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SPECIAL TEST REPORT DEC. 1982

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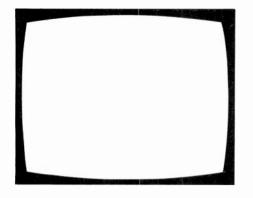
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TELEVISION

October 1987 Vol. 37, No. 12 Issue 444

On sale September 16th

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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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QUERIES

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

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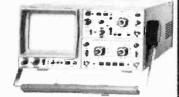
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- SPECIFICATION
 Digital Storage
 Analogue Real Time (Same as 203-6)
 Bandwidth DC-20MHz
 Sens, Ch1, Ch2 ZmV/cm
 Tragger DC-40MHz AC, DC, HP, LF, (TV Frame),
 Active TV Sinc. Sep.
- 100KHz Sample Rate
- 2x1K Storage Storage Range 1ms-5s/cm Variable hold-off 10.1 Calibrator

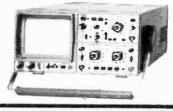
Price £498.00 + £74.70 V.A.T. Including two probes HM605 60MHz Multi-function

FREE Securicor Delivery

SPECIFICATION

- Bandwidth DC-60MHz Sens. Ch1, Ch2. 1mV/cm
- velay Line
 Delayed Sweep 100ns 0-1s
 Tragger DC-80MHz AC, DC, HF, LF, (TV Frame)
 /anable hold-off 10.1
 Switchable Calibrator
 Puserscan LED indicators
 Plus many more features

Price £583.00 + £87.45 V.A.T.



B.K.'s CRT TESTER-REJUVENATOR

Tests and rejuvenates blue, green & red guns separately. Fitted with delta at P.I.L. sockets. Compact size 120×65×60 mm. Supply 240V AC

Price £32.00 + £4.80 V.A.T.

B.K.'s REVOLUTIONARY DYNAMIC 'LOPT' TESTER

Revolutionary L.O.P.T. tester. Operates in dynamic mode which actually tests the L.O.P.T. under high voltage conditions without de-soldering or removal. Size 75×100×40 mm. Supply 240V AC

Price £25.99 + £3.90 V.A.T.



THANDAR SC110A PORTABLE OSCILLOSCOPE • Full trig. fac. inc. TV frame etc



- * Battery or mains adaptor Only 21/4" thick
- Fits in a brief case
 Sens. 10mV * Size 255mm x 148mm x 50mm
- * Bandwidth 10MHz
- **ACCESSORIES**

Carry Case £6.25 + £0.93 V.A.T Probe £7.50 + £1.30 V.A.T. Mains Adaptor £7.30 + £1 09 V.A.T

Price£195.00 + £29.25 V.A.T. INSULATION TESTER 500V

000

DIGITAL LCR METER

- LCD Display
- 18 Ranges
- Inductance 1µH-2H
- Capacitance 1pf 200µf
- Resistance 1 ohm 20Mohm

High acuracy

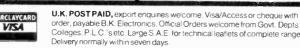
Price £85.00 + £12.75 V.A.T.



Electronic battery operated

- Measuring Voltage
- 500V DC Measuring Range
- 0-100Mohm
- * Centre scale 2Mohm

Price £65.00 + £9.75 V.A.T.





Normal Price £317.00 + £47.55 V.A.T. • Complete with tube base adaptors. Special Winter Price £275.00+£41.25 V.A.T. • Size H230mm W330mm D120mm

LEADER LCT910-A CRT TESTER REJUVENATOR Our top selling instrument is designed to readily test the various characteristics and

- rejuvenation of both colour and B/W CRT's. * Tests for shorts and leakage between electrodes
- . Tests cathode emission characteristics
- Separately checks condition of guns. * Removal of shorts and leakage between electrodes.
- * Checks heater warm-up characteristics
- * Rejuvenation of low emission cathodes with automatic timing.
- Super rejuvenation with manual control

SADELTA FIELD STRENGTH METER TC-402

THE SADELTA FIELD STRENGTH METER TC-402 has been designed to measure the signal levels delivered by the antenna to a TV or FM receiver, in order to test the performance of the antenna and evaluate the best conditions during installation etc. To facilitate measurements, the tuning frequency readout is shown on a digital display.

FEATURES

- Covering FM and all TV bands (UHF/VHF) including CATV freq.
- Digital tuning display (3 digits) for direct frequency readout.
- Accurate 10 turn tuning potentiometer. Built-in loudspeaker enables
- monitoring of sound in AM/FM. * Meter measurement in voltage
- and dB from $20\mu V$ ($26dB/\mu V$). Continuity tester 0-500 ohms.
- * Fully portable (battery).
- Sturdy carry case.

Price £249.00 + £37.35 V.A.T.



for use in production, installation and service of both colour PATTERN GENERATORS is intended for use in production. Installation and service of both colour and monochroner TV sets, video and computer monitors in order to control and adjust the various parameters <u>eight switchable</u>, patterns are provided. The technician has ready access to Laboratory, workshop and field use as the Generator has been designed using the latest micro-technology to achieve truly pocket size instruments, internal re-chargeable Nir Cd's. Supplied with 9V power supply charger. Size 131mm x 81mm x 23mm.

T.V. PATTERN GENERATOR PAL MC11B UK

- Band IV (21-34)
 O/Put 10mV into 75ohms
 Sound output
- * PAL I.

Price £124.95 + £18.74 V.A.T. PAL VIDEO COMPOSITE GENERATOR

- PAL B.G.I.
 Audio O/Put 10mV
 O/Put 1V p.p. (a: 750hms
 Switching 12V (a: 4K70hms

Price £124.95 + £18.74 V.A.T.

SECAM VIDEO COMPOSITE GENERATOR

- * SECAMB.G.D.K.L.
- * SECAM B.G.D.K.L. * Audio O/Put 10mV * O/Put 1V p.p. (ii 75ohms * Switching 12V @ 4K7ohms
 - Price £124.95 + £18.74 V.A.T.

R.G.B. PATTERN GENERATOR

- * O/Put sigs. Pos.RGB Neg. Composite
- O/Put TTL 5V P-P
 Blank Pulse etc. CCIR

200MHz DIG. FREQ. METER

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DIGITAL THERMOMETER * Pocket Size



- ★ -50°C to + 750°C ★ 1°C Resolution
- * 0.5"LCD * Supplied with
- thermacouple

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* 8 Dig. LED Display * Freq. Range 20Hz to 200MHz

* Pocket Size

* Resolution 0.1Hz

Sensitivity 10mV

Price £75.50 + £11.32 V.A.T.

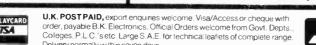
EADER High Voltage Metered EHT PROBE. Measures up to 40KV DC with safety. Built in meter. Accuracy ±3%

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The THANDAR TP1 LOGIC PROBE and TP2 LOGIC PULSER are effective and economical tools for checking both TTL and CMOS circuits. TP1 can show 14 different circuit conditions and can detect pulses down to typically 10ns. TP2 can inject a signal directly into a circuit without Price £23.00
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AN316	€3,75	BA532	£1.60	HA11225	£1.95	LA4110	£1.75	STK022	£5.30	TA7150P	£2.75 UPC1032H	£0.60 2SB561	£0.35	3ANTO VICSSOO (4) 12.13 SIN2250 19.30
AN318	€4.95	BA536	\$2.40	HA11226 HA11227	£4.50 £2.20	LA4112	£1.75	STK025 STK040	£7.50 £8.70	TA7152P	22.50 UPC10350	£1.95 2SB698	€0.40	
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AN362L	21.66	BA656	€4.50	HA11401	£2.80	LA4140	20.80	STK078	£6.75	TA7202P	£4.50 UPC11650	£1.30 2SC458	€0.30	SCINY SI T7ME/T7 (6) 52 00 TDA26524 CE 20
AN366P	€1.76	BA843	£4.50	HA11423	€4.75	LA4160	€2.40	STK080	£7.50	TA7203P	£1.90 UPC11680	£1.30 2SC460	£0.35 £0.35	CONV CLC7/17 (C) C2 00 TD40505 04 35
AN374P AN377	£2.20 £2.00	BA847	£3.75	HA11440A	£3.95	LA4170 LA4182	£3.50 £2.10	STK082G STK086	£7.75 £9.50	TA7204P TA7205AP	£1.75 UPC1170F £1.00 UPC11710		£0.70	
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AN612	€1.80	BA1310F BA1320	£1.75 £1.25	HA11704	£5.20	LA4200	£1.50	STK431	€5.95	TA7208P	£1.75 UPC11771		20.35	TOSHIBA V7540 (5) \$2.25 TDA4431 \$2.25
AN5033	₹5.25	BA1330	£1.75	HA11705	€6.95	LA4201 LA4220	21.60	STK433 STK435	£5.25 £5.50	TA7210P TA7214P	\$2.50 UPC1181F \$2.60 UPC1182F		£0.35 £0.35	TOSHIBA V8600 (6) £1.80 TDA4600 £2.95
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AN5620X	€3.50	BA5102A	€2.75	HA11710	€3.75	LA4250	£2.75	STK437	£6.50	TA7217AP	£1.60 UPC1185F	£2.50 2SC828	£0.30	
AN5701	€1.80	BA5406	€3.20	HA11711 HA11713	£9.50 £6.50	LA4420	£1.60	STK439	25.95	TA7220P TA7222AP	£2.50 UPC1186F £1.30 UPC1187V	£0.90 2SC840 £1.75 2SC900	£1.50 £0.35	882222EE4442E
AN5722 AN5730	£1.60 £1.85	BA6137 BA6209	£2.75	HA11713	25.95	LA4422 LA4430	£1.40	STK441 STK443	£7.95 £7.95	TA7223P	£1.30 UPC1187\ £2.30 UPC1215\		20.35	CASSETTE HEADS
AN5732	11.85	BA6304	12.20	HA11715	€6.25	LA4440	\$2.50	STK457	£6.50	TA7225P	£3.25 UPC12230	£2.20 2SC930D	£0.35	(0)
AN5753	€1.95	CX0642	€8.50	HA11716	€4.75	LA4445	€2.75	STK459	26.75	TA7226P	£3.20 UPC1225F		£4.75 £1.20	O Stereo 92.50 1- Auto Reverse 92.75 2 Minu/Stereo 92.75
AN6250	₩.30	CX065B	\$2.95	HA11717 HA11718	£5.75 £4.75	LA4460 LA4461	£1.80 £1.80	STK461 STK463	£7.50 £8.40	TA7227P TA7229P	£2.20 UPC1230F £3.25 UPC12630		£1.20 £0.70	Auto Reverse 27.75
AN6310 AN6341N	£6.25 £4.00	CX0758	22.75	HA11727	€9.50	LA4500	12.60	STK465	\$28.50	TA7230P	£1.95 UPC1277		20.35	1 00 5 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
AN6344	€4.75	CX095C	£2.85	HA11745	€9.00	LA4505	\$2.80	\$TK501	26.25	TA7232P	£2.95 UPC12784		€0.45	NIDEO HEADS
AN6350	₹7.58	CX100D CX101G	£6.75 £7.75	HA11747 HA11747ANT	£9.50 £9.50	LA4507 LA4520	£4.25 £2.50	STK0025 STK0029	£4.95 £4.75	TA7240AP TA7241AP	£2.95 UPC13500 £2.95 UPC13530	£1.20 2SC1875 £1.95 2SC1942	£2.95 £3.25	4 H.S.S. A H.S.S.S. A H.S.S. A H.S. A H.S.S. A H.S.S. A H.S.S. A H.S.S. A H.S.S. A H.S.S. A H.S.
AN6356N AN6360	£3.85 £4.50	CX130	£4.75	HA11747AN	£9.50 £4.75	LA4520 LA5112	£1.85	STK0029 STK0039	£4.75	TA7270P	12.75 UPC13560	£2,00 2SC1957	20.80	0.35 1.11
AN6362	€5.50	CX136A	£7.50	HA11750	\$5.00	LA6458D	€1.20	STK0040	Ω6.25	TA7310P	£1.85 UPC13630	£2.20 2SC1969	\$1.75	0.35 SEE 6.5MB S
AN6363	€7.50	CX143A	£7.50	HA11753NT	£8.50 £8.50	LA7016	€2.75	STK0049	26.50	TA7312P	£1.50 UPC1378F £1.50 UPC13820		£0.95 £0.95	N.C. 3HGS PANASON PANA
AN6387 AN6610	£5.95 £1.80	CX157 CX158	£4.25 £3.75	HA11758NT HA11768	£8.50 £4.50	LA7215 LA7751	£2.75 £4.75	STK0059 STK0080	£7.00 £7.75	TA7313AP TA7314P	£1.50 UPC13820 £2.50 UPC13840		£1.50	# S S S S S S S S S S S S S S S S S S S
AN6677	£1.80 £6.30	CX160	£3.50	HA11788	£4.50	LA7755	£3.20	STK2028	₹7.50	TA7315AP	£2.35 UPC13870	£2.50 2SC2577	£1.95	SAN SEE LA SE COA 6.0MC 20.40
AN6811	£1.60	CX161A	£3.50	HA11816NT	26.50	LA7800	£1.95	STK2029	€5.75	TA7317P	£2.75 UPC1391H		£2.75 £2.75	
AN6873	£4.50	CX162	£3.95 £6.75	HA11828NT HA12001W	£9.50 £6.50	LA7801 LA7806	£2.95 £2.75	STK2129 STK2230	26.75 26.50	TA7324P TA7325P	£2.50 UPC14030 £1.00 UPC14200		12.75	
AN6884 AN7105	£2.75 £2.30	CX170 CX181	£8.75	HA12002	12.95	LA7808	12.75	STK3042	€6.50	TA7328AP	\$2.20 UPC14580	£0.95 TDA1515	€4.50	Enquines invited for any Japanese LCs. As we have imported
AN7110	£1.50	HA1124A	€2.75	HA12017	\$2.75	LB1287	\$2.75	STK4060	€6.50	TA7331P	£2.20 UPC1533H	IA £2.75 TDA2002	08.03	for over 10 years.
AN7111	£1.50	HA1125	£1.75	HA12035 HA12038	£9.50 £6.75	LB1405 LC4066B	£2.20 £2.95	STK4141II STK4191II	£7.50 £8.95	TA7343P TA7607AP	\$2.95 UPC45570 \$2.95 UPC45580	£1.50 TDA2003 £0.90 TDA2004	£0.90 £2.20	TIEMS DESPATONED WITHIN 40 HOUNS
AN7114E AN7115E	£1.75 £1.60	HA1137W HA1144	£1.75 £4.25	HA12413	\$2.75	LC7120	£3.50	STK4332	£5.75	TA7608CP	23.95 UPD15140	£5.75 TDA2005	£2.75	Please add 60p post and packing and then add 15% VAT to total.
AN7116	£1.50	HA1151	12.50	HA13001	12.95	LC7130	€3.50	STK4392	₹7.50	TA7609P	12.70 UPD45148	C £3.50 TDA2006	£1.50	Callers by appointment:
AN7120	£1.50	HA1156W	€1.20	HA13402	£4.95	LC7131	€3.75	STK5211	26.75	TA7611AP	23.20 X0042CE 22.75 X0077GE	£2.20 TDA2020 £9.95 TDA2030	£1.40 £1.40	
AN7130	£1.30	HA1167 HA1196	£3.75 £1.75	HA13403 HA13430A	£7.50 £4.50	LC7136 LC7137	£2.75	STK5421 STK5422	£6.75	TA7614AP TA7617AP	\$2.50 X0092CE	£5.60 TDA3562A	£1.40	
AN7145M	1,1,30	DATE:00	£1.70		27.00	LUITUI	14.13	0110764	2.0.10	THE OTHER	- IOO THOUSEOF	20.00 10.0000	20.00	

