 1.79
3559 PHILIPS G9 2200/63V 1.55
3561 PHILIPS KT3 200+25X2/385V 2.65
3554 PHILIPS G8/GEC 2110 600/300V 3.16
3558 PHILIPS G9/PYE 731 600/300 PC 3.16
3565 PYE 725/731 800/250V 1.90
3564 PYE 691/697 200+300/350V 2.00
3576 RRI AB23 2500X2/25V 1.48
3588 TCE 3000/3500 1000/70V 0.89
3585 TCE1500 150X2+100/300V 2.35
3587 TCE3000 200+100X2/350V 2.86

MIXED DIALECTRIC CAPACITORS
4270 0.01 600V X5 0.75
4272 0.022 1KV X5 1.95
4273 0.033 1KV 1.40
4274 0.047 600V X5 0.85
4275 0.047 1KV X5 2.47
4276 0.1 600V X5 1.20
4277 0.1 1KV X5 1.98
4278 0.1 1250V X5 2.39
4279 0.1 2KV X1 0.75
4280 0.22 600V X5 1.45
4281 0.22 1KV X1 0.74
4282 0.47 1KV X1 1.02
4283 4700PF 1.5KV X5 1.89
4271 0.01 1KV X5 1.60

SLIDE CONTROLS
4883 100K LIN STD TV 0.55
4884 150K LIN STD TV 0.55
4874 1K LIN STD TV 0.55
4880 22K LIN STD TV 0.55
4881 22K LOG STD TV 0.55
4875 3K3 SEMI LOG STD 0.60
4885 470K LOG STD TV 0.55
4720 470R LG STD 0.99
4719 470R LM STD TV 0.99
4876 4K7 LIN STD TV 0.60
4877 4K7 LOG STD TV 0.55

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

TUNER UNITS
4662 DECCA 30 SERIES MECHANICAL 4.95
4664 ELC 1043/05 EXCH TUNER 6.00
4663 ELC 1043/05 NEW TUNER 8.25
4666 ELC 1043/06 EXCH TUNER 6.00
4665 ELC 1043/06 NEW TUNER 8.25
4972 ELC 2003 EXCH TUNER 12.50
5534 GEC 2100 TYPE REPAIR CHGE 10.25
4675 PHILIPS G8 EXCHANGE TUNER 7.25
4679 RR1 RANGER1/2 EXCH TUNER 9.75
4680 RR1 720 NEW TUNER 12.40
4678 RRI RANGER2/3 NEW TUNER 13.15
4668 U321 EXCH TUNER 6.50
4667 U321 TUNER NEW 6.25
4670 U322 EXCHANGE TUNER 6.50
4669 U322 NEW TUNER 7.95
4673 U341 EXCHANGE TUNER 7.25

VALVES
3883 DY802 VALVE 0.75
3932 PCF802 VALVE 0.95
3938 PCL805 1.08
3935 PCL82 VALVE 0.95
3936 PCL84 VALVE 0.85
3937 PCL86 VALVE 0.95
3940 PFL200 VALVE 1.20
3943 PL504 VALVE 1.50
3944 PL508 VALVE 2.06
3945 PL509 VALVE 6.25
3946 PL519 5.95
4870 PL802 VALVE 4.95
3950 PY500A VALVE 2.25
3951 PY801 VALVE 0.95

THORN SPARES
2897 T1590 MAINS TRANSFORMER 9.80
2920 TX10 FOCUS UNIT 7.54
4590 T1600 MAINS TX 7.92
5430 T1690 MAINS TRANSFORMER 9.00
4973 T1690 SLOW MOT. TUN. POT 3.99
2906 T3000/3500 A1 SWITCH 1.68
2904 T3000/3500 MAINS TX 5.00
2908 T3000/3500 METAL CUT OUT 2.34
4587 T3500 100R CONVERG POT 0.85
3277 T3500 200R CONVERG POT 0.56
3278 T3500 500R CONVERG POT 0.56
4585 T3500 50R CONVERG POT 0.65
2905 T3500 5MEG A1 POT 1.17
4589 T3500 SPARK GAP 1/1500 0.51
2907 T3500 THICK FILM VID LOAD 1.45
4563 T38000 MAINS ON/OFF SW 3.10
4412 T4000 FOCUS CONTROL UNIT 7.60
3273 T6818 220K BRIGHT CTRL 2.18
2909 T8500 FOCUS CONTROL UNIT 2.56
2911 T8500 MAINS CHOKE 17.45
4415 T8500 MAINS TX 12.75
2910 T8500 PLASTIC CUT OUT 3.72
2918 T9000 FOCUS UNIT 4.95
4556 T9000 FRI THICK FILM 1.65
2919 T9000 OVER VOLT THICK FILM 3.95
4555 T9000 T701 CHOPPER TX. 13.75
4982 T9600 0.33 2KV CAP 2.35
2914 T9600 CHOPPER TX T512 8.11
2916 T9600 FOCUS UNIT 2.95
2913 T9600 SWITCH MODE TX T511 9.98
2917 T9800 FOCUS UNIT 5.93
4429 T9800 MAINS CHOKE 11.03
4437 TX10 .0022 2KV 0.25
4658 TX10 100K TUNING POT 0.64
2938 TX10 CHOPPER DRIVER TX 3.27
5427 TX10 SW NONREM CONT 2.32
2922 TX10 TUNER DRAWER ASSY 1.95
4859 TX9 4" RND 15R SPEAKER 6.95
2937 TX9 INPUT CHOKE L65 12.85
2936 TX9 L64 BILIFAR CHOKE 4.25

DECCA SPARES
4616 DECCA 100 0.01 2KV CAP 0.98
2933 DECCA 100 BEOIGE TX 2.25
2932 DECCA 100 FOCUS CONTROL 2.77
4615 OECCA 100 LINE DRIVE TX 2.25
2928 DECCA 10SER 470K SH+VOL 2.15
4603 OECCA 2230 10R FUSIBLE 0.70
2930 OECCA 2233 PSH PSH SH 5.14
2931 OECCA 2263 PSH PSH SH 4.20
2926 DECCA 30 SER 3R9 RESIS 0.50
2924 DECCA 30 SER MAINS TX 12.35
2929 DECCA 30 SER 47K SH+VOL 2.45
2939 DECCA 80 470R SH+VOL 2.45

RESISTORS
CARBON
STANDARD RANGES
¼ WATT X 10 0.29
½ WATT X 10 0.29
1 WATT X 10 0.45
2 WATT X 10 0.60
SAFETY CERAMIC
STANDARD RANGES
5 WATT X 5 0.90
7 WATT X 5 0.74
11 WATT X 5 0.89
17 WATT X 5 1.15

OTHER RESISTORS
3279 2M2 H/V FOCUS RESISTOR 0.46
3280 22M H/V FOCUS RESISTOR 1.50
3281 33M H/V FOCUS RESISTOR 1.50
3282 47M H/V FOCUS RESISTOR 1.50
3283 56M H/V FOCUS RESISTOR 1.50

MAINS DROPPERS
3025 MAINS DROPPER RANK A640 1.20
3013 MAINS DROPPER DECCA 80/100 1.60
3016 MAINS DROPPER GEC 2010 0.90
3031 MAINS DROPPER THORN 3600 0.98
3030 MAINS DROPPER THORN 1600 1.45
4910 MAINS DROPPER DECCA 100 2R5 0.82
3034 MAINS DROPPER THORN 9800 1.48
3027 MAINS DROPPER THORN 1400 1.50
3026 MAINS DROPPER RANK A823 1.10
3028 MAINS DROPPER THORN 1300 1.60
3029 MAINS DROPPER THORN 1500 1.75
3018 MAINS DROPPER PHILIPS G8 0.99
3022 MAINS DROPPER PYE 725/731 1.40
3017 MAINS DROPPER PHILIPS 210 0.98
3019 MAINS DROPPER PHILIPS G8 47R 0.65
3033 MAINS DROPPER THORN 8500/8800 0.98
5385 MAINS DROPPER DECCA 80 2.97
5386 MAINS DROPPER DECCA 100 1.88
5533 PYE CT200 PHILIPS 579 DROPPER 3.45

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

FIDELITY SPARES
2940 CHOPPER TX FIDELITY CTV14R 4.50
2942 DRIVER TX FIDELITY CTV14R 2.65
2941 FOCUS UNIT FIDELITY CTV14R 0.50
5408 MAINS INPUT CHOKE ZX2000 3.45
5504 MAINS FILTER TX CTV14R 2.95
5505 DRIVER TX ZX3000 404387 2.95
6162 ON/OFF SH FIDELITY CTV14R 3.65
6163 ON/OFF SH FIDELITY CTV14S 1.65