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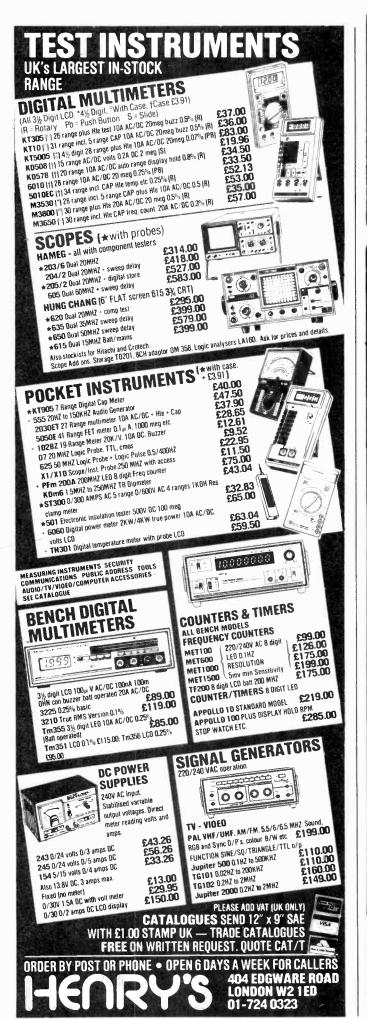
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						13/03N		Z.5A, J.15A	60	THORN TX10	19.5	I LZ.95 Bach	
FFROUNDALI 304	0040=0	m tor ma				13/03N		2.5A, 3.15A	60		19.5		
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TX9 Dual PTC I.F. Gain Unit Line O/P Trans	21 22.9 23.9	Capstan Mo Cass. Housi Cass. Motor Erase Head Guide Roller	tor	25.95 28.95 6.70 9.60	V4100H/VT11E Audio Head		VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller	ANYO D SPARES 32.95 6.95	9300/381/ Capstan I Loading N	SHARP IDEO SPARES 383 Motor	.50 F	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 erguson 3V00/16/22 erguson 3V29/30 ditachi 8000	1.50 2.50 1.80 1.95
TX9 Oual PTC I.F. Gain Unit Line O/P Trans Linear Line Coil	21 229 239	Capstan Mo Cass. Housi 5 Cass. Motor 5 Erase Head 60 Guide Roller 15 Leaf Switch	tor	25.95 28.95 6.70 9.60 30	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay		SOUVEDEC SOUVESSOU Capstan Motor Gear Idler Load. Roller Pinch Roller	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol	SHARP IDEO SPARES 383 Motor	.50 F	VIDEO BELT KITS AKAI 9300/9700 Imstrad 7000 erguson 3V00/16/22 erguson 3V29/30 ilitachi 93000 ilitachi 93009500	1.50 2.50 1.80 1.95
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke	21 22.9 23.9 1.2	Capstan Mo Cass. Housi 5 Cass. Motor 5 Erase Head 60 Guide Roller 15 Leaf Switch 16 Reel Idler	tor	25.95 28.95 6.70 9.60 30 1.45	V4100H/VT11E Audio Head		S. VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Motor	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rol Reel Idler	SHARP IDEO SPARES 383 Vlotor	.50 F	VIDEO BELT KITS AKAI 9300/9700 Imstrad 7000 Imstrad 700	1.50 2.50 1.80 1.95 1.80
TX9 Oual PTC I.F. Gain Unit Line O/P Trans Linear Line Coil	21 22.9 23.9 1.2	Capstan Mo Cass. Housi 55 Cass. Motor 56 Guide Roller 60 Guide Roller 65 Reel Idler 65 RF Converte Take-up Clu	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay		S. VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Motor	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot	SHARP IDEO SPARES 383 Wotor	.50 F .85 H .95 H	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 erguson 3V00/16/22 erguson 3V29/30 eitachi 8000 iitachi 9300/9500 iitachi VT11E VC HR7200	1.50 2.50 1.80 1.95 1.80
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke	21 22.9 23.9 1.2	Capstan Mo Cass. Housi 55 Cass. Motor 56 Guide Roller 60 Guide Roller 65 Reel Idler 65 RF Converte Take-up Clu	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F. F. Rew Arm Pinch Roller Relay Video Head V4004H/VT33E		S. VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Motor Reel Pulley	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot	SHARP IDEO SPARES 383 Vlotor	.50 f .85 H .95 H .30 H	VIDEO BELT KITS AKAI 9300/9700 Imstrad 7000 Imstrad 700	1.50 2.50 1.80 1.95 1.80 1.95 1.80
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter	21 229 239 12 29 149	Capstan Mo Cass. Housi Cass. Motor Erase Head Guide Rollei Leaf Switch Reel Idler RF Converte Take-up Clu UHF Tuner	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor	19.95 21.95 9.40 2.90 5.50 2.95 27.95	S. VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Motor Reel Pulley	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A:	SHARP IDEO SPARES 383 Motor 27 Motor 8. ler 5. 307 17	.50 F .85 H .95 H .30 H	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 erguson 3V00/16/22 erguson 3V29/30 eitachi 8000 iitachi 9300/9500 iitachi 9711E IVC HR7200 Jat Pan. NV333 Jat. Pan. 2000 Jat. Pan. 2000 Jat. Pan. 80000 Jat. Pan. 800000	.1.50 .2.50 .1.80 .1.95 .1.80 .1.80 .2.20 .2.25 .1.95
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit.	21 229 23.9 1.3 2.9 14.9	Capstan Mo Cass. Housi 55 Cass. Motor 56 Guide Rolled Leaf Switch Feel Idler 57 RF Converte Take-up Clu UHF Tuner	rtch	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95 2.45 36.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 29.95 8.95	S. VIDE(5000/5300 Capstan Motor Capstan Motor Load. Roller Pinch Roller Reel Motor Reel Pulley SERVICE TELEVISION	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler	SHARP IDEO SPARES 383 Motor 27 Adotor 8 leer 5 307 17 SSy. 3	.50 f .85 H .95 H .30 H .50 J	VIDEO BELT KITS KAI 9300/9700 mstrad 7000 mstrad 7000 itachi 8000 itachi 8000 itachi 8000 itachi WT11E VC HR7200 alt Pan. NV333 alt. Pan. NV3000 lat. Pan. NV3000 lat. Pan. NV7000	1.50 2.50 1.80 1.95 1.80 1.95 2.20 2.25 1.95
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans	21 22-9 23-1 1,2-9 14-9 14-9 12-18-18-18-18-18-18-18-18-18-18-18-18-18-	Capstan Mo Cass. Housi Cass. Motor Erase Head Guide Roller Leaf Switch Re Converte Take-up Clu UHF Tuner	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95 2.45 36.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F; /Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy E; /Rew Arm	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load, Roller Pinch Roller Reel Motor Reel Pulley SERVICE TELEVISION Ferguson TX9.	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler	SHARP IDEO SPARES 383 Motor 27 Adotor 8 leer 5 307 17 SSy. 3	.50 F .85 H .30 H .50 J .75 N .75 N .95 S .95 S	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 erguson 3V00/16/22 erguson 3V29/30 itlachi 8000 itlachi 9300/9500 itlachi 9711E VC HR7200 Jat. Pan. NV333 Jat. Pan. NV3300 Jat. Pan. NV3000 Jat. Pan. NV3000 Jat. Pan. NV70000 Janyo VTC50000	1.50 2.50 1.80 1.95 1.80 2.20 2.25 1.95 1.95
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans Dn/0ff Switch	21 22: 23: 1.3 2: 14: 14: 8: 32:	Capstan Mo Cass. Housis Cass. Motor Cass. Motor Erase Head Guide Roller Leaf Switch Reel Idler Fr Converte Take-up Clu UHF Tuner GG GG GG	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95 2.45	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90	S. VIDE(5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX9. Ferguson TX10	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler Reel Mot	SHARP IDEO SPARES 383 Motor 27 Adotor 88 Ier 5, 307 17 SSSy. 37 380 397 16	.50 F .85 H .85 H .30 H .50 J .75 N N .25 N	VIDEO BELT KITS KAI 9300/9700 .mstrad 7000 -erguson 3V00/16/22 -erguson 3V29/30 -itachi 8000 -itachi 8000 -itachi WT11E	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans	21 229 23.9 1.0 2.9 14.9 1.0 8.9 2.9 1.1	Capstan Mo Cass. Housis Cass. Motor Cass. Motor Crase Head Guide Roller Leaf Switch Reel Idler RF Converte Take-up Clu UHF Tuner The General Capstan Motor Take-up Clu HMF Tuner HM6232	tor	25.95 28.95 6.70 9.60 30 1.45 2.85 24.95 2.45 36.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy Ff./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy Ely Clutch Assy Ff./Rew Arm	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90	S. VIDEC 5000/5300 Capstan Motor Gear loler Load. Roller Pinch Roller Reel Pulley SERVIC! TELEVISION Ferguson TXI9. Ferguson TX90 Ferguson TX90	ANYO D SPARES 	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler Reel Mot	SHARP IDEO SPARES 383 Motor 27 Adotor 8 leer 5 307 17 SSy. 3	.50 F .85 H .30 H .50 J .75 N .75 N .25 S .50 S	VIDEO BELT KITS AKAI 9300/9700 Imstrad 7000 Imstrad 700	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.00 .1.95 .1.95
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans 0n/0ff Switch Tuner 10K ROT. POT.	21 229 23.9 1.0 2.9 14.9 1.0 8.9 2.9 1.1	Capstan Mo Cass. Housi Cass. Motor Cass. Motor Cass. Motor Cass. Motor Cass Motor Leaf Switch Rel Idler Rel Idler Rel Converte Take-up Clu UHF Tuner	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 29.95 29.95	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load, Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX10	ANYO D SPARES 32.95 6.95 1.95 6.85 9.95 6.95 E MANUALS 28.50 1.095 1.095	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler Reel Mot	SHARP IDEO SPARES 383 Motor 27 Adotor 88 Ier 5, 307 17 SSSy. 37 380 397 16	.50 F .50 F .50 H .95 H .50 J .75 N .75 N .25 S .95 S	VIDEO BELT KITS KAI 9300/9700 .mstrad 7000 .mstrad 7000 .mstrad 7000 .mstrad 8000 .itachi 8000 .itachi 8000 .itachi 900/9500 .itachi 910/9500	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.25
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans On/Off Switch Tuner 10K ROT. POT.	229 229 231 149 149 149 150 160 160 160 160 160 160 160 160 160 16	Capstan Mo Cass. Housis Cass. Motor Cass.	rtch		V4100H/VT11E Audio Head		S. VIDEC 5000/5300 Capstan Motor Gear loller Load. Roller Pinch Roller Reel Pulley SERVIC! TELEVISION Ferguson TX10	ANYO D SPARES 3.2.95	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot Unlock A: 481/483 Reel Idler Reel Mot S C5/C7 Ace Head	SHARP DEO SPARES 383 Motor	.50 F.35 H.35 H.35 H.35 H.35 H.35 H.35 H.35 H	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 Erguson 3V00/16/22 Erguson 3V29/300 Iitachi 8000 Iitachi 8000 Iitachi 9300/9500 Iitachi WT11E VC HR7200 Alat Pan. NV333 Iat. Pan. RV3300 Iat. Pan. NV3000 Iat. Pan. N	.1.50 .2.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.95
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans	229 233 11 221 145 129 11 145	Capstan Mo Cass. Housi 5 Cass. Motor 65 Frase Head 6 Guide Rollet 15 Re Converte 7 Take-up Clu UHF Tuner 15 16 17 18 18 18 18 18 18 18 18 18 18 18 18 18	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E		S. VIDEC 5000/5300 Capstan Motor Gear Idler Load, Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX10 Ferguson	ANYO D SPARES 32.95 6.95 1.155 6.85 9.95 6.95 1.050 1	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot - Unlock A: 481/483 Reel Idler Reel Mot - CS/C7 CS/C7 Ace Head Brake As	SHARP DEO SPARES 383 Motor	.50 F50 J75 N75 N25 N95 S50 S5	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 Ierguson 3V00/16/22 Ierguson 3V29/30 Iitachi 8000 Iitachi 8000 Iitachi 9300/9500 Iitachi 9711E IVC HR7200 Iat. Pan. NV333 Iat. Pan. NV3000 Iat. Pan. NV7000 Ianyo VTC5300 Ianyo VTC5500 Ianyo VTC5300 Ianyo VTC5500	.1.50 .2.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.40 .2.40 .2.50
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans On/Off Switch Tuner 10K ROT. POT.	223 223 23 1.3 1.3 14.5 14.5 229 15.7 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1	Capstan Mo Cass. Housi Cass. Motor Erase Head Guide Rollet Leaf Switch Re Holder. Take-up Clu UHF Tuner. HM6232 HM6231 HM9032 STR4211 STR441 STR441	rch		V4100H/VT11E Audio Head		S. VIDEC 5000/5300 Capstan Motor Gear Idler Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX90 Ferguson TX90 Fidelity AVS166 Fidelity CTV148 Fidelity CTV148	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot- Unlock A: 481/483 Reel Idler Reel Mot- S CS/C7 Ace Heac Brake As	SHARP IDEO SPARES 383 Motor	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 Erguson 3V00/16/22 Erguson 3V29/300 Iitachi 8000 Iitachi 8000 Iitachi 9300/9500 Iitachi WT11E VC HR7200 Alat Pan. NV333 Iat. Pan. RV3300 Iat. Pan. NV3000 Iat. Pan. N	.1.50 .2.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.40 .2.40 .2.50
TX9 Dual PTC I.F. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans 00/0/0f Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans Loudspeaker	21 22-1 23-1 21 2-1 14-5 8-8 32-2 1-1 14-4 19-3 2-2 2-1 1-1 1-1 1-1 1-1 1-1 1-1 1-1 1-1	Capstan Mo Cass. Housis Cass. Motor Cass.	rchitach		V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 29.95 29.95 29.95 49.95 AN.	S. VIDEC 5000/5300 Capstan Motor Gear loller Load, Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX10 Ferg	ANYO D SPARES 3.2.95	S300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot Unlock A. 481/483 Reel Idler Reel Mot S CS/C7 Ace Head Brake As Capstan I Limiter As	SHARP IDEO SPARES 383 Wotor 27 Adotor 88 Her 5, 3 307, 17 SSy. 3 DONY SPARES I Assy. 33 Sy 1 Motor 28 Motor 28 Sy 1 Motor 28 Sy 3	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS AKAI 9300/9700 Amstrad 7000 Ierguson 3V00/16/22 Ierguson 3V29/30 Iitachi 8000 Iitachi 8000 Iitachi 9300/9500 Iitachi 9711E IVC HR7200 Iat. Pan. NV333 Iat. Pan. NV3000 Iat. Pan. NV7000 Ianyo VTC5300 Ianyo VTC5500 Ianyo VTC5300 Ianyo VTC5500	.1.50 .2.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.40 .2.240
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans 0n/0 ff Switch Tuner TX90 Line 0/P Trans Loudspeaker. 0n/0 ff Switch Tuner	21 22-1 23-1 21 2-1 14-5 8-8 32-2 1-1 14-4 19-3 2-2 2-1 1-1 1-1 1-1 1-1 1-1 1-1 1-1 1-1	Capstan Mo Cass. Housis E Cass. Motor Cass	rtch	25.95 28.95 28.95 30 30 1.45 2.85 24.95 2.45 36.50 4.70 5.70 5.50 5.50 4.95 5.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head		S VIDEC 5000/5300 Capstan Motor Gear Idler Load. Roller	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Mot - Unlock 481/483 Reel Idler Reel Mot - S CS/C7 Ace Head Brake As Capstan I Limiter As Pinch Rol Remote C	SHARP IDEO SPARES 383 Motor	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9500 AKAI 9300/9500 AKAI 9300/9500 AKAI PAN NV333 ALA PAN NV333 ALA PAN NV333 ALA PAN NV3000	.1.50 .2.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.40 .2.240
TX9 Dual PTC I.F. Gain Unit. Line O/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line O/P Trans On/Off Switch Tuner 10K ROT. POT. TX80 Line O/P Trans Loudspeaker On/Off Switch Tuner TX100	21 229 23. 11 14. 14. 14. 19. 29. 29. 20. 20. 30. 30. 30. 30. 30. 30. 30. 30. 30. 3	Capstan Mo Cass. Housi Ease Head Guide Rollet Eaf Switch Re Converte Take-up Clu UHF Tuner 50 60 60 60 60 60 60 60 60 60 60 60 60 60	tor	25.95 28.96 9.60 9.60 30 1.45 24.95 24.95 24.95 36.50	V4100H/VT11E Audio Head		S. VIDEC S000/5300 Capstan Motor Gear loller Load, Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX90 Ferguson TX90 Ferguson TX90 Ferguson TX90 Ferguson TX90 Ferguson TX90 Fidelity AVS166 Fidelity CTV14F Fidelity CTV145 Fidelity CTV20 Fidelity ZX (text GEC C1403H GEC C1403H GEC C1403H	ANYO D SPARES	9300/381/ Capstan I Loading I Pinch Rol Reel Idler Reel Mot- Unlock A: 481/483 Reel Idler Reel Mot- S C5/C7 Ace Head Brake As Capstan I Limiter A: Pinch Rol Rewind K	SHARP DEO SPARES 383 Wotor 27 Actor 8 ler 55 307 17 Ssy. 11 ONY SPARES I Assy. 33 Sy 11 Motor 26 I Assy. 33 Sy 11 Motor 16 I Assy. 33 Sy 11 Motor 28 Motor 38 Mot	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000	1.50 2.50 1.80 1.95 1.80 2.20 2.25 1.95 1.95 2.95 2.40 2.40 2.50 2.50
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner	21 229 23. 23. 14. 14. 15. 16. 17. 17. 17. 17. 17. 17. 17. 17. 17. 17	Capstan Mo Cass. Housi Eass. Housi Cass. Motor Cass. M	rtch	25.95 28.96 9.60 9.60 30 1.45 24.95 24.95 24.95 36.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head NAT. P VIDEO SP NV333 Idler NV2000 Idler	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 29.95 29.95 49.95 AN. PARES 1.10 1.30	S. VIDEC 5000/5300 Capstan Motor Gear Idler Dinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 Ferguson	ANYO D SPARES	9300/381/ Capstan I Loading I Pinch Rol Reel Idler Reel Mot- Unlock A: 481/483 Reel Idler Reel Mot- S C5/C7 Ace Head Brake As Capstan I Limiter A: Pinch Rol Rewind K	SHARP IDEO SPARES 383 Motor	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9700 AKAI 9300/9500 AKAI 9300/9500 AKAI 9300/9500 AKAI PAN NV333 ALA PAN NV333 ALA PAN NV333 ALA PAN NV3000	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .2.40 .2.50 .1.95
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans 0n/0fl Switch Tuner TX90 Line 0/P Trans Loudspeaker. On/0fl Switch Tuner TX100 Choke. Line 0/P Trans	21 223 223 221 21 143 143 229 153 154 155	Capstan Mo Cass. Housis Cass. Motor Cass.	tor	25.95 28.96 9.60 9.60 30 1.45 24.95 24.95 24.95 36.50	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head NAT. P VIDEO SP NV333 Idler NV3000 Idler NV3000 Idler	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.30 1.25	S. VIDEC S000/5300 Capstan Motor Gear loller Load. Roller Pinch Roller Reel Motor Reel Pulley SERVIC! TELEVISION Ferguson TX:0 Ferguso	ANYO D SPARES	S300/381/ Capstan I Loading N Pinch Rol Reel Idler Reel Mot Unlock A: 481/483 Reel Idler Reel Mot S CS/C7 Ace Head Brake As Capstan I Limiter A: Pinch Rol Remote C Rewind K Rewind K	SHARP IDEO SPARES 383 Wotor	5.50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 .mstrad 7000 .mstrad 7000 .mstrad 7000 .mstrad 7000 .mstrad 8000	1.50 2.50 1.80 1.95 1.80 2.20 2.25 1.95 1.95 1.95 2.40 2.40 2.50 1.95
TX9 Dual PTC LF. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans On/Off Switch Tuner TX80 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX10 Choke Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans Choke Line 0/P Trans Loudspeaker On/Off Switch Tuner	21 229 23.	Capstan Mo Cass. Housis 65 Cass. Motor 65 Cass. Motor 65 Ref Converte 75 Ref Converte 76 Take-up Clu UHF Tuner 65 GE 66 HM9032 100 STR4211 5 STR443 5 STR443 STR451 5 STR454 STR451 6 STR620 (kit. 6 STR451 Line 6 STR451 Line 6 STR620 (kit. 6 STR451 Line 6 STR451 Line 6 STR620 (kit. 6 STR620 (tor	25.95 28.95 28.95 30 9.60 30 1.1.45 2.25 2.495 2.495 36.50 4.70 5.70 5.70 5.50 5.50 5.50 5.50 14.20	V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head NAT. P VIDEO SP NV333 Idler NV7000 Idler	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 29.95 29.95 49.95 AN. PARES 1.10 1.25 1.20 1.20	S. VIDEC S000/S300 Capstan Motor Gear loiler Load, Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX10 Ferguso	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Mot - Unlock 481/483 Reel Idler Reel Mot S C5/C7 Ace Head Brake As Capstan I Limiter A: Pinch Rol Remote C Rewind K Timer Lid C6 Ace Head	SHARP IDEO SPARES 383 Motor 27 Aotor 8 Iler 55 307 17 SSY. 307 16 ONY SPARES I Assy. 33 Sy 1 1 I Assy. 42	50 F F F S S S S S S S S S S S S S S S S	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000	.1.50 .1.80 .1.95 .1.80 .1.95 .1.80 .2.25 .1.95 .1.95 .1.95 .1.95 .2.240 .2.25 .2.25 .1.95 .2.240 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans Loudspeaker. On/Off Switch Tuner TX100 Choke Line 0/P Trans	21 229 23.	Capstan Mo Cass. Housi 55 Cass. Motor 56 Cass. Motor 57 Cass. Motor 58 Cass. Moto	tor		V4100H/VT11E Audio Head	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.30 1.25 1.20 1.20 1.20	S. VIDEC 5000/5300 Capstan Motor Gear Idler Dinch Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX9. Ferguson TX9. Fidelity CTV145 Fidelity CTV146 FIDEC C1405H GEC C1405H GEC C1405H GEC C2095H/C GEC C2095H/C FILER FINES FIN	ANYO D SPARES	9300/381/Capstan I Loading N Pinch Rol Reel Idler Reel Moto Unflock A: 481/483 Reel Idler Reel Moto S C5/C7 Ace Head Brake As Capstan I Limiter A Pinch Rol Remote C Rewind K Timer Lid C6 Ace Head DC Motor	SHARP IDEO SPARES 383 Motor	5.00 F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000	.1.50 .1.80 .1.95 .1.80 .2.20 .2.195 .1.95 .1.95 .1.95 .1.95 .2.96 .2.40 .2.20 .2.40 .2.50
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10k R0T. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Tuner	21 229 231 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Capstan Mo Cass. Housi 55 Cass. Motor 56 Cass. Motor 57 Cass. Motor 58 Cass. Moto	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head NAT. P VIDEO SP NV333 Idler NV2000 Idler NV3000 Idler NV7000 Idler NV7000 Idler NV7000 Idler NV333 Play Idler NV333 Load. Gear	19.95 27.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.20 1.20 3.95 2.50	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 Fergus	ANYO D SPARES	S300/381/ Capstan I Loading N Pinch Roll Reel Idler Reel Moto- Unlock A: 481/483 Reel Idler Reel Moto- SC/C7 Ace Heac Brake As Capstan I Limiter A: Pinch Roll Remote C Rewind K Timer Lid	SHARP DEO SPARES 383 40tor 27 40tor 88 1er 5, 33 5r 17 5SSY. 33 FONLY SPARES I Assy. 33 Syy. 31 1ontrol (C7) 466 it. 5, 5 1 Assy. 42 44 45sy. 33	5.00 F H S S S S S S S S S S S S S S S S S S	VIDEO BELT KITS KAI 9300/9700 MISTAR 7000	.1.50 2.50 1.80 1.80 2.20 1.95 1.80 2.25 1.95 1.95 2.40 2.40 2.50 1.95 2.40 2.50 5
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans 0/P Trans 0/P Trans Unit Coil Line 0/P Trans Loudspeaker 0/P Trans 0/P	21 229 231 131 145 145 145 145 145 155 155 155 155 15	Capstan Mo Cass. Housi 55 Cass. Motor 56 Cass. Motor 57 Cass. Motor 58 Cass. Moto	Truch CC/HITACH V SPARES CC/HITACH EO SPARE		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor V4005H/VT63	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 8.95 2.90 29.95 49.95 AN. ARES 1.10 1.30 1.25 1.20 1.20 1.20 1.395	S. VIDEC S000/5300 Capstan Motor Gear Ioler Load. Roller Pinch Roller Reel Motor Reel Pulley SERVICI TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX90 Fe	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Moto- Unlock A: 481/483 Reel Idler Reel Moto- S C5/C7 Ace Head Brake As Capstan I Limiter A: Pinch Rol Remote C Rewind K Timer Lid	SHARP DEO SPARES 383 Motor	5.00 F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000	.1.50 .2.50 .1.80 .1.95 .1.195 .1.195 .1.195 .2.25 .1.95 .2.40 .2.50 .2.50 .1.95 .2.40 .2.50 .2.
TX9 Dual PTC I.F. Gain Unit. Line O/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line O/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line O/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line O/P Trans On/Off Switch Tuner TX100 T	21 229 231 131 145 145 145 145 145 155 155 155 155 15	Capstan Mo Cass. Housi 56 Cass. Motor 57 Cass. Motor 58 Cass. Motor 58 Cass. Motor 59 Cass. Motor 59 Cass. Motor 50 Cass. Motor 60 Cass. Moto	Truch CC/HITACH V SPARES CC/HITACH EO SPARE		V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V10EO SP NV333 Idler NV2000 Idler NV7000 Idler NV333 Play Idler NV333 Load, Gear NV2000 Load, Gear NV2000 Load, Gear	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.30 1.25 1.20 1.20 1.20 1.20 1.20 1.20 1.20 1.20	S. VIDEC S000/S300 Capstan Motor Gear loller Load, Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX9. Ferguson TX9. Ferguson TX10 Ferguson TX9. Fidelity AVS16 Fidelity CTV14 Fidelity CTV14 Fidelity CTV14 Fidelity CTV20 Fidelity ZX (text GEC C1403H GEC C1403H GEC C2096H/C Philips CTX-S. Philips GTX-S. Philips KT3 Philips KT3 Philips KT3.	ANYO D SPARES	S300/381/Capstan I Loading N Pinch Rol Reel Idler Reel Mot Unlock A: Unlock A: S Capstan I Limiter As Pinch Rol Remote C Brake As Capstan I Limiter As Pinch Rol Remote C Rewind K Tempton C C Ace Head DC Motor Forward A Pulley As Reel Mot Reel Motor Reel Motor Forward A Reel Motor Forward A Reel Motor Reel Motor Reel Motor Forward A Reel Motor Reel Reel Reel Reel Reel Reel Reel Ree	SHARP DEO SPARES 383 40tor 27 40tor 88 1er 5, 33 5r 17 5SSY. 33 FONLY SPARES I Assy. 33 Syy. 31 1ontrol (C7) 466 it. 5, 5 1 Assy. 42 44 45sy. 33	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 MISTAR 7000	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.25 .1.95 .1.95 .1.95 .2.95 .1.95 .2.95 .2.40 .2.25 .1.95 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans Dn/Off Switch Tuner 10k R0T. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100	21 229 23 32 32 32 32 32 32 32 32 32 32 32 32	Capstan Mo Cass. Housi Ease Head Guide Rollet Eaf Switch Reconverte Take-up Clu UHF Tuner GGE THM523 HM6232 HM6231 HM6231 STR4211 STR421 STR421 STR441 STR441 STR445 STR456. STR4564 STR6020 (kit ET548 Tunet ET556A Tunet ET556A Tunet The Company of the Com	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V3000 Idler V3000 Idler V333 Play Idler	19.95 21.95 9.40 2.90 5.50 2.95 27.95 27.95 29.95 29.95 29.95 49.95 49.95 AN. PARES 1.10 1.20 1.20 1.20 1.80 1.80 4.95	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 Fe	ANYO D SPARES	S300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Mot - Unlock - Unlock 481/483 Reel Idler Reel Mot SC/C7 Ace Head Brake As Capstan I Limiter As Pinch Rold Remote C Rewind K Timer Lid C6 Ace Head DC Motor Forward , Pulley As Reel Mot Reel Mot	SHARP IDEO SPARES 383 Wotor 27 Adotor 88 Her 5, 3 Sy 17 SSy. 33 Sy 17 IASSY 33 Sy 1 IASSY 34 IASSY 42 IASSY 42 IASSY 33 Sy 1 IASSY 42 IASSY 33 Sy 1 IASSY 42 IASSY 33 Sy 1 IASSY 33	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000 Imstrad 7000 Imstrad 7000 Imstrad 7000 Imstrad 8000 Imstrad 8000	.1.50 .2.50 .1.80 .1.95 .1.80 .2.20 .2.195 .1.95 .1.95 .1.95 .2.40 .2.40 .2.40 .2.50 .1.95 .2.95
TX9 Dual PTC LF. Gain Unit. Line O/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line O/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line O/P Trans Loudspeaker. On/Off Switch Tuner TX100 Choke Line O/P Trans Don/Off Switch Tuner TX100	21 22 23 31 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Capstan Mo Cass. Housi Cass. Motor Erase Head Guide Rollet Eaf Switch Ref Converte Take-up Clu UHF Tuner HM6232 HM6232 HM6235 HM9032 STR4211 STR431 STR435 STR456 STR6020 Kis ET548 Tunet ET556A Tun ET566A	Tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy. F.F./Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy. F.F./Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V10EO SP NV333 Idler NV2000 Idler NV7000 Idler NV333 Play Idler NV333 Load, Gear NV2000 Load, Gear NV2000 Load, Gear	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.20 1.20 1.20 1.20 1.20 1.20 1.20	S. VIDEC S000/5300 Capstan Motor Gear loller Load. Roller Pinch Roller Reel Motor Reel Pulley SERVIC! TELEVISION Ferguson TX:0 Ferguson TX	ANYO D SPARES	S300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Mot - Unlock - Unlock 481/483 Reel Idler Reel Mot SC/C7 Ace Head Brake As Capstan I Limiter As Pinch Rold Remote C Rewind K Timer Lid C6 Ace Head DC Motor Forward , Pulley As Reel Mot Reel Mot	SHARP IDEO SPARES 383 Motor 27 Aotor 8 Iler 5 307 17 SSY. 33 ONY SPARES I Assy 33 I Assy 42 I Assy 41 I Assy 4	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 3300/3700 Mmstrad 7000 mstrad 7000	.1.50 2.50 1.80 1.80 1.95 1.80 2.25 1.95 1.95 1.95 2.40 2
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Tuner TX100 TX90 Choke Line 0/P Trans On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner FERGUSC VIDEO SPA 3V00/16Z Capstan Motor Orum Motor Orum Motor	21 22: 23. 1.1. 1.1. 1.1. 1.1. 1.1. 1.1. 1.1.	Capstan Mo Cass. Housis Cass. Motor Cass. Housis Cass. Motor Cass.	C/HITACH SPARES COMITACH SPARES COMITA		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V333 Idler NV333 Idler NV334 Idler NV345 Idler NV345 Idler NV35 Idle	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.20 1.20 1.20 1.20 1.20 1.20 1.20	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load, Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX9. Fidelity CTV145. Fidelity CTV145. Fidelity CTV145. Fidelity CTV145. Fidelity CTV20. Fidelity CTV3. Fidelity CTV3. Fidelity CTV4. F	ANYO D SPARES	9300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Moto- Unlock A 481/483 Reel Idler Reel Idler Reel Hoto- S CS/C7 Ace Head Brake As Capstan I Limiter As Pinch Rol Remote C Rewind K Timer Lid C6 Ace Head DC Motor Forward / Pulley As Reel Mot Reel Mot	SHARP IDEO SPARES 383 Motor 27 Aotor 8 Iler 5 307 17 SSY. 33 ONY SPARES I Assy 33 I Assy 42 I Assy 41 I Assy 4	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Imstrad 7000 Imstrad 7000 Imstrad 7000 Iitachi 8000 Iitachi 8000 Iitachi 8000 Iitachi 8000 Iitachi 900/9500 Iitachi 900/9500 Iitachi 900/9500 Iitachi VT11E VV HR7200 Iat Pan. NV333 Iat Pan. NV3000 Iat Pan. NV7000 Iat Pan. NV7000 Ianyo VTC5000 Ianyo VTC5000 Ianyo VTC5000 Ianyo VTC5000 Inanyo VTC5000 Inanyo VTC5000 Inanyo VTC500 Inanyo VTC5000 Inanyo VTC500 Inanyo VTC50	.1.50 .2.50 .1.1.95 .1.1.95 .1.1.95 .1.1.95 .1.1.95 .1.1.95 .1.2.95 .2.2.95 .2
TX9 Dual PTC I.F. Gain Unit. Line O/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line O/P Trans On/Off Switch Tuner TX0K ROT. POT. TX90 Line O/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line O/P Trans On/Off Switch Tuner TX100 T	21 229 231 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1.1 1	Capstan Moi Cass. Housi Cass. Motor Cass.	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V333 Idler NV333 Idler NV334 Idler NV345 Idler NV345 Idler NV35 Idle	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.20 1.20 1.20 1.20 1.20 1.20 1.20	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load, Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX9. Fidelity CTV145. Fidelity CTV145. Fidelity CTV145. Fidelity CTV145. Fidelity CTV20. Fidelity CTV3. Fidelity CTV3. Fidelity CTV4. F	ANYO D SPARES	S300/381/ Capstan I Loading Nonch Tolk Reel Idler Reel Mote Unlock Same Idler Reel Mote Unlock Same Idler Reel Mote C5/C7 - Ace Head Brake As Capstan I Limiter As Pinch Roll Remote C Rewind K Timer Lid - C6 Ace Head DC Motor Forward J Pulley As Reel Mot Revind K	SHARP IDEO SPARES 383 Motor 27 Actor 8 leir 5, 3 or 17 SSY. 33 ONY SPARES I Assy 33 Actor 26 I Assy 33 I Assy 42 I Assy 42 I Assy 42 I Assy 14 I Assy 42 I Assy 14 I Assy 14 I Assy 17 I Assy 18	50 F F F F F S S S S S S S S S S S S S S	VIDEO BELT KITS KAI 9300/9700 MISTAR 7000	.1.50 .2.50 .1.80 .1.95 .1.180 .1.95 .1.95 .1.95 .1.95 .2.20 .1.95 .2.25 .1.95 .2.25 .1.95 .2.25 .1.95 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
TX9 Dual PTC I.F. Gain Unit. Line 0/P Trans. Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/0f Switch Tuner 10K R0T. POT. TX90 Line 0/P Trans Loudspeaker. On/0f Switch Tuner TX100 Choke Line 0/P Trans Loudspeaker. On/0f Switch Tuner TX100 Choke Line 0/P Trans On/0f Switch Tuner TX100 Choke Line 0/P Trans On/0f Switch Teletext Board Tuner FERGUSO TIDEO SPA 3V00/16/22 Capstan Motor Orum Motor F/F Idler Pinch Roller Rewind Idler Rewind Idler	21 22: 23: 33: 11. 12. 14. 14. 15. 15. 15. 15. 15. 15. 15. 15. 16. 15. 16. 16. 16. 16. 16. 16. 16. 16. 16. 16	Capstan Mo Cass. Housis Cass. Motor Cass. Housis Cass. Motor Cass.	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V333 Idler NV333 Idler NV334 Idler NV345 Idler NV345 Idler NV35 Idle	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 8.95 2.90 29.95 49.95 AN. PARES 1.10 1.20 1.20 1.20 1.20 1.20 1.20 1.20	S. VIDEC S000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 F	ANYO D SPARES	9300/381/Capstan I Loading N Pinch Rol Reel Idler Reel Mot-Unlock A: 481/483 Reel Idler Reel Mot-Unlock A: 5 CS/C7 Ace Head Brake As Capstan I Limiter As Pinch Rol Rewind K Timer Lid C6 Ace Head DC Motor Forward J Pulley As Reel Mot Reewind K C9 DC-DC CC Door Ass Front Doc C5	SHARP DEO SPARES 383 Motor	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Minstrad 7000 mistrad 7000 mistrad 8000 mitachi 8000 mitachi 8000 mitachi 8000 mitachi 8000 mitachi 8000 mitachi 900 mitachi 900/9500 mitachi 900/9500 mitachi 900/9500 mitachi 900/9500 mitachi 900/9500 mitachi WT11E VC HR7200 many 0 WTC5000 many 0 WTC500 many 0 WTC5000 many 0 WTC5000 many 0 WTC5000 many 0 WTC500 many 0 WTC5000 many 0 WTC500 many	.1.50 .2.50 .1.195 .1.195 .1.20 .2.25 .1.195 .1.195 .1.195 .2.240 .2.240 .2.250 .1.25 .2.240 .2.250
TX9 Dual PTC I.F. Gain Unit. Line O/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line O/P Trans On/Off Switch Tuner TX0K ROT. POT. TX90 Line O/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line O/P Trans On/Off Switch Tuner TX100 T	21 22: 23: 11: 11: 14: 15: 15: 15: 15: 15: 15: 15: 15: 15: 15	Capstan Mo Cass. Housi Eass. Motor Cass. M	C/HITACH CONTACH CONTA		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head V333 Idler NV333 Idler NV334 Idler NV345 Idler NV345 Idler NV35 Idle	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 29.95 29.95 49.95 AN. ARES 1.10 1.20 1.20 1.20 1.20 1.20 1.49.5 1.60 1.595 4.95	S. VIDEC S000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 Fidelity ACS:1 Fidelity ACS:1 Fidelity CTV:4 F	ANYO D SPARES	S300/381/Capstan I Loading N Pinch Rol Mot Unlock A: 481/483 Reel Idler Reel Mot Dinch Reel Mot Dinch Rol Dinch Policy As Revind K Timer Lid C6 Ace Head DC Motor Forward / Pulley As Reel Mot Reel Mot Reel Mot Revind K C9 DC-DC CC Door Ass Front Doo Gear Kit.	SHARP IDEO SPARES 383 Wotor 27 Adotor 8 Her 5, 33 Or 17 SSy. 37 ONY SPARES I Assy. 33 Sy 1, Motor 28 Sy 3 Sy 1, Motor 26 II Assy. 32 II Assy. 32 II Assy. 33 II Assy. 34 II Assy. 35 II Assy. 36 II Assy. 37 II Assy. 38 II Assy. 38 II Assy. 38 II Assy. 39 I	50.855 H H H N N N N N N N N N N N N N N N N	VIDEO BELT KITS KAI 9300/9700 Mmstrad 7000 mstrad 7000	.1.50 .2.50 .1.1.95 .1
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TX9 Dual PTC LF. Gain Unit Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit Line 0/P Trans On/Off Switch Tuner 10K ROT. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX10 Choke Line 0/P Trans Choyer TX10 Choke Line 0/P Trans On/Off Switch Tuner TX100 TX100 TX100 Choke Line 0/P Trans On/Off Switch Tuner TX100 T	21 229 23.	Capstan Mo Cass. Housi Cass. Motor Cass. M	CC/HITACH V SPARES CC/HITACH V SPARES CC/HITACH CC/HITACH CC/HITACH CO SPARE COMMON		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V7000 Idler NV300 Idler NV30 Idler	19.95 21.95 9.40 2.90 5.50 2.95 27.95 29.95 29.95 29.95 49.95 49.95 49.95 49.95 49.95 49.95 49.95	S. VIDEC S000/5300 Capstan Motor Gear loller Load. Roller Pinch Roller Reel Pulley SERVIC! TELEVISION Ferguson TX9. Ferguson TX9. Ferguson TX10 Fidelity CTV145 Fidelity CTV145 Fidelity CTV145 Fidelity CTV145 Fidelity CTV20 Fidelity ECC C1407H Fidelity CTV20 Fidelity ECC C2095H/C Ferguson STX-5 Philips CTX-5 Philips CTX-5 Philips CTX-5 Philips K13 Philips K13 Philips K13 Philips K13 Philips K35 Philips K35 Philips K35 Philips CTX-5 Figuson WV225U VIDEO RECOR Ferguson 3V29 Ferguson 3V35 Ferguson 3V35 Ferguson 3V35 Ferguson 3V35 Ferguson 3V45 Fergus	ANYO D SPARES	S300/381/ Capstan I Loading N Pinch Rold Reel Idler Reel Moto-Unlock 481/483 Reel Idler Reel Moto-Unlock Pinch Rold Reel Idler Reel Moto-Barake As Capstan I Limiter As Pinch Rold Remote C Rewind K Timer Lid C6 Ace Head DC Motor Forward A Pulley As Reel Moto Rewind K C5 DC-DC CC Door Ass Front Dod Gear Kit Gouide Pin	SHARP IDEO SPARES 383 Wotor 27 Adotor 8 Her 5, 33 Or 17 SSy. 37 ONY SPARES I Assy. 33 Sy 1, Motor 28 Sy 3 Sy 1, Motor 26 II Assy. 32 II Assy. 32 II Assy. 33 II Assy. 34 II Assy. 35 II Assy. 36 II Assy. 37 II Assy. 38 II Assy. 38 II Assy. 38 II Assy. 39 I	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/9700 Mmstrad 7000 mstrad 7000	.1.50 .2.50 .1.1.95 .1.1.80 .2.25 .1.1.95 .1.1.95 .1.1.95 .2.240 .2.25 .2.240 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10K R0T. POT. TX90 Line 0/P Trans Loudspeaker. On/Off Switch Tuner TX100 Choke Line 0/P Trans Loudspeaker. On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board. Tuner FERGUSO TIDEO SPA 3V00/16/22 Capstan Motor Orum Motor F/F Idler Pinch Roller Rewind Idler Take-up Idler (LG). Take-up Idler (SM) 3V29/30 Booster	21 22: 23: 33: 11 14: 45: 45: 55: 55: 55: 55: 55: 55: 55: 5	Capstan Mo Cass. Housi Cass. Motor Frase Head Guide Rollet Leaf Switch Ref Converte Take-up Clu UHF Tuner The Moss Cass. HM6232 HM6232 HM6235 HM9032 TR441 STR451 STR451 STR454 Tunet ET556A Tunet The Moss Capstan Mo Idler F.F./Ref Pilot Lamp Pinch Roller Pulley F.F./Re Pilot Lamp Pinch Roller Pulley F.F./Re Video Head V4001H/V40 3000E9500E	tor		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F.Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F.Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V4005H/VT63E Capstan Motor Video Head NAT. P VIDEO SP NV330 Idler NV2000 Idler NV2000 Idler NV333 Play Idler NV333 Pinch Roller NV333 Pinch Roller NV300 Pinch Roller NV7000 Pinch Roller REMOTE CO PHILIPS M. Repair I Buttons & Repair I Buttons &	19.95 21.95 9.40 2.90 2.95 2.95 2.95 2.95 2.95 2.95 2.95 2.95	S. VIDEC 5000/5300 Capstan Motor Gear Idler Load. Roller Pinch Roller Reel Pulley SERVICE TELEVISION Ferguson TX:0 Fidelity CTV:1 F	ANYO D SPARES 7 32.95	S300/381/Capstan I Loading N Pinch Rold Reel Idler Reel Mot Unlock A: Unlock A: 481/483 Reel Idler Reel Mot Capstan I Limiter As Pinch Rold Remote C Brake As Capstan I Limiter As Pinch Rold C C Motor Forward J Pulley As Reel Mot Reel Mot Reel Mot Reel Mot Rewind K C C C C C C C C C C C C C C C C C C	SHARP IDEO SPARES 383 Motor	50 F F F F F F F F F F F F F F F F F F F	VIDEO BELT KITS KAI 9300/700 Imstrad 7000 Imstrad 7000 Instrad 7000	.1.50 .2.50 .1.1.95 .1.1.80 .2.25 .1.1.95 .1.1.95 .1.1.95 .2.240 .2.25 .2.240 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
TX9 Dual PTC LF. Gain Unit. Line 0/P Trans Linear Line Coil RFI Choke Tuner TX10 Ceramic Filter Focus Unit. Line 0/P Trans On/Off Switch Tuner 10k R0T. POT. TX90 Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans Loudspeaker On/Off Switch Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Teletext Board Tuner TX100 Choke Line 0/P Trans On/Off Switch Tuner TX200 Choke Line 0/P Trans	21 22: 23: 11: 12: 14: 14: 15: 15: 15: 15: 15: 15: 15: 15: 15: 15	Capstan Mo Cass. Housis Eass. Motor Cass. Motor Capstan Mo Capsta	C/HITACH V SPARES CONTACH OF SPARES CONTACH OF SPARES		V4100H/VT11E Audio Head Capstan Motor Clutch Assy F.F/Rew Arm Pinch Roller Relay Video Head V4004H/VT33E Capstan Motor Clutch Assy F.F/Rew Arm Video Head V4005H/VT63E Capstan Motor Video Head V7000 Idler V7000 Idler V7000 Idler V7333 Play Idler V7300 Load. Gear. V7000 Load. Gear. V7000 Pinch Roller V7000 Pinch Roller V7000 Pinch Roller REMOTE CO PHILIPS K Repair I Buttons & Text or No	19.95 21.95 9.40 2.90 2.95 5.50 2.95 2.7.95 2.95 2.90 2.9.95 2.90 2.9.95 49.95 49.95 49.95 49.95 49.95 49.95 49.95 49.95	S. VIDEC S000/5300 Capstan Motor Gear Ioler Load. Roller Pinch Roller Reel Pulley SERVICI TELEVISION Ferguson TX9. Fidelity CTV144 Fidelity CTV144 Fidelity CTV145 Fidelity CTV145 Fidelity CTV145 Fidelity CTV145 Fidelity CTV146 Fidelity CTV20. Fidelity STX-E. Philips CTX-S. Philips CTX-S. Philips K35. Philips CTX-Sony KV2252U Sony KV2705U VIDEO RECOR Ferguson 3V35 Ferguson 3V35 Ferguson 3V35 Ferguson 3V35 Ferguson 3V344 Ferguson 3V35 Ferguson 3V345	ANYO D SPARES	SOUV381/ Capstan I Loading N Pinch Roll Reel Idler Reel Moto- Unlock A. 481/483 Reel Idler Reel Moto- Finch Roll Remote C Rewind K Timer Lid C6 Ace Head DC Motor Forward A Finch Roll Pulley As Reel Motor Rewind K C9 DC-DC CC Door Ass Front Doo Gear Kit . Guide Pin Video He.	SHARP IDEO SPARES 383 40tor 27 4otor 8 1er 5 37 37 37 37 387 387 387 387 3	50 F F F F S S S S S S S S S S S S S S S	VIDEO BELT KITS KAI 9300/9700 MISTAR 7000	.1.50 .2.50 .1.1.95 .1.1.80 .2.25 .1.1.95 .1.1.95 .1.1.95 .2.240 .2.25 .2.240 .2.25 .20 .20 .20 .20 .20 .20 .20 .20 .20 .20
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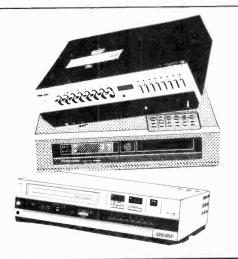
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BD184 BD187 BD201 BD202 BD203 BD204 BD225 BD232 BD235 BD236 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237 BD237	AA117 AA119 AA172 AA119 AA173 AA119 AA173 AA119 AA173 AA119 AA173 AA118
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TIP30 TIP30C TIP31C TIP31A TIP31A TIP31A TIP32 TIP32A TIP32A TIP33 TIP34 TIP41C TIP41C TIP42C TIP47 TIP47 TIP48 TIP50 TIP50 TIP50 TIP50 TIP50	BR100 BR101 BR103 BR103 BR103 BR103 BRY99 BRY99 BRY99 BRY96 BSX26 BU108 BU1124 BU124 BU124 BU126 BU108 BU116 BU111 BU111 BU111 BU111 BU116 BU117 BU146 BU26 BU26 BU26 BU26 BU26 BU26 BU26 BU2
25p 30p 24p 30p 24p 24p 50p 50p 50p 22p 25p 25p 40p 40p 120p 120p	40p 55p 50p 20p 20p 20p 20p 20p 20p 20p 20p 36p 15p 15p 15p 15p 36p 120p 36p 80p 48p 120p 120p 120p 50p 120p 50p 70p 70p 70p 70p 70p 70p 70p 70p 70p 7
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30p 30p 200p 90p 60p 25p 12p 80p 40p 40p 40p 110p 40p 120p 120p 160p	140pp 65pp 65pp 47pp 65pp 47pp 65pp 65pp 47pp 65pp 65pp 65pp 65pp 65pp 65pp 65pp 6
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70p 60p 65p 210p 60p 50p 80p 100p 31p 42p 55p 180p 180p 100p 42p 100p	30p 23pp 66pp 67pp 72p 24pp 44pp 44pp 44pp 110pp 111pp 112pp 113pp 113pp 12pp 22pp 22p
BA-527 BA-532 BA-534 BA-535 BA-636 BA-612 BA-658 BA-684 BA-685 BA-1320 BA-1320 BA-1330 BA-1360 BA-1360 BA-1360 BA-1360 BA-1360 BA-1403 BA-5101 BA-5102 BA-5406 BA-6104	AN-124 AN-124 AN-124 AN-127 AN-1363 AN-2136 AN-2136 AN-2214 AN-224 AN-225 AN-361 AN-371 AN-325 AN-361 AN-371 AN-362 AN-361 AN-371 AN-362 AN-361 AN-36
140p 140p 290p 600p 210p 160p 160p 160p 160p 160p 220p 500p 250p 250p 250p 250p	600p 400p 3160p 1160p 1160p 1160p 1170p 425p 1160p 1150p 1150p 1150p 110p 110p 110p 110p
LA-4190 LA-4192 LA-4200 LA-4201 LA-4210 LA-4220 LA-4250 LA-4261 LA-4400 LA-4420 LA-4440 LA-4440 LA-4440 LA-4440 LA-4440 LA-44460 LA-4460 LA-4460 LA-4460	CX-143A ER-1400 HA-1125 HA-1136 HA-1136 HA-1136 HA-1136 HA-1369 HA-1368 HA-1368 HA-1368 HA-1368 HA-1368 HA-1368 HA-1369 HA-1368 HA-1372 HA-1368 HA-1372 HA-1368 HA-1372 HA-1368 HA-1371 HA-1372 HA-1378 HA-137
300p 180p 130p 120p 150p 120p 175p 260p 300p 140p 130p 130p 130p 230p 260p 170p 170p 170p	80p 38p
SAS-570 STK-011 STK-013 STK-014 STK-015 STK-016 STK-020 STK-022 STK-025 STK-041 STK-043	M-5155 M-50120 M-51316B M-51316B M-515131B M-51515B M-51515B M-51515B M-51517L M-82736 MB-3722 MB-3722 MB-3722 MB-3722 MB-3731 MC-1455 MC-1439 MC-1458 MC-1459
110p 370p 700p 700p 490p 800p 540p 700p 700p 700p 7450p 620p 710p 910p 500p 490p	220p 120p 120p 120p 120p 120p 120p 120p
TBA-520 TBA-530 TBA-540 TBA-540 TBA-560 TBA-800 TBA-800 TBA-920 TBA-950 TBA-990 TC-9109 TCA-830 TCA-940 TDA-1170 TDA-2002 TDA-2002	STR.4401 STR.4401 STR.45020 T28000D TA.7054 TA.70636 TA.70636 TA.70636 TA.70636 TA.70636 TA.70636 TA.7109 TA.71130 TA.71
120p 120p 120p 120p 120p 40p	690p 700p 700p 700p 700p 700p 700p 700p 7
WE ARE HOLD! Please send 70 p 78 accepted. Junistator days for delivery. Al and boxed. Prices q be changed without GRA 9 THE BRO WEMBLEY Telephone: Telepx Acc	TOA. 2006 150p TOA. 2006 150p TOA. 2006 150p TOA. 2010 100p TOA. 2510 200p TOA. 2510
NG 3000 ITEMS EN FOR LARGE Pand VAT at 15%. Is given for large brand-new Comprised are subject to notice. ADWAY, P	
AND QUOTA QUANTITIES. Float. Govi. Colleges, et upantines. Pleas stock availabilin RESTON: GEX, ENGI 93 & 904- 15 (Sunmi ccepted	Tick
TIONS IC. Orders e allow 7 a are new rand may ROAD, AND 1115/6	40p 100p 100p 1100p 1100p 1100p 1100p 1100p 1100p 1100p 1100p 1110p 1100p