GEC SPARES
2965 GEC 1401 CHOPPER TX 16.56
2964 GEC 1401 INPUT CHOKE 9.63
5531 GEC 1501 MAINS TX 5.25
4758 GEC 2100 3R FUSIBLE RES 1.45
4759 GEC 2110 SH2 2KV CAPS 2.39
2959 GEC 2100 ETC FOCUS VOR 1.60
2958 GEC 2100 THERMAL CUT OUT 0.97
4760 GEC 2110 FOCUS CONTROL 5.98
4771 GEC 2110 LUM. DELAY LINE 1.83
4728 GEC 2110 MAINS CHOKE 10.50
4996 GEC 2110 NEONS 0.20
4751 GEC 2114 VOL+SWITCH CONT 1.98
4656 GEC 22K MULTI TURN POT 0.98

GRUNDIG SPARES
2949 GRUNDIG 5010 FOCUS VDR 3.35
4633 GRUNDIG 5010 CONTROL TX 4.76
2948 GRUNDIG 5010 FOCUS UNIT 3.75
4865 GRUNDIG 5010 L515 CHOKE 1.63
4744 GRUNDIG 5010/6010 LID 2.62
4745 GRUNDIG 5011 LID 2.59
4637 GRUNDIG 5011 SH+SLIDERS 11.69
2952 GRUNDIG 6010 MIXIE MOD 22.50
4630 GRUNDIG 6011 MAINS SH 3.68
4631 GRUNDIG 6110 MAINS SH 4.86
2947 GRUNDIG A6400 MAINS SH 4.95

REMOTE CONTROL UNITS
PLEASE STATE MODEL NUMBER
4311 DECCA 100 NONTEXT RCU 21.50
4314 DECCA 100 (TEST+PRESET) RCU 22.28
4310 DECCA 80/100 SERIES RCU 21.76
4315 DECCA 90/100 N/TXT RCU 20.78
4324 GEC 2 FUNCTION RCU 18.45
4325 GEC C2057H/2067H RCU 21.43
4326 GEC TELEMASTER 12 RCU 20.03
4327 GEC TELEMASTER 16 RCU 20.03
4328 GEC TELEMASTER 8 RCU 23.25
4332 GRUNDIG TELEPILOT 12 RCU 30.03
4333 GRUNDIG TELEPILOT 16 RCU 25.05
2955 GRUNDIG TELEPILOT 7 24.95
4334 GRUNOIG TELEPILOT 8 RCU 20.03
4357 KORTING 12 CHANNEL RCU 22.13
4358 KORTING 16 CHANNEL RCU 24.05
4380 PHILIPS G11 NONTEXT RCU 22.52
4378 PHILIPS G11 T/TEXT 8CH RCU 20.78
5409 PHILIPS G11 T/TEXT U/SONIC 25.16
5453 PHILIPS KT3 REMOTE RC4001 16.00
4379 PHILIPS/PYE G11 2 FUNC RCU 18.90
4359 PHILIPS/PYE KT3/KT30 16.13
4385 RBM 16CH NONTEXT RCU 21.95
4386 RBM 8CH NONTEXT RCU 19.20
4387 RBM TEXT&V/DATA RCU 20.78
2980 REMOTE CTRL UNIT PHILIPS G9 9.85
4390 TCE 9000CHAS 2 FUNC RCU 19.20
4398 TCE TX10(9653)+TEXT RCU 24.78
4400 TCE TX10(9670)+PREST RCU 21.78
4397 TCE TX9/TX10 19.20

PUSH BUTTON UNITS
2870 4 WAY DECCA ETC 8.25
2871 6 WAY DECCA 11.78
2873 4 WAY HITACHI ETC 5.50
2875 4 WAY PYE/TCE 10.87
2877 6 WAY GEC 2110 11.25
2878 7 WAY GEC 2112 10.95
2879 6 WAY T3500 2.75
2880 6 WAY PYE 713 15.75
2881 6 WAY T9000 7.25
2882 4 WAY BUSH A823 10.93
2884 6 WAY MOD CVC9 12.85
2885 6 WAY 520 PHILIPS 19.30
2886 6 WAY PHILIPS 550 21.25
2887 T1P SWITCH UNIT PHILIPS G11 27.50
2888 6 WAY PHILIPS G11 11.25
2889 PIANO KEY MOD DECCA 2631 22.48
4935 7 WAY ITT CVC5 12.90
5278 GEC 2136 TAPERED 10.95
5279 ITT 6 WAY +VCR 10.70
5280 6 WAY BUSH T20 13.81

ITT SPARES
2972 ITT CP340 PB ASSY 34.00
4501 ITT CP340 SLIOER ASSY 7.58
4683 ITT CV40 FOCUS UNIT 1.95
5543 ITT CVC20 LINE DRIVE TX 3.05
4571 ITT CVC20 MAINS SWITCH 1.35
4787 ITT CVC25 8N2 2KV CAP 1.35
4786 ITT CVC25 8N2 2KV CAPS 2.15
2970 ITT CVC25 BRIDGE COIL 4.05
4789 ITT CVC25 E/W LOAD COIL 1.92
4567 ITT CVC25/30 MAINS SW. 6.89
2969 ITT CVC32 DRIVER TX 2.55
4568 ITT CVC32 REMOTE MAIN SH 7.67
2971 ITT CVC32 SH MODE TX 5.00
4795 ITT CVC45 ON/OFF SWITCH 2.09
3286 ITT CVC5 1MFD 250V CAP 0.40
4569 ITT CVC5 MAINS SWITCH 1.85
4781 ITT CVC5 SHIFT PDT 25R 1.82
4780 ITT CVC5 SLIDER BANK 7.41
2967 ITT CVC5-9 MAINS TX 8.48
4570 ITT CVC9 MAINS SWITCH 5.61

FUSES
STANDARD RANGES
20MM O/B FUSE X 10 0.66
20MM A/S FUSE X 10
63MA - 160MA 1.80
200MA - 5A 1.20
1.25" O/B FUSE X10
250MA - 800MA 0.95
1A - 5A 0.70
1.25" A/S FUSE X 10
250MA - 2A 1.50
2.5A - 5A 2.30
PLUG TO P FUSE X 10 0.95
2, 3, 5, 7, 10, 13A

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

RANK RADIO SPARES
4650 RRI T20 SPEAKER 2.36
5524 RRI T24E ON/OFF + VOL SH 2.35
4842 RRI 1122 SH+VOL 22K PULL 3.10
4843 RRI A823 100K TUNER POT 1.78
4847 RRI A823 FOCUS ASSEMBLY 6.03
2998 RRI A823 PLASTIC CAM 0.35
5300 RRI A823ETC RING SPK GAP 0.55
4988 RRI T20 (TYPE) FOCUS ASY 0.60
3001 RRI T20 3K3 SH+VOL CTRL 2.67
4852 RRI T20 9N1 2KV CAP 1.98
4853 RRI T20 CONTRAST+AFC POT 3.23
3003 RRI T20 E/W CORR. COIL 3.29
3000 RRI T20 FOCUS ASSY 5.69
3004 RRI T20 SH MODE TX 11.20
4849 RRI 2718 3K3 SH+VOLUME 3.36

PHILIPS PYE SPARES
4969 PHILIPS 128711 4K7 VOL+SH 4.45
3288 PHILIPS 300 470L VOL+SWITCH 3.25
4449 PHILIPS 570/713 IF MODULE 7.00
5425 PHILIPS CTX-S EHT LEAD 10.11
5418 PHILIPS CTX-S FOCUS UNIT 5.50
4655 PHILIPS G11 100K TUNER POT 0.66
2983 PHILIPS G11 CVC32 B/COIL 1.95
2984 PHILIPS G11 E/W CORR COIL 2.45
2985 PHILIPS G11 FILTER COIL 12.80
2986 PHILIPS G11 FOCUS UNIT 9.15
2987 PHILIPS G11 G2 CONTROL ASSY 7.98
4575 PHILIPS G11 RND SHAFT SH. 2.32
4576 PHILIPS G11 SQ SHAFT SWITCH 2.32
4645 PHILIPS G11 TDA2600 HOLDER 0.65
5284 PHILIPS G8 100K TUN P/SET 0.84
2977 PHILIPS G8 10K COLOUR CTRL 0.98
4525 PHILIPS G8 10K CON POT (550) 0.87
4524 PHILIPS G8 15R CON POT (550) 1.07
2975 PHILIPS G8 2K2 BRIGHT CONTL 2.11
4526 PHILIPS G8 2H A1 POT (550) 3.80
4522 PHILIPS G8 5N1 1500V CAP 1.88
4523 PHILIPS G8 5R CONV POT (550) 0.64
4858 PHILIPS G8 6×4" 70R SPKR 5.98
2979 PHILIPS G8 EQUALIS COIL 3.20
4503 PHILIPS G8 METAL SH 1.72
2978 PHILIPS G8 RED/GRW SYM COIL 4.63
4504 PHILIPS G8/G11 NON REM SH 1.72
5307 PHILIPS K12 THICK FILM UNIT 14.99
4649 PHILIPS KT3 4X4 SPEAKER 2.85
4566 PHILIPS KT3 MAINS SWITCH 8.60
4907 PHILIPS KT4 THICK FILM UNIT 10.29
4564 PHILIPS T173 MAINS SWITCH 3.45
4648 PHILIPS G11 6X4 SPEAKER 3.85
2992 PYE 169 LINE DSC COIL 3.45
4839 PYE 731 3R3 50W RESISTOR 1.98
4535 PYE 731 47K VOL. SWITCH 5.25
2992 PYE 731 FOCUS UNIT 3.45
5545 PYE 731 L/H 3X 100K PSET 3.20
5546 PYE 731 R/H 3X 100K PSET 3.20
2994 PYE 731 THICK FILM ASSY 1.55
4938 PYE KT2 FOCUS UNIT 2.85
4864 PYE T194/6 SPEAKER 5.05
5556 PHILIPS G11 SHORT SHAFT SH 2.01