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NEW VIDEO HEADS	C27.00	VIDEO MOTORS SANYO	
NATIONAL SONY	527,00	REEL MOTOR (RM11) P/N 4-529V-1 CAPSTAN MOTOR 4-527V-51000	0800 £8. 00 £24.00
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CASSETTE TAPE HEADS MONO HEAD STEREO HEAD	£1.30 £2.20	HITACHI VT-5000	
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New and rebuilt for most makes of T.V.

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£1 BAKERS DOZEN PARCELS

Price per pack is £1.00.* Order 12 you get one extra free. All the parcels listed beloware brand new compenents.

Unless marked s.h

- 13 amp ring main junction boxes 13 amp ring main spur boxes flush electrical switches 4 - in flex line switches with neons 2 - 80 watt brass cased elements

16

2 – 80 walt brass cased elements
2 – mains transformers with 6V 1A secondaries
2 – mains transformers with 12V ½A secondaries
1 – extension speaker cabinet for 6½" speaker
5 – octal bases for relays or valves
12 – glass reed switches
4 – 0CP 70 photo transistors
4 – tape heads, 2 record, 2 erase
1 – ultrasonic transmitter and 1 receiver with circuit
2 – 15000 mfd computer grade electrollics
2 – light dependent resistors
5 – different micro switches
2 – mains interference suppressors
2 – 25 wat crossover units 2 way 18 19 20 21 22 23 28 30 31 32 33 34

2 - mains interference suppressor 2 - 25 wat crossover units 2 way 1 - 40 watt 3 way crossover unit 1 - 6 digit counter mains voltage 2 - Nicad battery chargers 1 - key switch with key

36 37 38 41

43 44

2 - Nicao battery chargers
1 - key switch with key
2 - humidity switches
2 - aerosol cans of ICI Dry Lubricant
48 - 2 metre lengths colour-coded connecting wire
2 - air spaced 2 gang funing condensors
3 - solid diaelectric 2 gang funing condensors
10 - compression trimmers
8 - rocker switch 10 amp mains SPST
5 - Rocker Switches 10 amp SPDT Centre Off
4 - Rocker Switches 10 amp DPDT
1 - 24 hour time switch mains operated (sh)
1 - 6 hour clock timeswitch
2 - 6v operated reed switch relays
10 - neon valves - make good night lights
2 - 12V DC or 24V AC, 3 CO relays
1 - 12V 4 CO miniature relay very sensitive
1 - 12V 4 CO miniature relay very sensitive
1 - locking mechanism with 2 keys
1 - locking mechanism with 2 keys
5 - Dolis House switches
5 - Gerrite roots 4" × 5/16" diameter aerials
1 - 4 ferrite slab aerials with L&M wave coils
2 - 200 - reservations are related to the support of the coils
3 - 200 - her accorders
4 - 200 - her accorders
5 - 200 - her accorders
6 - 200 - her accorders
7 - 200 - her accorders
8 - 200 - her 45 46 48 49 50 51 52

53 55 56 57 60 61 62

1 - 4 ferrite slab aerials with L&M wave coils

63 64 65 66 67

69

86 87

70 71 73 77 78 85

95 96 98 101 103 104

105 107

109.

118 120 122 132 188

5 - Dolis House switches
5 - Ferrite rots 4" × 5/16" diameter aenals
1 - 4 ferrite slab aerials with L&M wave coils
4 - 200 ohm earpiece
1 - Mullard Thysistor trigger module
10 - assorted knobs ¼ spindles
5 - different thermostats, mainly bi-metal
1 - Magnetic brake - stops rotation instantly
1 - low pressure 3 level switch can be mouth operated
2 - 25 watt pots 8 ohm
2 - 25 watt pots 1000 ohm
4 - wire wound pots - 18, 33, 50 and 100 ohm your choice
4 - 3 watt wire would pots 50 ohm
1 - time reminder adjustable 1-60 mins clockwork
- 5.5 amp stud rectifiers 400v
1 - mains shaped pole motor ¾" stack - ¼ shaft
2 - 3"plastic fan blades fit ¼" shaft
2 - 3"plastic fan blades fit ¼" shaft
1 - mains motor with gear box 1 rev per 24 hours
1 - mains motor with gear box 1 rev per 24 hours
2 - mains motor with gear box 1 rev per 24 hours
2 - mains motor with gear box 1 rev per 24 hours
2 - mains motor with gear box 1 rev per 24 hours
3 - mains motor with gear box 1 rev per 24 hours
4 - 11 pin moulded bases for relays
5 - B7G valve bases
4 - skirted B9A valve bases
1 - thermostat for fridge
1 - motor/sed stud switch (s.h.)
1 - 2"b hours delay switch
1 - 5 pin files plug and panel socket
1 - 5" speaker size radio cabinet with handle
10 - ¼" spindle type volume controls
11 - Hay mains power supply unit
11 - 4½" spindle type volume controls
11 - Hay mains power supply unit
12 - 5" speaker size radio cabinet with handle
10 - sider type volume controls
11 - It am mounting thermostat 24V
12 - p.c. boards with 2 amp full wave and 17 other recs
12 - p.c. boards with 2 amp full wave and 17 other recs
13 - p.c. boards with 2 amp full wave and 17 other recs
14 - praistic box sloping metal front, 16 × 95mm average depth 45mm
1 - car door speaker (very flat) 6½" 15 ohm made for Radiomobile
2 - p.c. car door speaker (very flat) 6½" 15 ohm made for Radiomobile

1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile 2 – mains transformers 9V ½A secondary spirt primary so ok also for 115V

1 - mains transformers 15V 1A secondary p.c.b. mounting 2 - 6v 0.6v mains transformer 3A p.c.b. mounting 330

350 453

2 – 6v 0.6v mains transformer 3A p.c.b. mountin 40 – double pole leaf switches 1 – 7ul 660v 50hz metal cased condenser 2 – 2¼in. 60hm loudspeakers 2 – 2¼in. 66hm loudspeakers 1 – mains operated relay with 2 sets c/o contacts 2 – packets resin filler/sealer with cures 3 – 5A round 3 pin plugs will fit item 193 4 – 7 segment 1.e.d. displays 4 – po bazefs for stripping, lots of valuable parts

466 470. 4 – pc boards for stripping, lots of valuable parts 473. 1 – 5* 4ohm speaker with built in tweeter Radio mobil 480. 1 – 3A double pole magnetic tip, saves repairing fuses 498. 4 – 1000ut 25V axial electrolytic cpacitors

TELEPHONE BITS Master socket (has surge arrestor - ringing condenser etc) and takes B.T Extension socket. 12.395
Doul adaptors (2 from one socket) . 12.395
Cord terminating with B.T. plug 3 metres . 11
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
100 mtrs 4 core telephone cable . 12.395

COMPACT FLOPPY DISC

DRIVE EME-101
The EME-101 drives a 3" disc of the new standard which despite its small sze provides a capacity of 500k per disc, which is equivalent to the 54" disc. We supply the Operators Manual and other information showing how to use this with popular computers: 8BC, Spectrum, Amstrad etc. All a a special snip pince of £27,50 including post and VAT. Data available separately £2, refundable if you purchase the drive.

EVERI ASTING BATTERIES!

Well not quite, but if you don't switch it on, the lithium battery has an almost indefinite shelf life, which makes it suitable for emergency, standby 8 similar applications, also for quartz clocks and instruments that draw only microscopic currents. The lithium battery we have is 3v and about as big and thick as 2b con Price 2 low 5t 1rd BDSSs. Note these plug into 01 socket our ref BDSSs.

3 POLE MODEL MOTOR
Will operate from as low as 1.5v and speed will increase steadily as the volta is increased, at 9v however a governor takes over and the speed remains constant — and ideal meter for models. Size approx 28mm × 40mm easily reversible and with good length spindle 60p each our ref BM30

CASSETTE STEREO TAPE HEADS with mounting brackets and with tape guides pairs, one re other erase \$1 pair ref BD541. ecord/playback and the

OPTRO INTERRUPTER
Consists of a IR emitter mounted close to light dependent resistor when light or IR is interrupted the change of resistence can be made to switch or operate a relay – useful for counking, motor stopping etc. Price 2 for £1 ref 80545



VENNER TIME SWITCH

VENNER TIME SWITCH

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

Ex-Electricity Board. Guaranteed 12 months.

12 volt MOTOR BY SMITHS Made for use in cars, etc. these are very powerful and easily reversible. Size 3 /2" long by 3" dia. They have a good length of 1/4" spindle – 1/10 hp £3.45 1/8 hp £5.75, 1/6 hp £7.50



SOUND TO LIGHT UNIT



Complete kit of parts at a three channel sound to light unit confrolling over 2000 watts of lighting. Use this at home if you wish but it is plently 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 orroff. The audio input and output are by 1/4" sockets and three panel mounting fuse holders provide thrystor protection. A four jin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

THIS MONTHS SNIP
9" VDU OR MONITOR (deal to work with computer or video camera
uses Philips black and white tube ref M2/3/3/50w Within tube is
miploson and k-Ray redation protected VDU is braid new and
has a time bases and EHT circulity. Requires only a 16v dc supply
to set if going, its made up in a laquered metal frame work but has
open sides so should be cased (if you are handy with a drill and file
you could make a case out of two of our 6 1/2" speaker cabinets)
The VDU comes complete with circuit diagram and has been line
tested and has our six months guarantee. Offered at a lot less than
some firms are asking for the tube allone, only \$16 plus t3 post,
We do a kit for the fib 2 ap su to operate this monifor price is \$3
our ref 3P26 or ready assembled P.S.U. \$5.

SLIDE SWITCHES Sub-miniature size only 10mm × 4mm single pole change over or on/off. Price 5 for £1 ref B0553.

LOW VOLTAGE RELAY DMRON 3 5v coil, plug in dil sockets, 5a c/o confacts Brand new offered at a silly price 2 for £1 ref BD548.

POLARISED RELAY depending upon its direction did current as tow 4 Ma makes this open circuit, so it could be used to protect delicate instruments or as an earth leakage, or reverse voltage trip etc. 2 for £1 ref 80549.

SLOTTED OPTO SWITCH infra red emitter and sensor mounted in slotted moulding, so that the emitter beam when broken makes a contactless switch, can be used in electronic ignition, speed sensing etc., etc. Price 2 for £1 rel 80545.

24Hr TIME SWITCH. Beautifully made with West German precision. Just under 4" square with 15 amp c/o contacts can be set anywhere around 2 hr dial to the nearest 15 mins also with an ovende switch. Ref 8P6 but hurry we have only 300.

The Acorn "Electron" as used in manuscripts The Acorn "Electron" as used in many schools for games and senous jobs. Works into colour or Black and White TV. Proper price was £199, our price, lested and working £05 + £3 peats. It ested but slightly faulty £36 + £3 peat and lastly lested but not working £20 + £3 peats. If all range of Software also in stock at very low prices.

TELEPHONE LEAD

3 mtrs long terminating one end with new BT, flat plug and the other end with 4 correctly coloured coded wires to fit to phone or appliance. Replaces the lead on old phone making it suitable for new BT socket. Price £1 ref BD552 or 3 for

POWERFUL IONISER KIT

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Generates approx. 10 times more IONS than the ETI and
similar croxitis. Will refersh your home, office, shop, work
room, etc. Makes you feel better and work harder – a
complete mains operated kit, case included. £9.50 + £2.00
P&P.

J & N BULL ELECTRICAL DEPT. TV., 250 PORTLAND ROAD, HOVE, **BRIGHTON, SUSSEX BN3 5QT**

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £20 add £1 service charge. Monthly account orders (min £20) accepted from schools and public companies. Acces & B/card orders accepted. Brighton 0273 734648. Bulk orders: write for quote.

NEW ITEMS

Some of the many described in our current list which you will receive with your parcel.

22 POUNDERS

UNDERS

1 combined clockwork switch and thermostat for boiler control.
1 30e rotary switch, surface mounting with pointer knob.
1 25e rotary switch, surface mounting, cover engraved, high, medium, low and off.
1 28lev. 2011mid block condensor.
1 30e bridge recibier assembly on heat snks.
1 i0 prom motor 115v so supplied with adaptor for 230v.
1 Crouzet motor 230v fits the Crouzet geator.
1 crouzet motor 230v fits the Crouzet geator.
1 clinical breaks 20e, Crabities ref C50.
1 9v 500mk psu, plugs into 13a socket.
10m 10 conductor intercom cable.
1 2 vizew element made for targential blowers.
1 7 hermo couple, stanless steel lipped for measuring internal heat.

2P150 -

1 Premo couple, stanless steel lipped for measuring internal heat.

1 Mains transformer 20v-0-20v 1a upright mounting 1 Mains transformer 20v-0-20v 1a upright mounting 1 rechargeable battley D size (4 AH) solder tag ended 1 months are internal mounting 1 rechargeable battley D size (4 AH) solder tag ended 1 months are internal mounting 1 recharge 1 mounting 1 recharge 1 mounting 1 recharge 1 r 2P154a = 2P154b = 2P155 = 2P158 = 2P160 = 2P161 = 2P162 = 2P163 = 2P163 = 2P164 = 2P16

C3 POUNDERS

1 DC voltage, doubler or halver for 12v to 24v, 12 to 6v, 24 to

3P8 -3P9 -3P10 -

LDC voltage, doubler or halver for 12v to 24v, 12 to uv, 24 w 12v.

12 4br time switch Sangarmo, new condition, guaranteed 1 year 1 12v 50m4 psu plugs in 13a socket.

1 Mains transformer 50v 2A with 6.3 pilot light winding, upright mounting, thly shroulded.

1 Noise filter to fit in mains lead of applicance up to 25a a waterpool case will talex 200 wait transformer.

1 signal box, 3 lamps on face plate of metal box size 5 ½ x 3½ choke and starter to work 8" fluorescent tube at 125w 12v.

1 25a amenter 3½ avide or equipment.

1 power factor correction condenser 35uf 350ac.

1 200va – auto transformer 230 to 115v tomodal encapsulated.

51,50 post.

1 200va – auto rension... 21.50 post 1 36v-0-36v tapped 20v-0-20v 100va. 1 3" floppy disc for Amstrad etc. 1 7" Electricans pliers.

3P23 ~ 3P24 ~ 3P25 ~

£4 POUNDERS

UNDERS
1 Car Rado aenal.
50m low loss co-ax 75 ohm + £1 post
3 Hortsman time and set switches 15 amp
1 150w mains transformer "C" core 43v 3.5A secondary
1 150w mains transformer "C" core 43v 3.5A secondary
1 powerful motor 2' stack fitted with gearbox final speed 60rpm, mains operated, could operate door opener etc
1 Uniselector 3 pole 25w, 50v coil standard size.
1 Volt meter with digital display (DIGIVISOR)
1 12v dc motor will fit to gearbox 4P20
1 Gear train giving speed reduction

4P17 ~ 4P18 ~ 4P19 ~ 4P20 ~

£5 POUNDERS

INTUINENS

1 Transformer upright mounting 230/240v primary 2 × 100 1a secondary.

1 transformer in waterproof metal box 24v 5a, add £2 post.

1 transformer in waterproof metal box 24v 5a, add £2 post.

1 4 bank healing element each 2kw ideal convector healer

1 18' long tangental blower with motor at one end.

1 4" blower, motor in middle motor at one end.

1 4" blower, motor in middle motor at one end.

1 6" alare blower of the motor at one end.

1 6" of the motor in motor in middle motor at one end.

1 6" of the motor in the motor at one end.

TV
SP30 — 1 6" alarm bell 24v dc or ac.
SP94 — 1 Current transformer 14v out with 1a dc input
SP95 — 1 Vintage photo coll.
SP95 — 1 Vintage photo coll.
SP96 — 1 Impedence matching transformer 0-4-5-8-160 ohm 100 add
C1 50 post
SP986 — 1 0-90a ammeter for mounting outside control panel.
SP986 — 1 0-180a ammeter for mounting outside control panel.
SP996 — 1 Mains operated blower contratugal output size app 5" × 11/2"
SP100 — 1 Mains spitter 45a switch 3 × 15a hased croutlis
SP101 — 1 Model motion 1 pm from 6v reversable.

POUNDERS
 TP1 - 1 Instant heat solder gun - mains with renewable tip and job light.

68 POUNDERS

INDE-HS

1 Charger transformer 10a upright mounting 230/240 primary
16v 10a secondary.

16' underdome alaminiset suitable for a fire alamin or burglar
alamin mains operated.

1 read sink big powerful so ideal for power transmitter.

1 /2 hp motor 900 rpm capacitor un.

1 /2 hp motor 900 rpm capacitor un.

1 /2 hp motor 900 rpm capacitor un.

1 /2 hp motor 900 rpm capacitor vi.

1 /2 his mis witch - 2 on offs 15a c/o contacts 3' × 3' × 11/2'

1 Salent sentinel invisible ray kti.

1 Papos tan 31/2 × 31/2 × 11/2 230v metal bodied. 8P3 -8P5 -8P6 -8P7 -8P8 -

1 Pages lar 3/2 x 3/2 x 1/2 250 meat bould.

10P13 — 1 reversible motor with gearbox 104 pm Parvalux
10P14 — 1 100e time switch 1 ontol per 24 hr extra triggers £1 pair
10P15 — 1 Max demand meter 230 AC mans
10P16 — 1 powerful air mover 2 snail type blowers with motor in middle.
10P18 — 1 mains operated Maxon.
10P19 — 112v alarm bell really loud, mains operated, in iron case + £5

sensitive volt meter relay.
 fruit machine heart 3 fruit wheels each stepper motor

operated. 1 big panel meter face size 4^3 /4 \times 2^1 /2 200ua movement scaled 1-10.

10P26 - 1 "Secretary" phone auto-dialiter complete unfested sold as such.
10P29 - 1 124 engine cooling fan.
10P30 - 1 instrument psu on pcb has 4 outputs 124/ 5v 6a/ 12v .5a/ 5v

.5a. 10P31 — 1 7 day time switch 16a c/o contacts sep switches for each day 10P32 — 1 68 rpm 1/6th hp motor reversible.

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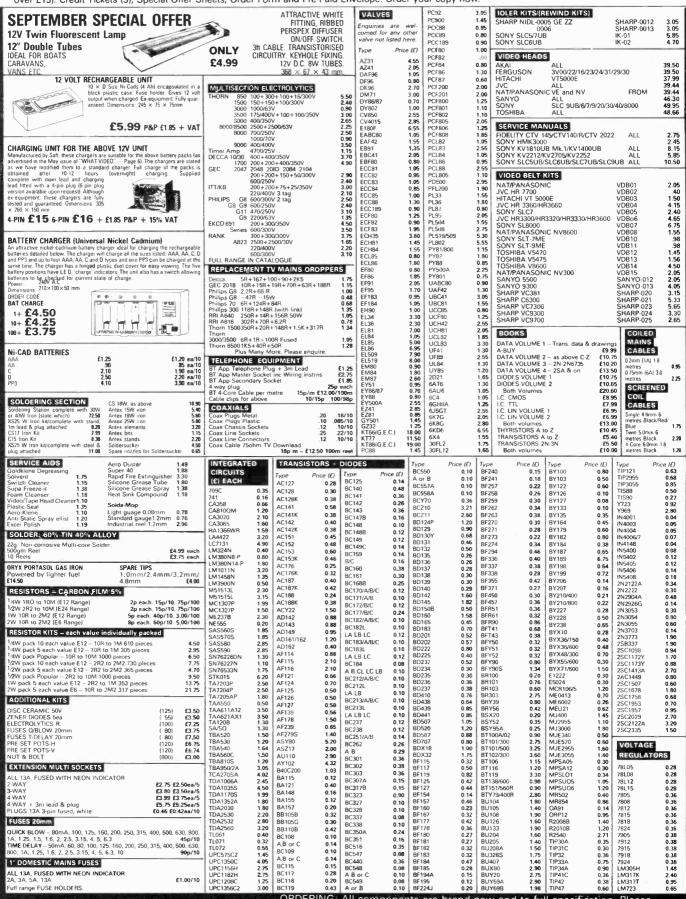
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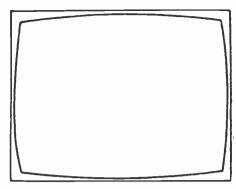
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John A. Reddihough

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COVER PHOTO

This month's cover photograph shows the Ferguson TX85 chassis. See article on page 838.