THORN VIDEO SPARES (OVER 450 PARTS)
QUOTE THORN PART NUMBER IF POSSIBLE
5561 T3292 BOOSTER 44.62
5562 T3292 CAPSTAN BELT 3.48
5563 T3292 CAPSTAN MOTOR 51.16
5568 T3292 CASSETTE LAMP 1.80
5569 T3292 COUNTER BELT1 0.60
5571 T3292 COUNTER BELT2 0.60
5575 T3292 ORUM MOTOR 47.70
5577 T3292 F/F IOLER 2.02
5582 T3292 GUIDE ROLL ASSY 11.40
5585 T3292 LOWER ORUM ASY 80.48
5587 T3292 PINCH ROLL ASSY 9.84
5591 T3292 REWIND IDLER ASSY 7.04
5592 T3292 REWIND RUBBER TYRE 0.60
5621 T3292 UNLOADING BELT 0.78
5622 T3292 UNLOADING IDL. ASSY 6.43
5624 T3292 UPP/ORUM KIT+MOD 35.94
5629 T3V00 CAPS. MOTOR BELT 0.60
5635 T3V00 COUNTER BELT 1 0.60
5637 T3V00 ORUM MOTOR 49.39
5646 T3V00 PINCH ROLLER ASSY. 7.31
5648 T3V00 RECORDING LAMP 2.34
5650 T3V00 SERVICE MANUAL 17.57
5655 T3V00 T/U IDLER ASSY 6.35
5657 T3V00 UPPER DRUM+MOD KIT 35.94
5663 T3V16 PINCH ROLLER ASSY 7.31
5666 T3V00 CAPSTAN MOTOR 51.16
5688 T3V00 TENSION BAND 2.16
5689 T3V00 TIMING GEAR 4.12
5692 T3V00 UNLOAOING IDLER ASSY 6.43
5710 T3V01 TENSION BAND 2.16
5716 T3V16 CAPSTAN BENT 3.85
5720 T3V16 CASSETTE LAMP 1.80
5721 T3V16 CHANGE GEAR 0.86
5726 T3V16 DIODE STACK 3.41
5727 T3V16 DRIVE ARM ASSY 4.50
5750 T3V16 SERVICE MANUAL 26.24
5758 T3V16 T/U IDLER ASSY 6.25
5759 T3V16 T/U IDLER ASSY (LA) 8.95
5765 T3V16 UNLOADING IDLER 6.43
5772 T3V22 CAPSTAN MOTOR 51.16
5773 T3V22 CAPSTAN MOTOR BAND 0.60
5774 T3V22 CAPSTAN BELT 3.86
5790 T3V22 F/F IDLER 1.74
5803 T3V22 GUIDE ROLLER ASSY 8.39
5807 T3V22 MICRO SWITCH 4.25
5809 T3V22 PINCH ROLLER ASSY 7.31
5814 T3V22 REWIND IDLER ASSY 7.04
5822 T3V22 SUPP SPOOL CARRIER 4.00
5824 T3V22 TAKE UP IDLER SMALL 6.25
5825 T3V22 TAKE UP IDLER LARGE 8.95
5828 T3V22 TENSION BAND 2.16
5834 T3V22 UPPER DRUM ASSY 35.94
5840 T3V23 BOOSTER 24.71
5844 T3V23 CAPSTAN MOTOR 55.83
5852 T3V23 CONNECT GEAR ASSY 6.56
5856 T3V23 GUIDE ROLLER TYRE 0.60
5862 T3V23 PINCH ROLLER ARM AS 4.10
5868 T3V23 REEL IDLER ASSY 2.87
5869 T3V23 REEL MOTOR ASSY 32.81
5879 T3V23 T/U REEL DISK ASSY 5.17
5880 T3V23 TAKE UP REEL ASSY 2.58
5882 T3V23 UPPER DRUM ASSY 35.94
5885 T3V23 WORM GEAR SPINDLE 5.95
5886 T3V23 WORM GEAR SPROCKET 1.63
5888 T3V24 BRAKE SHOE 0.60
5896 T3V24 CASSETTE LAMP 1.80
5899 T3V24 DEW SENSOR ASSY 9.05
5902 T3V24 F/ERASE HEAD ASSY 10.41
5908 T3V24 LOADING GEAR ASSY 28.91
5909 T3V24 LOADING MOTOR 10.25
5912 T3V24 PINCH RLR LVR ASSY 0.62
5920 T3V24 SERVICE MANUAL 28.50
5945 T3V29/30 BOOSTER 24.71
5946 T3V29/30 BRAKE SHOE 0.67
5951 T3V29/30 CAPSTAN BELT 1.95
5952 T3V29/30 CAPSTAN MOTOR ASSY 36.88
5957 T3V29/30 CASSETTE LAMP 1.65
5962 T3V29/30 EJECT LCE ARM 0.60
5974 T3V29/30 LOADING MOTOR 10.25
5976 T3V29/30 LOHR DRUM ASSY 78.72
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AN5033	£5.25	BA1330	£1.75	HA11705	£6.95	LA4200	£1.50	STK086	£9.50	TA7207P	£1.75	UPC1176C	£1.75	2SC536	£0.35
AN5265	£3.20	BA1360	£1.80	HA11706	£4.75	LA4201	£1.60	STK430	£5.50	TA7208P	£1.75	UPC1177H	£1.60	2SC537	£0.35
AN5510	£2.75	BA5102A	£2.75	HA11710	£3.75	LA4220	£1.50	STK431	£5.95	TA7210P	£2.50	UPC1181H	£1.10	2SC710	£0.35
AN5620X	£3.50	BA5406	£3.20	HA11711	£9.50	LA4230	£1.95	STK433	£5.25	TA7214P	£2.60	UPC1182H	£1.10	2SC732	£0.35
AN5701	£1.80	BA6137	£2.75	HA11713	£6.50	LA4250	£2.75	STK435	£5.50	TA7215P	£2.30	UPC1183H	£2.20	2SC733	£0.35
AN5722	£1.60	BA6209	£3.75	HA11714	£5.95	LA4420	£1.60	STK436	£5.25	TA7217AP	£1.60	UPC1185H	£2.50	2SC828	£0.30
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AN5732	£1.85	CX0642	£8.50	HA11716	£4.75	LA4430	£1.40	STK439	£5.95	TA7222AP	£1.30	UPC1187V	£1.75	2SC900	£0.35
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AN6350	£7.50	CX101G	£7.75	HA11747ANT	£9.50	LA4505	£2.80	STK461	£7.50	TA7230P	£1.95	UPC1277H	£2.75	2SC1364	£0.35
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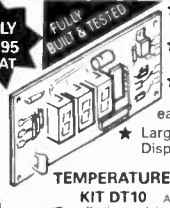

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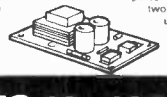

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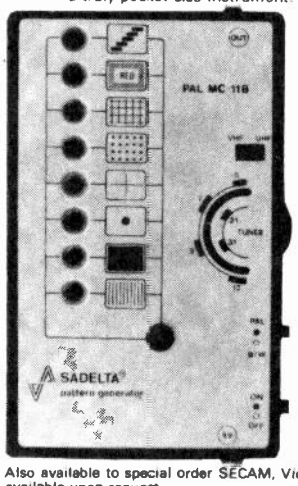

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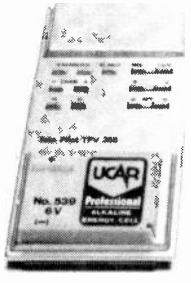