CORRECTION

Our apologies for icorrect Ferguson/ JVC equivalents shown in VCR Clinic. The JVC equivalent of the Ferguson 3V29 is the HR7200. The HRD110 and 3V39 are equivalents.

TELEVISION

Charting the course ahead

In discussing, some months ago, the problems that the Japanese consumer electronics industry would face as a result of the high exchange rate value of the yen we suggested that one way to maintain profitability would be to place greater emphasis on higher value-added products, i.e. your all talking, all dancing, feature-full goods and systems. We are already beginning to see the expected move in this direction. The approach is appropriate not only for the Japanese of course. It has been tried with success by some rental chains seeking to maintain profitability in a declining market, and is a logical way of combating the market saturation conditions now found in many countries. What do you do when every household has a music centre, a VCR and several TVs? You have to try and sell them a remote control TV with stereo sound, teletext, an FS tube and so on. And do much the same with other consumer goods. Will this approach work? There are two fundamental problems here. First, if every manufacturer adopts the same policy the overall effect is likely to be a stagnant industry rather than an increasingly profitable

one. And secondly the public might not accept the bait.

The current biennial Berlin Consumer Electronics Fair has seen a host of new, technologically advanced products launched and announcements of new developments. Two of these are of particular significance, first Sony's decision to go ahead with the introduction of the digital audio tape (DAT) system in Europe and secondly Philips decision to launch the new-generation laser disc system, in particular the compact video disc (CDV). There has also been the now usual talk about the home of the future and the way in which it might be equipped electronically – with a computer linking everything together, including security surveillance, heating and so on, something that Philips refers to as the domestic digital bus. Philips has suggested that by 1990, only three years off, we shall be using remote control units which will be capable of five times as many commands as the most sophisticated now available. The company believes that in ten years' time half the entertainments products available will be completely new. There is something strangely ironical about the idea of highly sophisticated remote control arrangements. The basic intention is to make life easier, but if you've got to master and remember how to use something really complex you can end up finding that life is more difficult. There's also the prospect of considerable technological redundancy. Just what is the point of having – and paying for – a hundred controls when all you ever use is half a dozen?

The basic problem here is whether developments in consumer electronics and allied fields are being technology driven or market driven. Just because something is technically possible doesn't mean that there's a market for it. To assume that markets exist or can be created for whatever you can make can lead to traumatic consequences for manufacturers. As a relatively simple example, the failure of RCA's capacitance video disc did the company great harm and could well have been a major factor in ending the company's days as an independent entity. The technology was sound, and much had been spent on its development. It's difficult when the crunch comes and you have to decide whether to try to make something of it or call a halt. The strange thing is that the Japanese, despite their very different lifestyle from western norms, seem to be better at making sound judgements on international market prospects for technology.

The DAT system, developed in Japan, looks a reasonably sure bet that could do a great deal for Japan's consumer electronics industry. A price of about £1,300 has been suggested for the initial machines. As we've seen in the past however prices can soon start to fall dramatically once production expands after a product has caught on. The system offers saleable advantages: high quality performance coupled with flexibility in use, something that's obviously relevant in the donestic context. It has been held back by the music copyright problem and by the lack of software, but in the long term there's no holding back something that offers obvious advantages.

One has far greater reservations about the new video/audio discs, especially the compact video one with its five minute audio-visual section followed by twenty minutes of audio only. This tends to look like an effort to make a market for something simply because it exists. The format was originally devised for promotional purposes: whether it's relevant in the domestic context remains to be seen. The CDV disc will cost about £5 and the player about £500. Due in the shops this autumn.

There is no stopping the onward march of technical development. The question is whether there's a use for the outcome. Audio is now going digital since there's a considerable advantage in terms of quality. Storing video in digital form is something that's being worked on but one wonders, when it becomes a feasible prospect in terms of a price suited to domestic markets, whether it will offer much of an advantage. Sure, you will be able to mess about with the stored material – change its colours and so on – but who wants to sit around doing that? There is always the constraint of the time available for leisure activities: the more options on offer, the less likely it is that fringe ones will represent a viable market.

Whatever the outcome in terms of consumer reaction in the years ahead, of greater concern to some of us will be the servicing aspects. High-tech servicing as it's coming to be called offers some daunting prospects in terms of viability. Having to invest in expensive test gear to deal with something you might see twice a year, then having to start fault-finding from first principles, is going to mean horrendous bills for the public or bankruptcy for the service trade. There's an educational job to be done here to prepare the public. It's something we should be considering as a matter of urgency.

Long-distance Television

Roger Bunney

There were some incredible, sustained Sporadic E openings during July and numerous reception logs have been received. Without further ado, here's the collated log for UK SpE reception during the month.

- 4/7/87 TVE (Spain) chs. E2, 3, 4; RTP (Portugal) chs. E2, 3; RAI (Italy) chs. IA, IB; EPT (Greece) E3.
- 5/7/87 RAI IA, B; TVE E2, 3; RTP E3; MTV (Hungary) R1, 2; JRT (Yugoslavia) E3, 4.
- 6/7/87 RAI IA; TVE E2, 3, 4; RTP E2, 3; EPT E3; ORF (Austria) E2a; CP+ (Canal Plus, France) L3; CST (Czechoslovakia) R1; ARD (West Germany) E2; TVP (Poland) R1; TSS (USSR) R1, 2; NRK (Norway) E3.
- 7/7/87 RAI IA, B; MTV RI, 2; TVP RI, 2; CST RI, 2; +PTT (Switzerland) E2, 3; DR (Denmark) E3; TSS RI, 2, 3; SR (Sweden) E2, 3, 4; NRK E2, 3, 4; RTE (Eire) IB (received in Cornwall); JRT E3.
- 8/7/87 TVE E2, 3, 4; RTP E2, 3; RAI IA; CST R1; TVP R1, 2; TSS R1, 2; SR E2, 3, 4; ARD E2; RUV (Iceland) E4.
- 9/7/87 EPT E3; JRT E3, 4; ORF E2a; JTV (Jordan) E3; TVP R1, 2; SR E2, 3, 4; NRK E3, 4; TSS R1; RUV E3; CST R1.
- 10/7/87 CST R1, 2; TVP R2; DFF (East Germany) E4; TSS R1; ORF E2a; TVP R1, 2; SR E2, 3, 4; NRK R2; TSS R1; ORF E2a; SR E3; DR E3, 4; C+ L3; JRT E3; RAI IA; RTP E3; MTV R1; TVE E2, 3, 4.

 TVE E2, 3, 4.
- 11/7/87 TSS R1, 2; RAI IA, B; TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; TVR (Rumania) R2; JTV E3; MTV R1, 2; TVP R1; +PTT E2; ARD E2; ORF E2A; C+ L3; EPT E3.
- 12/7/87 TVE E3; RAI IB; ARD E2.
- 13/7/87 TVE E4; TVE-2 E2; RTP E3; RAI IA.
- 14/7/87 RAI IA; TVE E2, 3, 4; RTP E2, 3; JRT E3, 4; SR E3, 4; YLE (Finland) E3.
- 15/7/87 TVE E2, 3, 4; RTP E2, 3; RAI IA, B; RTP E2; TVE-2 E2; ARD E4; NRK E4; SR E2, 3, 4.
- 16/7/87 TVE E2, 3; TVE-2 E2; RAI IA, B; RTP E2; +PTT E2; ORF E2a; CST R1; DFF E4; RUV E4; NRK E2.
- 17/7/87 NRK E2, 3, 4; SR E2; DR E4; ORF E2a; MTV R1, 2. 18/7/87 RAI E2, IA, B; TVE E2, 3, 4; TVE-2 E2; RTP E3; C+
- L3, 4; CST R1; MTV R1; JRT E4.

 19/7/87 TSS R1, 2, 3; SR E2, 3, 4; NRK E2, 3, 4; DR E3; CST
- R1, 2; DFF E4; ARD E2, 3; TSS R1, 2; +PTT E3; C+L3; RUV E4; RAI IA; JRT E3.
 20/7/87 C+L3; RAI IA; RTS (Albania) IC; JRT E4; TVR R2;
- TVE E2, 3, 4; RTP E2, 3; TVE-2 E2; SR E2, 3, 4; TVP R1, 2; TSS R1, 2; ORF E2a, E4; JTV E3.
- 21/7/87 RAI IA, B; 'Telemarket' E2 (Italian private station); +PTT E2, 3; JRT E3, 4; MTV R1; ORF E2a, E4; TVR R2; TVE E2, 3, 4; RTP E3; C+ L3; DR E3; CST R1, 2; TVP R1, 2; TSS R1, 2, 3; NRK E2, 3, 4; SR E2, 3; YLE E3; ARD E2, 3, 4; EPT E3; ch. A2 (N. America).
- 22/7/87 +PTT E2, 3; CST R1; TVP R1; TSS R1, 2; SR E2, 3; DFF E4; NRK E2, 3, 4; RAI IA, B; JRT E3, 4; TVE E2, 3, 4; RTP E2, 3; C+ L3.
- 23/7/87 RTP E2, 3; TVE E2, 3, 4; +PTT E3; ARD E2, 4; CST R1; TSS R1; NRK E2, 3, 4; SR E2, 3, 4; Arabic station ch. E2 (suspect Abu Dhabi).
- 24/7/87 YLE E3, 4; NRK E2, 3, 4; SR E2, 3, 4; TSS R1; CST R1, 2; MTV R1, 2; DR E3; TVE E3.
- 25/7/87 RAI IA; TVE E2, 3; NRK E2; RTP E3.

- 26/7/87 RAI IA, B; TVE E2, 3; RTP E2, 3; RTS IC; ORF E2a; JRT E3, 4; +PTT E3; CST R1; ARD E2, 3; TSS R1, 2, 3; RTM (Morocco) E4.
- 27/7/87 RAI IA, B; RTP E2, 3; TVE E2, 3, 4; TSS R1, 2; TVP R2; TVR R2; SR E2, 4; NRK E4; unidentified Arabic E4 signal.
- 28/7/87 TVE E2; TVE-2 E2; RAI IA, B; NCT (Italian private station) IA; RTP E3; NRK E2, 3, 4; SR E2, 3, 4; unidentified dark-skinned announcer on ch. E3 at 1840BST.
- 29/7/87 TVE E3; DR E3.
- 30/7/87 TVE E3; RAI IA; CST R1; TSS R1, 2; RUV E4.
- 31/7/87 RAI IA; TVE E2.
 - 1/8/87 EPT E3; RAI IA, B; MTV R1; JRT E3; Syria E3, 4.

Thus July proved to be an extremely rewarding month for SpE operators. With increased amateur radio activity in the 50MHz band so further information on reception possibilities is becoming available. It's evident that the trans-Atlantic path to N. America is often open. Perhaps we should pay greater attention to the possibilities here and take a look to the west from time to time from late afternoon, particularly when strong signals are present from RUV (Iceland).

Congratulations are due to Cyril Willis (Norfolk) on his reception of N. American ch. A2 signals on the 21st, for some thirty minutes from 2325-0008 with strong though impossible to identify vision. The programme went on to the news at the hour and a second much weaker signal was also present.

Perhaps more dramatic was his reception of Syria ch. E3 and later E4 on August 1st. The signal consisted of a PM5544 test pattern with an upper identification in Arabic script and "ORTAS-DAMAS" lower, going on to a caption and clock (plus two hours at 1350). A similar caption was visible on ch. E4. The ch. E3 signal was present for over an hour! Later on the same afternoon Ray Davies (Norwich) received a smeary ch. E2 signal from the south, undoubtedly from Nigeria or Ghana. This was a spectacular day!

As this is being written news has just arrived from Mark Baldwin (Rugby) of Band III SpE reception on August 5th, from 1735-1752 BST. The ch. E6 signal started with a Star Trek cartoon dubbed in Arabic. This was followed at 1745 by a female announcer then a rural scene with singing which faded away to noise. Fortunately Mark recorded the reception via his VCR. Photographs have been promised and attempts are being made to identify the source of the signal. Tunisia or Algeria is the most likely source, Libya being a less likely possibility.

A ch. E2 signal suspected of being from Abu Dhabi, was seen on July 23rd carrying adverts for Gulf Air. Other unusual signals were RAI (Italy) ch. E2 and JRT (Yugoslavia) also on ch. E2.

On several days there was intense SpE to blanketing levels, with openings of up to an hour in the 144MHz amateur band. Reports suggest that the m.u.f. reached ch. E12 on one day. According to the RSGB there were trans-Atlantic 50MHz SpE amateur openings on June 7/8/13/14/19/20 and July 11/14/17/18. On the 21st there was a six-hour opening from the UK to the USA. Many of the signals received during these openings came from as far as central USA, for example Kansas, Arizona and Missouri on the 11th. 144MHz SpE openings were noted on June 23rd and July 7/10/11/13/20/21. Apart from news of the go ahead for 50MHz operation in Norway and Malta, contacts have been made with Spain and Yugoslavia (these countries have no official 50MHz allocation – yet!).

According to Stanford University the sunspot peak in

the present cycle should occur during 1991, with an estimated count of around 125.

One mystery has been cleared up. The Telsur caption mentioned in the August column is from a regional afternoon TVE programme.

A new listing has enabled Hugh Cocks to identify some of the US stations he reported receiving last month. WSB-TV comes from Atlanta and the WFMY-TV and WUND-TV stations are both in N. Carolina. The signals were received in ch. A2. A Spanish language programme heard beneath Puerto Rico ch. A2 is thought to have come from Cuba. Hugh also comments on interference from CD players and digital tuning hash in Band I!

Tropospheric enhancement was noted on July 4/5th, the 9th (giving TVE chs. E5/31/37 in the western UK) and the 22nd. During the latter day Band I/II and ch. E29 NRK

signals were received in Aberdeen.

An extremely busy month then. My thanks to the following for logs to supplement my own: Bill Cotterill (Tipton), Dave Shirley (Hastings), Roger Fussell (Torpoint), Peter Schurbert (Rainham), Tim Anderson (St. Leonards), Simon Hamer (Powys), Iain Menzies (Aberdeen), Mark Baldwin (Rugby), Tony Privett (Basingstoke) and Cyril Willis (Norfolk).

News

UK: The DTI and the Electronic Engineering Association have started work on a programme to introduce a digital, short-range radio service by the early 1990s. It will use digitally encoded voice and data transmission with powers no greater than 5W and 25kHz bandwidth channels. There are likely to be some 80 channels, one of these being a control channel which will scan the others to find a clear frequency within the band. Ranges will be up to 5km. No frequencies have been allocated yet and licences won't be issued before 1990.

Benelux: The Belgian government has agreed to pay 224m Belgian Franc damages for the destruction of the RTL-TV transmitting mast in 1981. A Belgian Mirage plane hit the mast, putting RTL off-air for a period. There is talk of a new commercial TV station that would broadcast to the French-speaking parts of Belgium. It would be called simply TV1 and would be established by RTL and a group of French newspapers. In Holland, Roermond-3 ch. E34 is now on test during the morning and afternoon periods. The FUBK card is used, with identification.

50MHz: The Maltese Ministry of Wireless Telegraphy has announced that amateur radio operation in the 50-52MHz band is now permitted to class A licence holders. The Norwegian radio authorities have permitted 50MHz operation subject to non-interference with TV transmissions. Austria is believed to be considering similar concessions.

Sri Lanka: A second TV channel is to be inaugurated shortly. It will be used for education/instruction only, aimed at both students and adult viewers.

Satellite news: Japan launched its first true DBS craft in mid-July. The satellite provides a 24-hour English-language service including ITN/BBC news. Israeli enthusiasm for TVRO equipment has resulted in a rash of large dishes on roofs. Dishes of under 2-44m diameter are to be allowed but larger dishes will not be permitted in residential areas. Voice of America Europe in stereo is now available on a SAT-1 subcarrier.

Transmitter Listings

The following list of Italian private TV stations has been provided by the Benelux DX Club (BDXC):

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Ch. IA: Radio Tele Uno; Nord Center TV; Teleatalia; Telleomellina; Tele Spazio Campano. The latter is in central Italy, the rest in the north.

Ch. IB: Tele Trieste Mia (north); Teleradio S. Marco (east); Tele Bari (SE); To Sardegna (N. Sardinia); Teleor (C. Sardinia); TVC Quattro Mori (S. Sardinia); Telemarket (Rimini).

Ch. IC: Radio TV Atri (east); Tele Sud Italia (toe of S. Italy).

There are other stations whose location is not known.

The following is a definitive list for the Danish TV2 transmitter chain. Note that the second TV network has no connection with the state run Danmarks Radio (DR).

Station	Channel	E.R.P.	Opening date
Nord Fyn	E22	500kW	December 1988
Aarhus	E26	600kW	November 1988
Rodekro	E27	600kW	June 1988
Thy	E28	250kW	February 1989
Veile	E30	500kW	August 1988
Svd Fyn	E32	250kW	December 1988
Brammingg	E33	500kW	May 1989
Alborg	E35	600kW	February 1989
Vendsyssel	E37	50kW	February 1989
Ringkobing	E40	600kW	September 1988
Jyderup	E48	600kW	March 1989
Ńakskov	E52	100kW	August 1989
Kobenhavn	E53	600kW	March 1988
Bornholm	E56	800kW	September 1989
Skive	E56	500kW	June 1989
Vordingborg	E58	600kW	August 1989

Apart from Thy all transmissions will be horizontally polarised.

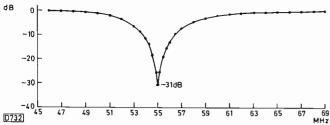


Fig. 1: Measured characteristic of the Aerial Techniques TDNF1 Band I notch filter at 55MHz.

The main transmission centres for the Spanish TV3 Television De Catalunya service are as follows: Tibidabo ch. E44 10kW; Rocacorba ch. E52 10kW; La Mussara ch. E63 10kW; Alpicat ch. E52 10kW; Montcaro ch. E29 5kW. There are at present 73 u.h.f. relays with powers from 0-625W to 200W.

405-line Equipment

A number of requests were received for the equipment mentioned in the August column. Obviously there are many enthusiasts who are seeking mature equipment and information. So rather than junk old magazines, manuals, test equipment and receivers write in to offer them.

Aerial Techniques Catalogue

My connection with South West Aerials ended about three years ago. The company was subsequently renamed Aerial Techniques and it's interesting to note developments as reflected in the latest catalogue, which is available for 75p. Many of the old and popular lines have been continued but there are many new items of interest. These include the active Triax UFO aerial (shortly to be reviewed), the Revco discone aerial and new very wideband head amplifier, field strength meters, a new Band I filter and new rotors. Most welcome is an extended list of TV receivers suitable for v.h.f./u.h.f. TV-DXing, covering several transmission standards. Good reading for the enthusiast.

From our Correspondents . . .

Jean Louis Dubler, resident in Seoul, S. Korea, has been on a trip through S.E. Asia. He mentions that there are some eight TV networks in Japan. Many programmes are of high quality, with few imported shows. In prime time however the commercials occupy about 25 per cent of programme time – a two hour movie can last for three hours! Video equipment is cheap in comparison with Europe but 10-15 per cent higher than in Hong Kong. It's an expensive country to visit. In comparison, living standards in S. Korea have a long way to go to catch up with Japan. Korean industry is export orientated and the output is sold at higher prices in the home market than overseas.

Paul Barton has been developing a new variable-bandwidth TV-DXing system which will be featured in these pages when finalised. Diode switching provides two bandwidth settings: in the narrow-band (2MHz) position the response at 8MHz is 60dB down. Video polarity switching and sound tuning will be provided. Paul has tried out various tuners from Sendz Components to check on their suitability for DX use. The Mitsumi MEC1-FS1 covers the French channels A-C, 1-6 and 21-69. It uses thick-film printed components mounted on a PCB – a data sheet is provided. He reports that the best currently available tuner seems to be the Toshiba EG522F which

gives coverage of 45-110MHz, 105-250MHz and 430-860MHz. It's a good buy at £5. MOSFET devices are used and the pin connections are as follows: 1 a.g.c. (8V for maximum gain); 2 12V u.h.f.; 3 12V v.h.f.; 4 leave open-circuit for Band I, connect to chassis for Band III; 5 0-30V tuning; 6 omitted; 7 12V for oscillator (i.c. type TA7635P); 8 i.f. output at 36MHz. The pin numbers are stamped on the base of the can. A frequency counter output is also provided.

Band I Notch Filter Review

The double-notch Band I filter listed in the current Aerial Techniques catalogue has now been replaced by the single-notch type TDNF1. A sample has been tested and my comments are as follows.

The new filter resembles a CB braid breaker type, being of slim in-line construction. It's housed in a 3in. × 5/sin. diameter tube covered with shiny, black heat-shrink sleeving (so you can't get inside to examine it!), with inbuilt socket and a Belling-Lee plug on a flying lead some 4in. long. A small preset capacitor provides tuning, accessible through a hole in the case. Tuning throughout Band I is available – a small metal screwdriver can be used without detuning effects. Fig. 1 shows the response when tuned to 55MHz, the notch depth being 31dB. This is a measured response plotted with inputs at 250kHz intervals. The result is good though the slope is wider than with say the 10M1X ferrite toroid which gives -6dB at ± 1 MHz and -0.8dB at ± 3 dB. The insertion loss away from resonance is excellent at well under 1dB - 0.1dB at the extreme band edges. At 48MHz (ch. E2) the notch depth is 22dB, the peak being 45dB at 70MHz. In general the filter gives acceptable results for DX-TV use though it's a pity that the maximum notch depth isn't in the 50MHz region where problems may be experienced with radio amateurs. The 22dB level should deal with most such problems however with the filter tuned to the 51MHz mid-band frequency.

A d.c. pass is available via both the inner and outer (braid) circuits, with no short between them. The filter can thus be used with a coaxial feeder that carries d.c. supplies to a masthead amplifier.

In conclusion, a useful filter at a reasonable price. For further details contact Aerial Techniques (see advertisement in this issue).

Dutch Third TV Network

The following list of transmitters for the Dutch third TV service has been received from the BDXC:

Station	Channel	E.R.P.
Wieringermeer	E42	300kW
Markelo	E51	300kW
Goes	E35	250kW
Hulsberg	E43	100W
Arnhem	E43	30kW
Maastricht	E39	1kW
Noorbeek	E52	5W
Losser	E34	3kW
Smilde	E44	1,000kW
Lopik	E30	1,000kW
Roermond	E34	250kW
Eys	E48	1kW
Wijk aan Zee	E21	4W
Slenaken	E32	10 W
St. Pietersberg	E23	250W

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Keith and Alex

Les Lawry-Johns

Keith and Alex have been up again from Pompey to straighten me out. They keep having to do it. If you recall, on the last occasion they were in the shop I'd sold a chap a tripler and told him to join the diode and earth leads together, whereupon Keith had commented "it won't last long like that". I wondered about this as I've always joined them for use in the ITT CVC32 chassis. Apparently the receiver had been a CVC32 not a CVC32 – the evidence being the tripler he'd had in his hand. Now I honestly didn't see a tripler of any type and understood that he wanted one for a CVC32. Hence the confusion. The chap never came back, so I assume that he must have read the leaflet and connected it correctly. My apologies all round.

The Philips G11

While Keith and Alex were paying their latest visit I told them about the Philips G11 that had me going for some time. In a nutshell, it blew the BU208A line output transistor every four days, despite fitting a nice new $470\mu F$ h.t. reservoir capacitor – on the first day. Three times it came back, and each time I went over the joints, resoldering every suspect and non-suspect. I could have fitted a new line scan panel but wasn't happy with this approach to the problem. When I'd fitted the last BU208A I kept the set on test for several days.

One morning I switched it on and it refused the start. The h.t. fuse was intact – it had always blown when the BU208A had gone short-circuit. The set started when the top plug supplying the BU208A was touched. My troubles were over when I connected an extra lead from the socket's base connector to the base of the transistor. The set's been going all day every day since but the owner hasn't been back to collect it. I suppose he was a bit fed up with it and with me.

The joke was when a gentleman came in to buy a blackand-white receiver since he's colour blind. Said he'd been everywhere (I doubt that) but hadn't been able to purchase one. He looked at the G11's picture – a black-and-

white film happened to be on.

"I like that" he said.

I told him that one wasn't for sale, so he bought a 20in. Thorn 1500 which had had a new tube fitted. He told me that he could identify the balls on a snooker table without seeing the colours. Well I never . . .

The Bush T20

Shortly after this a Bush T20 came in and a quick test proved that the BU208A was short-circuit. I fitted another one and resoldered all suspect joints. After switching on there was a lovely picture – for three minutes. Bonk. The BU208A had bit the dust. I did everything I could think of, including the addition of an earth lead from the timebase panel to the line scan panel, renewed the BU208A and the driver transistor and tried again. Two and a half minutes later the BU208A died. I put the set to one side and got on with some more rewarding jobs – not that there are many about nowadays.

· I eventually tackled the T20 again. After fitting yet

another BU208A I concentrated on the joints that looked good and resoldered all that played a part in driving the line output stage. When I removed the solder from the legs of the line driver transformer I noticed that they weren't clean. I scraped them until they were shiny and resoldered them. This time the BU208A survived and so did I. Fooled by an old one like that!

Dr Dicey's Dynatron

When Dr. Dicey phoned I knew I couldn't ask him to bring his set in — it's a great big 26in. Dynatron. So I would have to go to see him, and I didn't have a car. Mine had broken down on the way to Heathrow a few days earlier and as the cylinder head was now warped I would be without it for some time. I remembered my friend Les whose Dynatron I'd fixed a couple of days previously. He'd said he would like a new set but would like to have it fitted into the existing cabinet. I'd declined to do this on the grounds that it would be difficult to get one to fit. As Les is retired I got on the phone to him to see whether he would run me up to Dr. Dicey. He said it would be no trouble at all and he'd like to see Dr. Dicey again — he'd not seen him for some years.

"But he was a woman's doctor, one of those gynaecologist fellows" I said.

"Yes of course. I knew him outside his practice."

By now we were almost there and soon came to a halt in his drive. I went in and examined the patient, which had severe damage to the power supply and remote control receiver boards. The chassis is similar to that used in the Pye 731 series.

The doctor commented that had it been a woman he'd have sorted out its inside, but a TV set was another matter and he didn't feel inclined to have it repaired. He wanted to retain the cabinet and fit a new set inside it. I knew that this would mean two transplants, one for the doctor and one for Les. Oh well.

I carefully measured the inside of the cabinet and jotted down my findings. We returned to the shop to pick up a G11 in good working order to serve as a loan set while I ordered a new one. This kept him happy for a few days, and in the meantime I picked out the Pye 59KE2703 as the most suitable candidate for the operation. This arrived a few days later. It had a dark cabinet (anthracite) and a remote control handset. I quickly unpacked it and lined up the programmes.

The 24in. FST screen looked lovely and flat and I felt it would fit nicely into the doctor's cabinet, being 27in. wide and just over 18in. high. I contacted Les who was only too pleased to assist with the fitting, knowing that if all went well there'd be a repeat performance with his own set.

Up we steamed and I ripped out the panels and removed the tube. Then came the job of removing all the bits and pieces that would have impeded the entry of the new set. The Dynatron's nice looking front panel had to be removed, but shortly afterwards the new Pye looked out over the doctor's lounge and produced a good picture. All that was now necessary was to line up a programme for the doctor's video, which was quickly done.

I piled all the panels into a bin liner and struggled out with the tube, the G11, etc. while the doctor wrote out his cheque. On the way back Les said he wanted a set just like that and a video to go with it. When I ordered these the chap at the other end was interested to hear about our success in fitting the 24in. Pye into the Dynatron cabinet. Apparently he has one of them himself and wanted just this information . . .

Teletopics

POCKET CTV

Ferguson has launched an LCD pocket TV set, Model PTV01, which is expected to sell at around £250 and will be in the shops from November. An up market with high disposable income is envisaged and the launch is timed to benefit from the Christmas gift buying season. In addition to its use as a watch-anywhere TV set it can be used as a colour monitor with Ferguson camcorders that have playback capability. A rechargeable battery pack will be available at £20, a car adaptor at £16, an external aerial adaptor at £5 and an a.c. adaptor/charger at £16. The set has a 2.6in. (diagonal) screen, weighs 330g and measures $85 \times 145 \times 35.3$ mm. Automatic channel selection is by press-button sweep tuning. There's on-screen indication of channel tuning and press-button adjustment of volume, with an earphone socket provided - an earphone comes with the set.

The set is manufactured in Japan by Seiko Epson. Ferguson undertook the design work for European 625-line, PAL operation. The screen is of the active drive twisted nematic liquid crystal type with 56,000 pixels. Active drive means that the pixels are individually driven by semiconductor devices built into the display. MIM (metal insulator metal) technology is used for this purpose, the drive devices having a diode-like configuration. RGB filters arranged in a triangular pattern, with black in-filling, are laid over each group of pixels. Back lighting is used to provide a bright picture even in dim lighting conditions.

Ferguson expect to sell about 20,000 of these sets in the first year and estimate that this will represent 20-30 per cent of the market.

The Citizen colour LCD set mentioned in this column last month is expected to be available in limited quantities from October. An initial retail price of about £190 is envisaged. This is expected to drop as production builds up.

FINLUX FLAT TV

Further details of the prototype Finlux "Face" flat TV set mentioned last month have been released. The 7in. electroluminescent screen is 2cm deep and has a microscopic layer of zinc sulphide on a glass substrate. At present the set, which despite its size offers stereo sound, teletext and remote control, is not being manufactured as a commercial product – obstacles still to be overcome are those of price and colour (the present prototype has a monochrome display). It's likely that the display panel will be used in computer systems initially, coming into domestic use some time in the mid-90s when a 12in. colour version should be available.

THORN EXPANSION

Thorn, whose takeover of the US Rent-A-Center business was announced last month, has bought the north country Vallances TV/electrical retail/rental chain which consists of 28 high street shops and 13 out-of-town Atlantis stores. Most of the shops will be integrated with Thorn's Rumbelows retail chain; three will become part of Thorn's Focus TV operation. Vallances' profits peaked in 1983. Last year the company made a pre-tax loss of £1·3 on a turnover of £46·8m.

It's understood that Thorn have expressed an interest in taking over the Granada TV rental business.

MITSUBISHI'S GIANT TUBE

Mitsubishi, whose 31 and 35 inch colour tubes are already in use in production receivers, has announced the development of a yet larger tube with a 40in. diagonal screen. Mitsubishi sets fitted with the 40in. tube will go on sale in Japan shortly. They are expected to be used for such purposes as teleconference monitors and concourse terminals.

The large tubes have a resolution of 560 lines and employ a new gun (type XF) which has multiple-stage convergence and a scandium oxide dispersion cathode that can provide a beam current four times greater than a conventional cathode.

NEW CEEFAX COMPUTER SYSTEM

Softel Ltd. is to provide the BBC with a new Ceefax computer system to replace the one taken into service in 1979. The new system will enable the BBC to continue its policy of improving the teletext service. The use of more spare TV lines will give faster access to pages, and a clearer and more varied page format will be used during "Pages from Ceefax" broadcasts.

VIDEO DISCS

It seems that the LaserVision disc system is at present being played down in preparation for the launch of the new generation of 8 and 12in. LD discs and the 5in. CDV disc. These will all have digital sound, which will make the discs incompatible with current LaserVision players. In the present system the analogue sound signal amplitude modulates the f.m. vision signal and is separated during playback by filtering. A new generation of players will be able to handle all types of laser scanned audio and video discs.

In the USA, GE/RCA have demonstrated a relatively low-cost disc that stores the vision signal in digital form: the company aims to develop a 5in. compact disc that will provide over an hour of full-motion, full-resolution vision stored digitally. The system allows interactive operation and at present has a resolution of 256×200 pixels. Data compression techniques are used to enable the material to be stored in the small disc. GE/RCA say that the system could be made available in about two years' time, with players selling for around \$1,000.

PLESSEY-PHILIPS TVRO CHIP COLLABORATION

Plessey and Philips are to collaborate over the production and marketing of a set of chips for satellite TV receiver systems. The companies have signed an exclusive licence with the Norwegian firm Nordic which has developed a multi-standard MAC decoding system. Philips microcontroller chips will be used, with Plessy contributing VLSI chips.

S-VHS CAMCORDER

Hitachi has announced an S-VHS specification camcorder which is expected to be available in Japan and the USA this autumn. The MOS pick-up device has a resolution of 450 lines.

NEW PRODUCTS

Test Reliability Ltd. (PO Box 20, Petersfield, Hants GU32 3JQ) has announced a low-cost automatic colour

analyser for use when setting up monitors, VDUs and TV sets. The system caters for tubes in sizes from 9-26in., is portable and can be used to accurately and repeatably set up the red, green and blue guns to predetermined target colours in under a minute. It operates via a sensing head that incorporates three phototransducers. The head is attached to the screen and enables measurements taken at high and low light levels to be processed for deviation from target values. An interface connects with the monitor/TV set via the aerial or other socket, enabling the results to be displayed as bar graphs. The operator then adjusts the RGB outputs to colour specification. Colour details for up to 32 types of tube can be programmed and selected as required.

Adcola has changed the colour scheme of its range of soldering stations and added a version with LED temperature read out – the visual indication of actual bit temperature is said to be accurate to within ± 2 per cent.

Fringe Electronics Ltd. (Fringe House, 50 Mansfield Road, Clipstone, Notts NG21 9EQ) has introduced two "two set power units" that enable two TV receivers to be operated from a single masthead amplifier. The internal inductive splitter is suitable for all f.m./v.h.f. radio and TV signals in the 40-860MHz frequency range. The two units, P1215/2 and P1290/2, differ in their output current

capability. Through loss is 3-5dB at 40-230MHz, 3-5dB at 470MHz and 5dB at 860MHz. Average isolation is 17dB and the minimum input signal level 1mV.

THE SONY HANDYCAM PRO

George Cole writes: Sony UK is to introduce a new lightweight Video 8 camcorder later this year. The Handycam Pro, Model CCD-V90, weighs just 1-1kg yet has many features normally found only on heavier Prorange camcorders. A newly developed LSI chip which incorporates the entire system control and servo circuitry has contributed to the reduced weight. The size and weight have also been decreased by the use of high-density chip mounting technology which makes use of both sides of the boards. A newly developed battery weighs just 150 grams, half the weight of a conventional camcorder battery yet providing up to 45 minutes' recording time. The new CCD pick-up device has 380,000 pixels, giving Super Beta quality resolution.

Other features of the CCD-V90 include a variable speed digital shutter (five speeds from 1/60 to 1/2,000 sec), an edit/search function, vision and sound fader, double azimuth head for noise-free special effects, and a date/time recording function. The $99 \times 130 \times 330$ mm CCD-V90 will cost around £1,400.

Non-tripping Faults

George Wilding

While a short-circuit power diode or transistor in any position, a broken down tripler, or shorted turns in a line output or chopper transformer will generally instigate fuse blowing or overload trip operation, there are many instances where a lighter overload current won't, nor is it expected to, produce cut-off action.