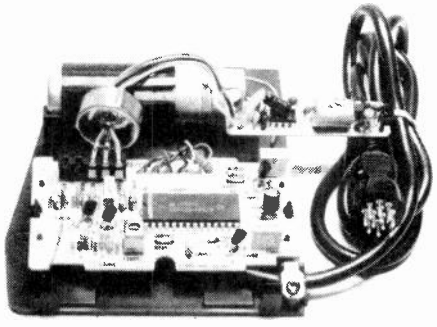

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AA119	9p	BC338	6p	BF185	20p	BFY64	25p	TIP32C	28p	2N.1132	28p	BY298	26p	7824	35p	PFL200	85p	LA-5112	120p	TBA750	100p	74LS24	38p
AAY32	9p	BC557	6p	BF194	5p	BFY90	45p	TIP33A	50p	2N.1613	24p	BY299	28p	7905	35p	PL36	80p	LM301	26p	TBA800	35p	74LS26	17p
AC107	28p	BCY32	150p	BF195	5p	BLY48	85p	TIP34	50p	2N.1711	24p	BY478	90p	7912	40p	PL82	45p	LM311	35p	TBA810S	90p	74LS27	17p
AC126	17p	BCY33	150p	BF196	6p	BLY49	85p	TIP41A	22p	2N.2102	50p	BYX10	15p	7915	40p	PL83	32p	LM324	35p	TBA820	75p	74LS28	17p
AC127	15p	BCY34	150p	BF197	7p	BR100	14p	TIP41C	25p	2N.2160	300p	BYX55/350	30p	7918	40p	PL84	90p	LM325	45p	TBA920	100p	74LS30	17p
AC128	15p	BCY42	20p	BF198	7p	BR101	43p	TIP42A	22p	2N.2218A	24p	BYX55/600	30p	7924	40p	PL95	140p	LM339	40p	TBA950	100p	74LS32	17p
AC128K	23p	BCY56	16p	BF199	6p	BR103	37p	TIP42C	25p	2N.2219	24p	BYX55/800	32p	79L05	28p	PL500	110p	TBA990	100p	74LS33	17p
AC141K	30p	BCY70	16p	BF200	16p	BSX20	15p	TIP47	40p	2N.2221	23p	BYX70/300	29p	78L12	28p	PL504	95p	LM348	60p	TCA270	40p	74LS37	17p
AC142K	30p	BCY71	16p	BF240	16p	BSX26	18p	TIP48	40p	2N.2222	23p	BYX70/500	32p	78L15	28p	PL508	179p	LM380	100p	TCA800	200p	74LS38	17p
AC153K	23p	BCY72	16p	BF241	10p	BSX29	15p	TIP50	60p	2N.2369	15p	BYX70/800	38p	78L18	28p	PL519	450p	LM381	150p	TCA940	100p	74LS40	17p
AC176	18p	BD115	26p	BF255	12p	BT106	90p	TIP51	120p	2N.2484	20p	BYX71/600	80p	78L24	28p	PY81	70p	LM382	130p	TDA1170	100p	74LS42	39p
AC176K	20p	BD124P	50p	BF256	18p	BT109	90p	TIP52	120p	2N.2646	40p	OA47	6p	79L05	40p	PY88	65p	LM387	100p	TDA1412	60p	74LS47	70p
AC187	15p	BD124	110p	BF257	18p	BT116	80p	TIP53	120p	2N.2904	20p	OA90	4p	79L12	45p	PY500A	160p	LM709DIL	30p	TDA2003	150p	74LS48	60p
AC187K	20p	BD128	35p	BF258	18p	BT119	100p	TIP54	140p	2N.2905	20p	OA91	4p	79L15	48p	**LINEAR IC'S**		LM723	40p	TDA2020	140p	74LS51	17p
AC188	17p	BD131	25p	BF259	18p	BT120	100p	TIP105	85p	2N.2906	18p	OA200	7p	LM309K	100p	AN-214P	200p	LM741DIL	18p	TDA2030	140p	74LS54	17p
AC188K	23p	BD132	26p	BF262	25p	BU100A	110p	TIP106	85p	2N.2907	18p	OA202	7p	LM317T	180p	AN-240P	150p	LM741 MET	45p	TDA2522	90p	74LS55	17p
ACY18	48p	BD135	20p	BF263	25p	BU104	100p	TIP107	65p	2N.2926	8p	IN.914	2p	LM323K	420p	AN-360	120p	LM747	58p	TDA2530	100p	74LS73	28p
ACY19	48p	BD136	20p	BF270	18p	BU105	80p	TIP110	47p	2N.3019	28p	IN.4001	4p	LM723	32p	AN-7110	140p	LM748	35p	TDA2532	100p	74LS74	28p
ACY20	48p	BD137	20p	BF273	15p	BU108	100p	TIP111	50p	2N.3053	18p	IN.4002	4p	78HGKC	570p	AN-7114	160p	LM1458	33p	TDA2540	100p	74LS75	32p
AD142	60p	BD138	20p	BF311	21p	BU110	110p	TIP112	40p	2N.3054	35p	IN.4003	4p	78HO5KC	520p	AN-7115	160p	LM3900	30p	TDA2560	100p	74LS76	28p
AD149	45p	BD139	20p	BF324	25p	BU111	140p	TIP115	45p	2N.3055	35p	IN.4004	4p	78GU1C	190p	AN-7120	140p	M-51513L	180p	TDA2593	100p	74LS78	34p
AD161	22p	BD140	20p	BF336	20p	BU124	60p	TIP116	45p	2N.3055H	58p	IN.4005	4p	79GU1C	215p	AY3-1270	380p	M-51515BL	270p	TDA2690	100p	74LS83	45p
AD162	22p	BD144	90p	BF337	20p	BU126	70p	TIP117	50p	2N.3440	85p	IN.4006	4p	79HGKC	670p	AY3-1350	300p	M-51516	280p	UPC-556H	80p	74LS85	50p
AF124	25p	BD150	30p	BF338	20p	BU204	75p	TIP120	43p	2N.3442	85p	IN.4007	5p	**VALVES**		AY3-8910	360p	M-51517L	280p	UPC-575C2	100p	74LS86	30p
AF125	25p	BD157	38p	BF355	28p	BU205	70p	TIP121	46p	2N.3702	9p	IN.4148	2p	DAF96	60p	AY3-8912	400p	MB3712	150p	UPC-577H	64p	74LS90	39p
AF126	25p	BD158	38p	BF362	30p	BU208	75p	TIP122	47p	2N.3703	9p	IN.5400	9p	DF96	50p	AY5-3600	570p	MB3730	260p	UPC-592H2	95p	74LS91	75p
AF127	29p	BD166	30p	BF367	13p	BU208A	80p	TIP125	47p	2N.3704	9p	IN.5401	10p	DL92	47p	CA270	40p	MB3756	260p	UPC-1001H	220p	74LS92	46p
AF239	22p	BD175	30p	BF371	17p	BU208D	100p	TIP126	56p	2N.3705	9p	IN.5402	10p	DY86	80p	CA3046	60p	MC1327	70p	UPC-1025H	230p	74LS93	40p
AL112	70p	BD176	30p	BF414	18p	BU325	55p	TIP127	56p	2N.3706	9p	IN.5403	11p	DY87	50p	CA3048	180p	NE555	20p	UPC-1026C	105p	74LS95	52p
AL113	80p	BD179	32p	BF420	16p	BU326	85p	TIP140	90p	2N.3707	9p	IN.5404	11p	DY802	45p	CA3060	280p	NE556	40p	UPC-1028H	90p	74LS96	53p
AS215	100p	BD181	45p	BF421	18p	BU406	85p	TIP142	90p	2N.3708	9p	IN.5405	12p	EABC80	50p	CA3080E	70p	SAS560	110p	UPC-1031H2		74LS107	35p
AS217	100p	BD182	60p	BF422	21p	BU406D	95p	TIP145	65p	2N.3771	85p	IN.5406	13p	EB91	44p	CA3089E	150p	SAS570	110p		180p	74LS109	38p
AU110	110p	BD183	60p	BF423	15p	BU407	75p	TIP146	90p	2N.3772	90p	IN.5407	13p	EBF80	45p	CA3090AQ	300p	SN76003N	140p	UPC-1032H	70p	74LS112	38p
AY102	180p	BD187	30p	BF440	16p	BU407D	95p	TIP147	100p	2N.3773	100p	IN.5408	13p	EBF89	50p	CA3130E	80p	SN76013N	140p	UPC-1155	200p	74LS113	32p
AY106	180p	BD201	33p	BF451	17p	BU408	85p	TIP2955	42p	2N.3819	29p			ECC82	40p	CA3130S	100p	SN76023N	140p	UPC-1156H	140p	74LS114	38p
		BD202	38p	BF455	14p	BU408D	95p	TIP3054	48p	2N.3866	68p	**ZENERS**		ECC83	43p	CA3140E	38p	SN76033N	150p	UPC-1181H	115p	74LS122	44p
BA145	10p	BD203	42p	BF458	19p	BU409	95p	TIP3055	42p	2N.3903	11p	400MV		ECC84	40p	CA3189E	260p	SN76110N	70p	UPC-1182H	150p	74LS123	50p
BA148	10p	BD204	42p	BF459	19p	BU426	120p	TIP543	45p	2N.3904	11p	BYZ88 Range		ECC85	40p	CA3240E	90p	SN76115	70p	UPC-1185H2		74LS124	85p
BA154	6p	BD207	38p	BF461	80p	BU500	110p	TIP544	40p	2N.3905	11p	2V7 to 39V	6p	ECH81	49p	HA-1156W	110p	SAS580	110p	T2800D	52p	74LS125	36p
BA157	12p	BD222	31p	BF462	62p	BU526	80p	TIP561	15p	2N.3906	11p	1.3W Zeners		ECH84	52p	HA-1197	150p	TA-7120	55p	TA-7137P	83p	74LS126	42p
BB101	13p	BD225	31p	BF469	30p	BU801	95p	TIP588A	45p	2N.4031	28p	BZX61 Range		ECL80	57p	HA-1306W	170p	TA-7146P	400p	UPC-1350C	150p	74LS132	44p
BB103	18p	BD232	31p	BF470	28p	BU806	120p	TIP590	15p	2N.4036	28p	2V7 to 39V	12p	ECL82	59p	HA-1319	250p	TA-7193P	400p			74LS133	34p
BB105B	18p	BD234	32p	BF471	28p	BU807	95p	TIP591	18p	2N.4037	25p			ECL84	57p	HA-1339	170p	TA-7200	200p	**74LS SERIES**		74LS136	35p
BB205B	24p	BD235	28p	BF479	30p	C106D	23p	TIP593	20p	2N.4058	13p	**JAPANESE**		ECL85	57p	HA-1342	170p	TA-7201	200p	74LS00	17p	74LS138	38p
BC107	7p	BD236	30p	BF493	18p			VK1010	88p	2N.4443	76p	**TRANSISTORS**		ECL86	49p	HA-1366WR		TA-7203	180p	74LS01	17p	74LS139	40p
BC108	7p	BD237	21p	BF494	18p	MJ2500	100p	VN.10KM	60p	2N.4444	76p	2SB324	55p	EF80	31p		160p	TA-7204	110p	74LS02	17p	74LS145	83p
BC109	7p	BD238	24p	BF496	18p	MJ2501	110p	VN.46AF	88p	2N.5061	20p	2SB507	68p	EF85	34p	HA-1368	160p	TA-7205	180p	74LS03	17p	74LS147	120p
BC115	10p	BD244	50p	BF595	16p	MJ2955	55p	VN.66AF	100p	2N.5294	30p	2SB754	80p	EF89	43p	HA-1377	220p	TA-7210	200p	74LS04	17p	74LS148	110p
BC118	11p	BD245	50p	BF596	16p	MJ3000	115p	VN.88AF	115p	2N.5296	30p	2SC495	60p	EF183	45p	HA-1389	140p	TA-72222AP		74LS05	17p	74LS151	38p
BC140	19p	BD433	28p	BF597	10p	MJ3001	115p	VN.89AF	110p	2N.6106	40p	2SC1060	99p	EF184	53p	HA-1397	230p		120p	74LS08	17p	74LS153	42p
BC141	19p	BD434	30p	BF615	30p	MJE29A	30p			2N.6107	40p	2SC1061	200p	EL34	190p	HA-1398	280p	TA-7310P	100p	74LS09	17p	74LS154	100p
BC142	19p	BD435	31p	BF758	41p	MJE30A	30p	ZTX107	11p	2N.6109	40p	2SC1096	78p	EL36	60p	HA-1398	240p	TA-7609	270p	74LS10	17p	74LS155	51p
BC143	19p	BD437	26p	BF869	22p	MJE340	28p	ZTX108	11p	3N.128	58p	2SC1161	110p	EL84	50p	LA-1201	85p	TAA550	15p	74S11	17p	74LS156	49p
BC147	6p	BD438	36p	BF870	22p	MJE350	80p	ZTX109	12p	3N.143	68p	2SC1172	150p	EL95	50p	LA-1352	120p	TBA120S	45p	74S12	17p	74LS157	35p
BC148	6p	BD439	40p	BF872	23p	MJE520	30p	ZTX212	27p	2N.4444	76p	2SC1306	90p	EL500	80p	LA-1365	140p	TBA395	60p	74S13	26p	74LS158	47p
BC149	6p	BD440	40p	BF960	38p	MJE2955K	90p	ZTX300	13p	2N.5061	20p	2SC1307	100p	EL504	100p	LA-3301	120p	TBA396	60p	74S14	30p	74LS160	52p
BC157	6p	BD441	40p	BF963	40p			ZTX301	16p	2N.5294	30p	2SC1678	120p	EY86	31p	LA-3350	120p	TBA520	100p	74S15	17p	74LS161	58p
BC158	6p	BD442	40p	BF964	38p	OC28	100p	ZTX302	16p	2N.5296	30p	2SC1969	130p	EY87	31p	LA-3361	116p	TBA530	100p	74LS20	17p	74LS162	50p
BC182	6p	BD523	60p	BF966	40p	OC29	80p	ZTX303	24p	2N.6106	40p	2SC2028	75p	EY88	42p	LA-4030	200p	TBA540	100p	74LS21	17p	74LS163	60p
BC182L	6p	BD534	38p	BFR40	26p	OC35	100p	ZTX304	17p	2N.6107	40p	2SC2029	120p	EZ35	45p	LA-4031	140p						
BC183	8p	BD535	38p	BFR51	21p	OC36	120p	ZTX320	29p	3N.128	58p	2SC2078	120p	EZ80	50p	LA-4032	140p						
BC183L	6p	BD536	38p	BFR62	21p	OC45	50p	ZTX326	29p	3N.143	68p			EZ81	55p	LA-4050	130p						
BC184	6p	BD537	40p	BFR79	25p	OC71	30p	ZTX500	13p	BY100	40p	**LOW PROFILE SOCKETS**		GZ34	180p	LA-4051	160p						
BC184L	6p	BD538	40p	BFR90	52p	OC72	50p	ZTX501	13p	BY103	32p	8pin	6p	PC97	100p	LA-4100	120p						
BC212	6p	BD675	40p	BFR91	99p	OC200	180p	ZTX502	18p	BY126	6p	14pin	8p	PC85	42p	LA-4101	100p						
BC212L	6p	BD676	40p	BFX29	20p	R2008B	100p	ZTX503	18p	BY127	8p	16pin	9p	PC86	42p	LA-4102SK	140p						
BC213	6p	BD677	38p	BFX84	20p	R2010B	100p	ZTX504	25p	BY133	8p	18pin	12p	PC88	58p	LA-4112	250p						
BC213L	6p	BD678	40p	BFX85	20p			ZTX550	24p	BY164	40p	20pin	14p	PCF200	135p	LA-4125	210p						
BC214	6p	BD679	40p	BFX87	15p	TAG4443	76p			BY176	85p	22pin	16p	PCF801	110p	LA-4140	70p						
BC214L	6p	BD680	40p	BFX88	15p	TAG4444	76p	2N.696	26p	BY179	35p	24pin	18p	PCF802	87p	LA-4201	120p						
BC237	7p	BD681	45p	BFX89	60p	TIP29	15p	2N.697	22p	BY182	32p	28pin	20p	PCF806	115p	LA-4220	120p						
BC238	7p	BD682	45p	BFY17	30p	TIP29A	22p	2N.698	40p	BY184	32p	40pin	25p	PCH200	100p	LA-4400	190p						
BC300	18p	BDX32	100p	BFY18	40p	TIP29C	25p	2N.699	45p	BY187	32p			PCL81	54p	LA-4420	140p						
BC301	18p	BDX65	80p	BFY41	28p	TIP30	25p	2N.706A	22p	BY196	20p	**VOLTAGE REGULATORS**		PCL82	63p	LA-4422	130p						
BC302	18p	BDY92	100p	BFY50	14p	TIP30C	30p	2N.708	22p	BY206	11p	7805	35p	PCL84	50p	LA-4430	130p						
BC303	18p	BF180	16p	BFY51	14p	TIP31A	24p	2N.914	28p	BY207	11p	7812	35p	PCL85	55p	LA-4460	170p						
BC327	8p	BF181	18p	BFY52	14p	TIP31C	30p	2N.918	36p	BY208	18p	7815	35p	PCL86	55p								
BC328	6p	BF183	20p	BFY56	25p	TIP32	24p	2N.930	18p	BY223	72p												
										BY225	120p												
										BY226	18p												
										BY227	19p												
										BY228	32p												

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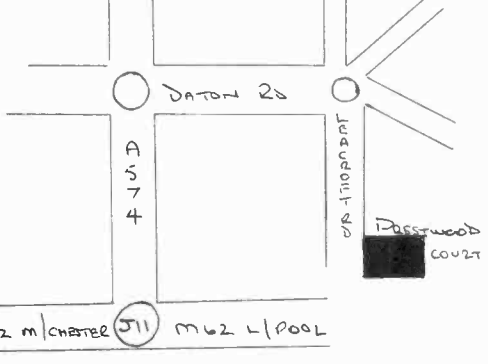

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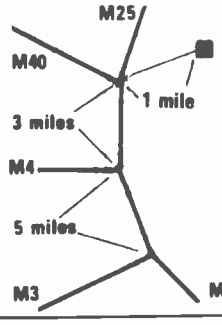

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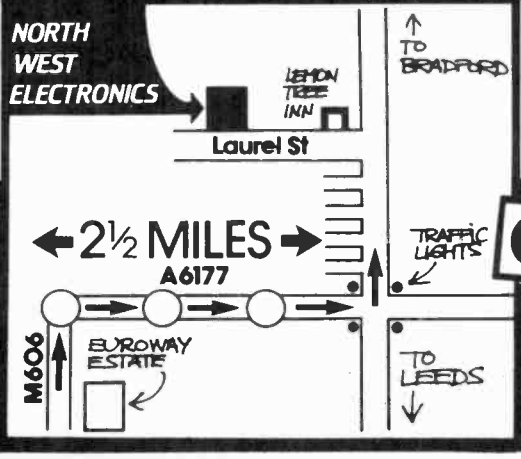

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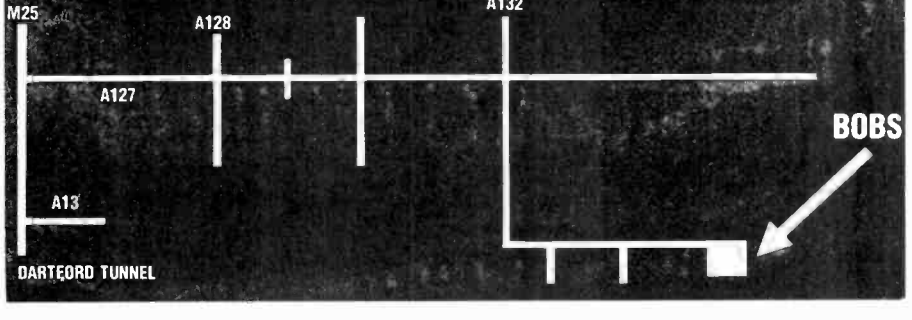

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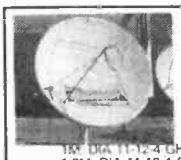

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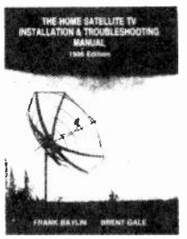

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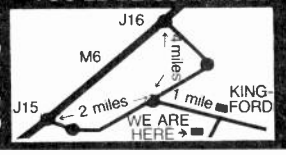

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2SC940 £1
BU 105/04 80p
BU 108 £1
BU 124 50p
BU 126 80p
BU 180a 65p
BU 204 70p
BU 205 £1
BU 206 £1
BU 207 £1
BU 208 80p
BU 208A £1.10
BU 208D 90p
BU 222 £1
BU 326 £1
BU 407 60p
BU 426V 60p
BU 500 £1.10
BU 500D £1
BU 508A £1.20
BU 526 75p
BU 807 £1
BU 824 50p
BUW 11 £1.00
BUW 84 60p
BYW 20-08-9 £1
BYW 95 10p
TIC 106a 30p
TIC 116m 40p
TIC 116n/Y 1003 35p
TIC 126N 40p
TIC 206m 30p
TIC 225S 40p
TIC 226E 40p
TIC 226m 30p
TIC 236m 30p
TICV 106D (T092 case 2A/400V) 10p
TIP 29 20p
TIP 30 35p
TIP 30A 35p
TIP 30B 40p
TIP 30C 45p
TIP 31 30p
TIP 32 25p
TIP 33B 50p
TIP 33C 70p
TIP 34A 50p
TIP 34B 60p
TIP 34C 70p
TIP 35B 50p
TIP 35C 70p
TIP 35D 80p
TIP 36 50p
TIP 36C 70p
TIP 41B 40p
TIP 41D 70p
TIP 42/BRC 6109 30p
TIP 48 40p
TIP 49 30p
TIP 57 30p
TIP 100 30p
TIP 102 30p
TIP 115 50p
TIP 117 50p
TIP 120 35p
TIP 125 35p
TIP 126 40p
TIP 127 40p
TIP 130 30p
TIP 131 25p
TIP 136 30p
TIP 140 50p
TIP 640 50p
TIP 2955 35p
T 6032 30p
T 6036 40p
T 6040 40p
T 6047 40p
T 6049 40p
T 6051 40p
T 6052 40p
T 9004 40p
T 9005 40p
ZTX 107 10p
ZTX 108c 10p
ZTX 109k 5p
ZTX 213 5p
ZTX 341 10p
ZTX 342 10p
ZTX 384 10p
ZTX 451 10p
ZTX 550 10p

MJ 2253 60p
MJE 3040 60p
MJE 2209 10p
SP 8385 50p
SAB 3205 £1.00
SAB 4209 £1.00
G11 condenser £1.75
300M + 700 320V £1.80
200 + 100 + 100 + 50 300V 50p
150 + 200 + 250M 300V 50p
Chassis complete £35
Computer Transformer 20v/2.25A; 20v/1.5A; 17/.5A; 19/.5A; 28/.05A £3
Mains ViewData Torroidals £3.75
240V/240/6V/4 amp/6v 500m/a in / out - - - - - - -
Mains trans 240/12v-0-12v 2 amp £3.50

Voltage Regulators
+5V/UA78PO5SC 30p
−5V/LM79MO5CP 25p
−8V/79M08c 30p
+6V/78M06c 30p
+10v/78LA10 20p
LM 317T 35p
LM 337 30p
LM 342/18 30p
LM 340T 5.0 50p
+12V/LM 340T12 50p
+15V/78M15 15p
+18V/MC78M18 20p
+24V/78M24 30p
MC 7724cp 40p
MC 7824 40p
TIS 90 10p
TIS 91 20p
TIS 92 20p
TIS 93 20p
U 19885 40p
U 3832 15p
U 3845 15p
MR 508 10p
MR 501 10p
MR 502 10p
BCW 71R 30p
BYF 1202 10p
BYF 1204 10p
BYF 3126 40p
BYF 3214 40p
BYX 10 6p
BYX 36/600 35p
BYX 38/300 25p
BYX49/600R 75p
BYX 55/350 10p
BYX 55/600 (Bead) 10p
BYX 71/350 20p
BYX 71/600 50p
BYX 72/300 20p
BYX 36/600 50p
BYV 95B 10p
BVY 95C 12p
BYV 96D 10p
BYZ 106 10p
BPW 41 15p
BYW 56 2A/1000v G11 8p
BZU 15/24 54p
BZY 93c75 50p
BZV 15/18 30p
BZV 15/30 30p
BZW 70c6v2 10p
BZX 79.3v 10p
Bush thyristor RCA 76122 £1
Transformer 240v/20v-500Ma 75p
Chassis type Transformer 240v/12 Volts 500m/a 75p
CVC 20 tube base £2
Tube Base Rank & G11 £1.20
6v-9v-13v tape motor 75p
Infra red led LD57CA 15p
G 8 transductor £1.25
AT 4041/41 transductor £1
VHF 3 Transistor rotary tuner DX-TV £1
15K-20 turn pots 20p
Thorn panel 6×100 pot + changeover switch (Irish) 50p
Battery converter TA 75 for colour TV. 12/24v Thorn 3787 £6
Thorn 3500 2A cut out 50p

Stereo GEC amp 20 watt + pre-amp with 4 pots + mains power unit with circuit £6

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

BRIDGES
SKB 2/08 L5A 30p
KBL 005 30p
KBL 02 30p
KBP 04 30p
W02 15p
W004 15p
W005 20p
AT 2076/35 £7
AT 2076/55 GEC split diode transformer £10
AT 2048/11 LOPTI Mullard £2.50
Z918 Front Panel with Mains Switch & I.C. £4
Thorn Chass U916D Compleat £10
Thorn TX9 Remote Panels with I.C.s £2.50
Thorn 9000 4 Slider Front Panel £4
Philips 12 Volt car aerial 15.00
Philips 2 off 30 watt car speakers. £15.00

Philips car radio speaker door pair £7
2× Hi-Fi Philips car tane up tweeter EN8320 £10
ITT CVC45 8 way resistor unit for v/cap £3
4700/10v × 10 50p
68/16 × 10 50p
150/16 × 10 50p
47/25 × 10 50p
220/25 × 10 50p
1/250 × 10 50p
8000/30v 50p
470/40v × 10 £1
22/100v × 10 £1
100/350v 70p
400/350v 70p
.47/500v 25p
1/600v 25p
.022/1kv 10p

VIEW DATA PANELS
NEW £3
Tel-Tex Decoder VM6101/01 £10.00
NI.CD Charger MW398 6A.A £8
NI.CD 5 Hours Battery Charger £8

Nickel Cadmium Battery Charger AA-C-D-PP9 £6

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

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

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

20AX GEC Split Diode lead £1.00

ITT Tel-Tex Decoder Panel £6.00

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

ITT Display Tube 58705 50p
8 Seg Display FND500 20p
Mullarad 12.5V/170 Mc/s 45 watts
BLW60C £4.00
Mullard Broadband R.F. power modules
UHF. BGY22E £10.00
PT4236C, PT8706C, PT9783 £3
ITT Micro Phone M5 50p with switch
1½ Volt Sub Min Relays 25p
12 Volt Relays
Double changer over 10A contacts 35p
Sub-min Relay low voltage 50p
Mains relay coil 230v 30p
Philip PP3 batterys 10 for £3
12v battery holders A.A. 50p 1.5 battery
T/V 12v 2 pin battery lead 30p

60–40 Soldar 500G 20 SWG £5.00
15 Watt Stereo Amp Sanyo Module with Data 50p
25pcs Precision Screwdriver & Tool Set £6.00
25 Watt Solder Iron £4.00

Various Tools and Accessories
T/V V/Aerial 300Ω or 75Ω £1.50
L.C.D. clock display with alarm 75p
* D/P push mains switch 20p each
Mains lead & two pin socket for radio cassette 35p
Xcelitr cutter £3.90
T/V loop aerial 75p
Radio Telescopic Aerial £1.00
Philips Neon Lamps for TV sets 5p
Freeze £1.20
Foam Cleaner £1.20
Contact Cleaner £1.20
Cans of Anti Static, Degrease Cleaner and Anti Corona All at £1.40
Lorlin Full Remote Relay Switch fit most T/V sets, mains 4 tag, 2 tag 12 volt £1.00
Mains timer. 13 amp — up to 2 hours: easy to use, plugs into socket £3.00
Screen locking agent, large can £1.50
20 GEC Service Manuals £5.00
Red E.H.T. LAED and Anode Cap £1.00
10 × G11 Cap 470/250 £15.00
Weller solder iron 15 watt/25 watt £5.00
Hitachi Silver Oxide Battery G13 UCC357 1EC SR44 1.5V 60p
70ML Silicone Sealer (clear) £1
100 Coax Plugs £12.00
De-solder pump + 2 nozzels Philips £4.00
Plastic box for i.c.s 6"×3"×½" 50p
Flat Red LED and Green 5p
500gm 60/40 solder reel £6
Solder 1 kilo reel £5.50
Clearweld glue pack 30p
Dual v/u meter -20 – +10db £1
K30 thermistor 232266298009 75p
GEC Mains Power Supply R.E.G. £3.00
De-solder Pump £2.50

Panel Meters VM/A
Gray front and .0-300V AC/DC 2¾ × 2¼ £2.00 each

1061 Series
GEC Automatic Telephone Answering Machine £40

SONY 1400KV Chroma Panel £6
SONY 1400KV Touch button unit £3.50

PHILIPS Pattern Gen. PM5519 £400 Cost £1000

12 Volt Mains Trans 500M/A £1.00
18V or 12 Volt Mains Trans 500M/A 75p

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

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

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

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

200 Mixed Diodes £1

100 500M/A Fuse £1
100 1.225 Amp Fuse £1

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

Thorn Spares

New 9000 Decoder	£8.50
9000 Frame panel	£8
9000 Cyclops panel	£1.50
8000/8500 timebase panel	£8
8800 convergence panel	£6
8500 convergence panel	£6
4000 Power supply	£3
1600 Mains lead, switch	
3500 6 push button + cable form	£1.50
T605 1xNPN TO66 80v/6A	10p
9000 Sound output panel	£1
3500 Focus unit	£1.50
3500 Mains Trans	£4
3500 cut outs	10 for £4
3500 IF panel	£2
3500 Frame panel	£3
3500 Line panel	£3
3500 A1 Diode	20p
Export 3500 IF panel	£2
IC board with set of SN741S	£1
4000 Tube base	£4
3500 A1 pots	50p
Beam limiter panel	£1.50
3500 Power panel with Y969	£1
3 Way regulated adaptor 240V 6V/7.5/9V/300mA	£3.50
Rank/Toshiba preh unit 0354	£9.50
2 banks of 3 PB unit. Pye 731	£2
4 Push button unit preh	£1.00
6 Push button VHF/UHF for x/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
G8 Push Button Unit	£10.00
KT3 12 Push button unit	£2.00
KT3 (Export) 12 P B u	£2
6 Push button Unit Thorn	£1.00
6 Push button Unit fits GEC & Decca etc.	£6.00
Hearing aid unit	£3
Rank Z718 4 P B/Unit MECH	£4
7 Button Unit GEC with Lamps	£7
Bush T515A 6 button unit with Pos & mains lead. 6 bush buttons Bush	£6.00
697 Push Button Unit	£6.00

Mains Droppers

G8 2R2+68R	£1.25
G8 47R 15 watt	75p
Pye 731 3+56+27R	50p
Thorn 50/17/1K5	£1.00
120/20/20/48/117	£1.00
270/10/6 for Thorn 4000	50p
18.320/70/39	£1.10
Thorn 50-40R-1K5	50p
Ac Socket & Lead GLC, ITT, Philips, Pye	25p
7×3¾ Thorn	£1
Thorn 1600-1700	£1.50
Rank Toshiba Tube Bases	30p

Speakers

6×4 G11	25 ohm	£1.00
5½×2½	3 ohm	£1.00
5×3	80 ohm	70p
5×3	80 ohm	50p
5×3	35 ohm	70p
6×4	15 ohm	£1.00
7×3	70 ohm	£1.00
8×5	8 ohm 15 watt	£2
8×5	8 ohm	£1
5×3	8 ohm	70p
7×3	16 ohm	£1.00
5" dia	16 ohm	£1.00
5" dia	8 ohm	£1.50
6½" dia	4 ohm	£1.50
6½" dia	3 ohm	£1.50
2¾" dia	8 ohm	75p
3" dia	8 ohm	75p
4½" sq	15 ohm	75p
KT3 speaker	K30	75p
3" dia	15 ohm	60p
1600 5×3	12 ohm	£1
K45 Philip	15 ohm	75p
K30 15 watt		£1

KT3-K30

OE-550	L W	10p
OE-513	correction	10p
OE-557		50p

DIODES

BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 164	50p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600 4 8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 228	10p
BY 299 Red	20p
BY 229/400	30p
BY 299/600p Tag	30p
BY 237	5p
BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 527	10p
BY 602	10p
F 247	10p
GP20G	5p
NK 3102	50p
BYV 28/200	20p
800/2 75 amps	10p
International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
6A/1000V Stud Diodes	20p

K35 Decoder	£8
K35 Sound OP	£4
K35 Split Diode 3122-138-35930	£10.00
Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00

Line Transformers

Hitachi Split Diode and GEC 1981 to 1984	£13
2 J/Pots 3,500 f off each type	£3.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
1690 Thorn EHT over-wind with diode lead & anode cap	£2.50
GEC 2040	£3.00
GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono 1704A	£3.50
Split Diode Trans	£7.00
GEC 20 AX Rank Z522	£3
Rank L O P T. Z970	£3
CVC20 ITT	£3.50
AT2080/15	£5.00
CVC30 ITT	£5.00
CVC32 Line Tran	£6.00
CVC800 Line Trans	£6.00
CVC40 Slip/Diode	£12.00
CVC 45	£5.00
GEC Portable G1OT2041	£3.00
GEC Portable G1OT2046	£3.00
EHT Split Diode Leads ITT	£1.00
3500 L.O.P.T. & ITT Trans	each £2
LOPT Rank Z763	£5
K35 Split Diode 3122/13835930	£7

Triplers

11 TTF	£2.50
11TGA	£2.00
ITT CVC 5-8-9	£3.50
Rank 125LE Tripler	£2.00
Rank 11TCP A823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
8500 Thorn	£4.00
9000 Thorn	£6.00
9500 Thorn	£4.50
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
TVK 76/9	£3.00
G8	£4.00
CVC 825 ITT CVC 20/25/30/32	£3.50
Decca 80 100	£4.50
Grundig TVK 52	£2.50
11TBQ Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/03	£4.00
BG 100/41	£3.25
ERO Tripler print type with foacs	
PO7 BG2087	£5
T/text ultrasonic rec'r panel	£14.00
Video cassette lamps on lead. 12-14V	50p or 3 for £1.00
20 for £5.00	200 for £25.00
GEC 8 touch unit assy complete with all I.C's + pots	£4.00
G11 E.W. Transformer	50p
G11 E W coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Scan Coils	£5.00
G11 100K tuner pots	12 for £1
K13 IF panel	£6.00
K13 line OSC transformer	£1
KT3/K30 infra-red receiver head	£1
K30 drawer unit with IC's (home)	£10
K30 drawer unit with IC's (export)	£10
KT3 AE Sockets	50p
KT3 receiver panel	£8
KT3 line driver transformer	50p
Pye, K30, GEC, etc Pre-mains stand-by switch	£1
Decca 80/100 IF panel	£5
NPN PNP 80V 6 Amp TO66 O P Trans	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B U	£24
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10
CVC 20/25/30/35/40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
K13 Front Panel Control Assy.	£2.50
BTW 30/50	50p

TELETEX DECODER

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

Rank T20 Z136 Panel	£6
NEW Pack THORN 17 off Manual	£5.00
NEW 1617 THORN Chassis with ICs & AU113	£5.00
30V Power Supply 500M/A 4×2¼	£2.50
Pye 731 Power Panel	£13
6 Diode Universal Triplers	£4.00
NEW PYE 725 line O/P panel with L.O.P.T. & Tripler	£10.00
NEW GEC 20AX Power Supply Switch Mode	£12.00
Complete new GEC portable chassis M1201H/M1501H with P.B.U / v.cap/LOPT	£10
Field + Jungle panel for GEC 3133/3135	£1.50
GEC 2110 line panel with transformer	£7.00
GEC 2110 tuner unit + IF Panel	£12.00
Pye/Chelsea Line op panel	£12.00
Pye 205 Tunit	£3.90
Pye 205 Line op panel	£7.50
Pye 713 IF panel and tuner	£7.00
Pye 713 Chroma	£10.00
Pye/Chelsea Timebase panel with LOPTI	£10.00
Pye 731 Frame Panel	£5.00
Pye 731 Convergence Panel	£5.00
Pye 731 Chroma	£10.00
Pye 731 IF panel + tuner	£10.00
Pye CDA/205 panel	£6.00
GEC portable chassis + LOPTI 2114 New	£4.00
Thorn 1613/1713 chassis	9.75
G9 Power Panel	£6.00
Mono RANK Chassis 127A NEW	£10.00
NEW G9 Frame Panel	£10.00
NEW G11 IF Panel	£7.00
G8 Tuner Unit + Panel	£4.00
G8 Power Supply	£5.00
G8 6 Sloping PBU	£8.00
G8 IF & Chroma	£6.00
G8 Chroma	£3.00
G11 IF Detector	£3.00
G11 Selector gain module	£3
Complete CVC 825 Chassis (both panels)	£40.00
AFC V/Cap Resistor Unit UHF with IC	
SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz I.I.C. SL437F	£3.00
Z909B RANK IF Panels	
Export 5.5MHz 2 I.C.'s	
TBA120SB TCA270SQ	£2.50
K35 IF	£6.00
Z743 RANK IF Panel	
Export 5.5MHz 3 I.C.'s	
TBA750+SC9504P+ SC9503P	£1.50
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead	£5.00
Pye 6 button switch portable	£1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 700B3 (Export)	£12.00
GEC Line O/P PC 659B3	£6.00
2110 GEC Power Panel	£8.00
GEC Power Supply (Export)	£10.00
G11 dynamic correction panel	£6
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots	£9.00
CVC 9 slider pots panel	50p
CVC 5 Mains on/off + 5 pots	£2
Universal Focus. Fits Pye, Thorn and Decca Units.	
T147 Rank tube base on panel	£1.00
Z718 Focus Unit	£1.50
T20 Focus Unit	£1.00
Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
K30 Focus Pot	75p
K30 Tube base on panel	£1.00
TX10 Focus Units	£7.00
CVC 32 Focus Unit	75p
Fedility Focus Unit 14R-14S	30p
3500 Thorn Focus Unit	£1.00
ITT Small for use with Split Z718 Bush Focus	£2.00
Diode	50p
TV11	50p
Remo TV12SP	50p
1600 Thorn EHT Rec and Lead	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p
G11 drawer ASS 3 pots Mains switch and lead	£2.00
K30 Drawer Ass with pots cable forme	£1.00
Line O/P panel GEC 2217/2218/2213/ 2214/2226/2227/2228	£10

DISPLAYS

4040 Clock	£1.00
7seg Red LED	50p
2 digit LED 8.8	50p
2 digit LED −1.8 with panel + MC14511	£1.00
4700/63	£1.50
250/64	10p
CVC 20-25-30 Mains Switches	75p
Infra Red and Ultrasone G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720R)	£1.50
RANK & ITT Mains Remote Switch 2806 ohm	£1.50
RANK & ITT Remote Switch 2800 ohm	£1.50
G11 Mains Switch	50p
4 amp Mains Switch	25p
GEC Mains Switch 4 amp	30p
KT3 Mainswitch	£1.00
THORN Rotary Mains Switch	50p
G8 Mains Switch	75p
Thyristor 600/4 amp C106/2	24p
G11 Preh Red LED P/Button for C.H. Change	20p
RANK TOSHIBA Transductors TPC-201I	50p
Mains Switch ITT Long Type Print	75p
Mains Switch Philip Long Type TAG	75p
Mains Switch GEC Long Type TAG	75p
Thorn 12 or 24 volt battery convertor for portable colour T/V	£6.00

.1/250AC	20p
.1/100	5p
1/100 × 10	30p
22/100	10p
4.7M/100	5p
470/100	20p
2000/100	70p
4700/100	75p
47/160	10p
300 300/300V	80p
800/160	50p
.1/250 Pulse	5p
2.2 250v	10p
3n3/250 A.C.	10p
33/250V	20p
.39/250V	15p
4n7/250 tested 5KV	25p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
GEC 600/250	60p
700/250	£1
300+300 MFD 350v	£1.00
800/250	40p
32/300	20p
4/350	5p
8/350	8p
4.7M/350v	10p
33/350	20p
220/350	30p
300/350	40p
400/350	50p
10/375	10p
22/375	15p
220/385 (ITT)	75p
330/385 CVC 820 ITT	60p
0 1/400	15p
KT3 F/W .39/400	20p
.56K/400v	20p
4700pf/400	10p
.22/400	10p
8/400	15p
33/400	20p
400/400	40p
394K/400V	20p
220/450	40p
47/500	25p
0.1/600	15p
0 1/1200V wire end	20p
0 1/450 A/C wire end	20p
047/600	15p
0.047/1000	10p
0.01/1000	10p
0 1/1000	10p
47/1000v	65p
.47/250V A C	10p
.001K/1250	10p
0.0047/1500	10p
.005/1500	10p
0105/1500	10p
1n8/1500	15p
2n0/1500	10p
2n2/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0.1/2KV	20p
10n/2KV	15p
3n9/2KV	15p
0.001 5/2KV	10p
5n2/2KV	10p
6n2/2KV	15p
2n0/2KV	15p
2n2/2KV	15p
470pf 4KV	10p
2500pf/2KV	10p
3000PF/3000V	10p
4n7/2KV	15p
8n2/2KV	15p
0.0082/2500	15p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
47/100V	80p

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

Multi-Caps

220 MFD Sprague 385V	50p
4,700/75 6 amp Rip	£2.00
350V 300M + 300M	£1.00
400V 400M	60p
350V 400M	60p
Thorn 3500 175/100/100/350v	£1.00
KT3/200/25/25/385v	£1.00
200+200+75+25M 325V	£1.00
300+300+150+100+50MFD 350V	£2
G11 CAP 470/250	£1.50
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
150/200/200/300v	70p
400/400/200v	£1.70
300/100/100/16/275v	£1.50
100/200/325v	40p
150/150/100/375v	£1.50
200/200/75/25M 325V	£1
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
Jelly pot Thorn 00D4/013	£3
150/150/100/100/320v	£2.00
100/350 + 300/200/100/16/275v	£2.00
225+25/380 GEC	70p
200/100/100/350v	£1.50
500/500/25v	50p
150/150/100/300v	75p
200/150/150/300v	1.00

ITT 8 and 6 Push Button	£1.00
Pye 725 LOPTs	£6.00
Pye 731 LOPTs	£6.00
Thorn 8500-8800 LOPTs	£5.00
CMD 800 Chassis. No tuner	£20.00
CMD 800 Decoder	£8.00
TAG 226/600	50p
BD 650	50p
UPC 574	30p
BSS 38	30p
G11 I I.C Receiver Panel	£1.50
3 I.C. Power Supply G11 Full Remote Receiver Panel	£3
Teletext Receiver Model T1 Fits on top of TV with handset.	£95
FET Power VN88AF	50p
PHILIPS SBC 469 Stereo Microphone	£23.00
Meters Hills 520	£17.00
Meters Hills 420	£15.00
Infra-red Tester Handset	£12.00

Infra Red Hanset Tester

Works at 24 feet – Sound repeater. Works off 9 volt battery £8.00
Fits in top pocket

Repaired Handsets

Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day £10.00
RC4001 Full Remote KT3 K30 Teletext Handsets exchanged £9.00

GEC Full Remote Infra-red, 1983 models	£15.00
Timers, 60 mins, small	£1.00
G11 Touch Unit Full Remote	£13
G11 Ultrasone Teletext Handset	£24.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H	£15.00
New Replacement for G11 Ultrasone Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£24.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18
Philips full remote KT3 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
G11, Full remote top button assy	£12.00
G11, Full remote repair service (exchange unit)	£12.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
K35 KT3/K30 T/Text	£15.00
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
Hitachi 8 button unit with resistor unit Last year mod	£7.00
GEC infra-red 2236-2026	£4.00
GEC push pad handset button blobs	10p each
Pye & Philips handset K13-K30 chassis No RC5150-RC5176-RC5171-RC5177. Special Price	£13.00
ITT hand set with TV-Teletext-VCR	£12.00
RC4001 KT3 and Teletext	£14.00
IT CVC 32 handset repaired	£15.00

We have all parts for Philips Handsets