A typical instance is leakage in the common or individual high-voltage capacitor(s) used to decouple the supply/supplies to a tube's first anodes. The result of such leakage will be reduced brightness or reduced output from one gun. Until there's a severe value reduction the high-value feed resistor(s) will limit the overload current and prevent trip operation.

When a tripler starts to break down the initial picture symptoms will be poor focus, reduced brightness and overscan due to the reduced e.h.t. voltage. Because of the increased beam current demand all these symptoms are accentuated when the brightness control setting is advanced.

A leak or excessive current demand from one chopper power supply rail will to some extent reduce the voltages provided by all the supply's rails since the power supply is being asked to operate at the fringe of or beyond its normal self-regulating limits. Similarly, because of the very tight magnetic coupling an excessive load on one line output stage derived rail will tend to reduce the voltages on all these rails. In such instances voltage checks at the individual reservoir/smoothing capacitors won't positively identify the rail across which the excessive loading is being applied. This blanket reduction of chopper and line output stage derived supplies will mean that the e.h.t., the tube's first anode voltage(s) and the h.t. for the RGB output stages will probably all be reduced. Thus the most common symptom is a black screen with no sound.

How do you find the cause quickly? There will almost always be a slight smell of burning within a few minutes of switching the set on: this is generally caused by one or more composition resistors being overrun.

Since the h.t. voltage in a modern receiver is not high, instances of capacitor failure are not common. Even miniature electrolytics have a good service record.

Thus the cause of most non-tripping leaks and shorts will be traced to a semiconductor device, the voltage regulator chips often used to provide a highly stabilised 12V rail for the small-signal handling circuits being common offenders.

The first move should be resistance checks for a short in such an i.c. The breakdown will problably be across the output since a short across its input, with only a low-value feed resistor present to limit the current flow, is likely to result in fuse failure or operation of a trip or fusible resistor.

Should such a short be detected, its presence probably confirmed by a discoloured feed resistor, the question that arises is whether the short is within the chip or across its output. Even if the short is across its output the excess current will have stressed and probably damaged the i.c., so it's best to remove this item. If the i.c. seems to be all right however and the feed resistor is not discoloured the stressed component will be obvious soon after switching on because of the rising hot air thermal or slight smoke.

In such circumstances the overheating component will almost certainly be a composition resistor and the cause of the overload is likely to be one of the following: (1) a shorted or defective zener diode operating at well below its normal voltage rating; (2) a transistor with a base-collector or collector-emitter short-circuit (blowthrough); (3) a short or heavy leakage within an i.c., this being most common with types fitted with a heatsink (such a fault will usually blow a fuse or operate a trip, but this is not always the case); (4) a short or heavy leakage within a capacitor resistor fed from a supply rail. In this latter event the excess current and the loading imposed will depend on the value of the resistor and the rail voltage. Thus an excess load which a 12V supply would tolerate for some time

before the resistor's value fell further would produce immediate switch-off action if it was across an h.t rail.

Remember that with most meters the black probe is positive and the red probe negative when making resistance checks.

Typical Example

A typical example of a non-tripping short came our way

recently in a Ferguson TX10 chassis. The symptoms were a blacked out screen, though some e.h.t. could be felt on the tube's faceplate, and no sound with an above normal hum. A check at the output pin of the 12V regulator IC621 produced a reading of only a few ohms in both directions. Removing the i.c. proved that it was responsible for the short. Normal results were restored after replacing it along with the feed resistors R612 (3-9 Ω) and R613 (10 Ω).

VCR Clinic

Ferguson 3V45/JVC HRD140

The fault with this machine was that the clock half of the display worked but the play/rewind/etc. half didn't. Switching off at the mains and powering up again had no effect and I couldn't find any dry-joints on the panel. Finally I removed the memory back-up capacitor for a few seconds, refitted it and then powered up. This brought the display back on again.

P.B.

Panasonic NVM5 Camcorder

Unloading was incomplete because the pinch roller was returning in front of the drum exit loading guide. Removing the pinch roller arm assembly and reinstalling it would clear the fault for a couple of uses, but it would then jam again. The problem was caused by excess grease on the cam gear and hardened grease in the teeth of loading gear C. Cleaning loading gear C, the sector gear and both sides of the cam gear is the only long-term solution. Careful realignment of these gears, with reference to the service manual, is essential. The NVM5 uses the same deck as the NVM1 and the Philips VKR6800.

A.D.

Philips VR6542/Sharp VC651

Four or five of these machines, under both brand names, have come our way over the last couple of months. All required the same repair. The symptoms vary from failure to load a cassette, failure to eject a cassette, to intermittently doing either. In all cases careful repositioning of the mode control switch was what was needed. Full details are given in the manual, but extreme care should be taken to ensure that the loading poles are in the fully unloaded position. If not the machine works but leaves a small loop of tape hanging from the cassette. These machines were all only a matter of months old.

A.D.

Mitsubishi HS337

This VCR had a clock fault. It lost about ten minutes a day and the clock intermittently displayed the power loss warning. A check revealed that the oscillator in IC8A0 was working intermittently. The chip, type μ PD7516HG, had to be replaced to cure the fault. It's a surface-mounted type, about three quarters of an inch square, with 64 legs.

Fitting Hi-fi Heads

Fitting new video heads in a Ferguson 3V29 is usually straightforward. Just two leads per head have to be threaded through the holes in the drum assembly. Minor irritation occurs when one of the leads bends over and

Reports from Philip Blundell, Eng. Tech., Alfred Damp, Eugene Trundle and Nick Beer

fails to go through the hole. Imagine however the irritation when fitting new heads to a hi-fi VCR with long-play facility. With two leads per head and three heads per channel (one SP head, one LP head and one hi-fi head) you have to try to get six leads of unequal length through the holes at the same time, a very frustrating and time consuming job. It needn't be however. Cut two pieces of shrink-fit sleeving, about 1-5in. long, and push these over the leads of each head. The sleeving, with the leads inside, now easily threads through the holes in the head assembly. When the head is installed the sleeving is simply pulled off. Remember only to push the shrink-fit sleeving on – don't heat it.

Sony TTF1UB

The TTF1 was the tuner-timer partner to the late and lamented Beta SLF1 portable/component VCR. It has a switch-mode power supply to provide 12V. This one gave a green light indication with no load, but on connecting the SLF1 the green on LED would flicker and only a low, pulsing output voltage was available. The power supply would often then cut out altogether. The problem was due, as so often with Sony equipment, to dried up electrolytic capacitors, in this case the switching transistor couplers C618 and C619. Both are 4.7μ F, 350V types and both were growing white fur around their legs. Maybe we were lucky not to lose the power switching transistors . . .

E.T.

Fisher FVHP530

This one had an audio problem for a change. There was intermittent recording of the sound, with the E-E sound disappearing when the fault was present. Playback was always o.k. During the rare appearances of the fault the output at pin 10 of IC401 disappeared, though it remained at input pin 18. The 8-6V supply to pin 15 of the i.c. simultaneously fell to 4-7V. The cause of the trouble was a partial open-circuit in transistor Q404's base-emitter junction – complete loss of sound was probably due to the action of the comparators within IC401. This chip, type BA5102A, can be responsible for an obscure no-sound fault on timed recordings (the audio signal disappears from pin 4).

Hitachi VT11

These machines have two loading belts in series, which seems to be tempting fate somewhat! One that came in for service would occasionally fail to operate from cold – it was made to misbehave by being kept in a cold place. We

822

found that in the fault condition the take-up reel didn't turn, giving rise to a growing loop of tape until the syscon switched to stop. The second (small) loading belt was slipping, but we replaced both as a precaution.

E.T.

Hitachi VT33

Having been told that this machine didn't work at all we thought we'd an easy one. What we found was that the head drum turned all right but the tape wouldn't load and there was no response from the fast forward and rewind keys. After a prolonged foray into the syscon section we discovered that the loading mechanism was stiff. This led us to the loading motor which was virtually seized solid. A new loading motor cleared all the symptoms.

E.T.

Hitachi VT5000

All piano-key operated machines are now getting old, but this one worked well enough apart from a horrible wow on sound at varying intervals during both record and playback. At its most severe the wow was accompanied – useful clues – by horizontal white bars across the picture and a slight dimming of the fluorescent clock display. In view of these symptoms we checked the 12V regulator whose output, observed on a scope, was seen to vary somewhat when the fault was present. Tapping, flexing and probing led us to a junky 12V preset control (R662) on the servo board. Replacing this and resoldering some suspect joints in the area put everything to rights.

Panasonic Booster Amplifiers

The ENPE716 r.f. booster is used in several Panasonic VCRs, amongst them the NV333 and NV366. We encountered one in a triple-standard Model NV390 which had been imported from the middle-east – we'd converted

it for System I sound. The complaint with it was low gain on r.f.—through. E-E, recording and playback on ch. 36 were perfect. So far as I can see there's no circuit diagram for this module, but to save the cost of a new one we decided to have a go. By trial and error we found that one of the 2SC2671 transistors had base-emitter leakage—it was marked Q3 on the board. No substitute r.f./u.h.f. transistor from our stores would give good results: we finally found a scrap booster which provided us with a 2SC2671. This restored full gain, but what the owner saved in materials largely went in labour charges! E.T.

Saisho VR805

Faulty reel motors are a fairly common problem with these machines. New motors are readily available from Willow Vale Electronics.

N.B.

Hitachi VT63/4/5/GEC V4004

We often get the following series of events with these machines. Switch on, put in a tape, eject it. The tape in light then remains on and the machine won't accept another one. The cause is faulty end of tape sensors. **N.B.**

Ferguson 3V16/JVC HR3660

The problem with this machine was that the drum speed varied after one and a half hours. The cause was dry-joints on the servo board, around the BA814 i.c.

N.B.

Triumph VR9500

Loads of these machines come in with the no rewind complaint. The cause is the idler, but don't despair – the Saisho VR805 idler fits and is available from Willow Vale Electronics.

Micro Clinic

Roger Burchett and Steve Beeching, T. Eng.

Sinclair Spectrum Plus

I've mentioned before the Spectrum Plus computers sold to a local school after modification. This one did at least appear to have started life as a Plus, being an Issue 6A machine. It had been in with every stock fault imaginable. Through all this there had been complaints of slow resets and locking up. It was also suggested that the membrane was faulty. We changed this, but I could never see any other definite fault. One day my colleague managed to duplicate the fault(s) and rang me up about it. Have you ever tried fault-finding by phone? Although an experienced software man he doesn't claim to be an engineer. Armed with a meter, he had checked the CPU's pins and found pin 25 (/BUSREQ) low. It was presumably floating, the meter's internal impedance pulling it down. We eventually discovered that the pull-up resistor for this line, R30, was missing. As a result the CPU thought it was getting requests for an external device to take control of

On test the machine again locked up. This time we discovered that pin 24 (/WAIT) of the CPU was floating.

The pull-up resistor for this line, R29, which is next to R30, was the cause of the problem. When removed it promptly fell in half.

It seems that this machine had been well and truly got at.

R.B.

JVC HC7

We've had several problems with these machines. One had an intermittent display. The cause was an intermittent 5V supply to the display controller chip due to a dry-jointed link next to C407. On another the fault was intermittent resetting to the start-up pages while a program was running – these start-up pages are displayed as an introduction after a power-up reset. We first changed the MSX controller chip but the fault turned out to be in the main LH0080A microprocessor chip. It was running slightly warm, though this is not unusual.

Intermittent audio, which sometimes sounded as if it was running slow, was traced to a poor connection at pin 11 of the MSX controller chip. This pin feeds clock pulses to the AY-3-99810A programmable sound generator chip for timing purposes.

Power supply failure was not the only fault on one computer. While checking we tried a substitute power supply, but the computer failed to reset and produce the introductory pages. Further fault tracing revealed that both the MSX controller and the microprocessor chips had to be replaced to restore normal operation, though we suspect that only the latter was faulty.

S.B.

Letters

BUDGET VARIABLE PSU

I am a little concerned about certain aspects of the budget variable power supply (August issue).

First, the 1N4148 diode in parallel with the 2mm LED is presumably included to prevent the LED being subjected to peak inverse mains voltage. This being so the diode is shown the wrong way round – and is in fact shorting out the LED. Also the $47k\Omega$ series resistor needs to be a 1W component in this position. If the shunt diode protection is changed to a series diode (e.g. a 1N4006) the current flows for only half the time and an 0.5W, $47k\Omega$ resistor can be used. It's simpler to run the LED from the rectified secondary side of the supply however.

Secondly there's not a fuse in sight, either on the primary or secondary side of the mains transformer. Good practice dictates that there should be a fuse somewhere.

Thirdly, there are disadvantages in using a bridge rectifier connected across half of the transformer's secondary winding. A 15-0-15V transformer is generally intended to be used with a biphase rectifier circuit (two diodes). The use of a biphase circuit avoids two diode forward voltage drops and shares the load equally across the whole secondary winding. Only two instead of four transient/modulation hum filtering capacitors across the diodes are then needed: the cost saving can contribute towards placing a fuse in series with each diode! A suitable arrangement is shown in Fig. 1, with the indicator LED fed from the unregulated supply to save messing about with LEDs on the mains side.

My fourth point is a bit more involved. It concerns the ammeter shunt arrangement. I note that a 0-1mA meter is suggested. These typically have a d.c. resistance of between 50Ω and 100Ω . Doing the sums for the 100mA shunt first we have, for a 100Ω meter, Rshunt = Rm/(M - 1). For M = 100, Rshunt = $100/(100-1) = 1.01\Omega$. For a 2A shunt, where M = 2,000, we get approximately $50\text{m}\Omega$. For accurate and consistent results the shunt

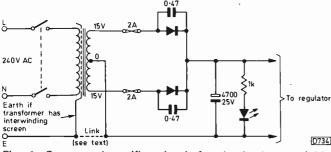


Fig. 1: Suggested rectifier circuit for the budget variable power supply (August issue).

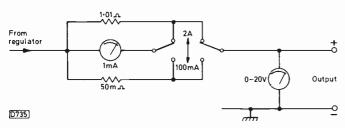


Fig. 2: Suggested modifications to the meter circuits.

switch needs to have a repeatable resistance of much less than $50m\Omega$. Typical switch resistance is $10m\Omega$ when new, even for a chunky switch of the type suggested in the article. I believe that the method used could give inconsistent results. A better method switches the meter independently of the load, as shown in Fig. 2. A small double-pole changeover switch of the 3A variety can be used. In this configuration the switch contact resistance in series with the switch is insignificant. The shunts are also independent of each other. Note the split of the wiring to the switch after each shunt, to avoid the wiring behaving as an extension of the shunt.

I also suggest placing the output voltmeter across the power supply's output terminals, where it reads the true output voltage taking into account the voltage drop across the shunts.

Lastly, as a safety measure I think it's a good idea to connect the negative side of the power supply to mains earth if this can be done without introducing earth loop problems.

Keith Cummins, Holbury, Hants.

CAUTIONARY TALES

An 80 year old enthusiast recently presented us with a dead Hitachi CPT2226TX. Inside we found a letter describing work he'd done on it. The original fault, loss of the top half of the picture, had obviously been caused by a dry joint in the field output module (tapping this had provided a temporary cure). He'd located this but his shaky soldering iron had led to field collapse. While going through what he described as a "trial and error" process in an attempt to cure this he'd added an 0.2μ F capacitor and blown the mains fuse. This had been a big mistake! Amongst other things the stabiliser and timebase oscillator chips and a couple of transistors had been destroyed. His bill, which he gratefully paid, came close to £100. This is a cautionary tale of unskilled amateurs. If the set had been brought in to us at the first sign of trouble it would have been repaired free of charge under guarantee.

On another subject, we recently received an invoice for £95.42 trade price for an aerial socket for a Hitachi CPT2650! The moulded aerial socket with nine inch lead is an integral part of the tuner. Fortunately the part was under guarantee, but what happens in a few months' time?

W.H. Clarke, CSC Electrix Ltd., Belfast.

SERVICE CHARGES AND THE COWBOYS

In the July issue D. Tasker raised the question of servicing charges. The situation in his area (Harrogate) seems to be completely different from that in my part of London (north west). Here, reference to the local papers or Yellow Pages reveals firms that commonly offer "free estimates – no call out charges". No one gets something for nothing of course, and these firms charge a very high price for doing the job. The customer thinks that he has saved money by not paying a call-out charge but doesn't realise that he shouldn't have had to pay so much to have the job done.

In my experience many so-called "TV and video" engineers know little about the equipment they work on. They can deal with the easy faults, i.e. certain simple mechanical problems with VCRs and simple TV faults, but cannot cope with the more complicated faults.

Like D. Tasker we also have a call-out charge. Some accept it, many don't. We can sometimes estimate the total cost of repairs over the phone – if we know the make of TV set, the model and the nature of the fault. Most people however seem to think that say £20 for repairing a set is expensive. I've even had the response "£20 for repairing the telly? – I can get one in the paper for £25". I'd like to see that £25 set! Based on research carried out with our customers we find that we provide an overall cheaper service.

So how do these firms that give free estimates work? It appears that they go to a job and quote a price, saying that they can do it now and either you want the job done or you don't. In other words they don't really want to know and are pressurising the customer to accept their extortionate estimate. Here are a few examples:

- (1) A Philips set, G11 chassis, that belonged to an unemployed person. The quote was £80 to replace the line output panel "because it was sparking". A replacement h.t. reservoir capacitor and some resoldering of dry-joints put the set right at much lower cost.
- (2) A Panasonic NV2000 which wouldn't record (playback o.k.). According to one repairer it required new heads. According to another it needed a new syscon board. We traced the fault to a switching transistor.
- (3) A customer who paid £60 to have the usual rewind kit fitted to a Sony SLC7.
- (4) A customer who paid £75 to have a take-up clutch fitted to a piano-key JVC/Ferguson VCR. A few days later a drive belt broke (it should have been replaced along with the clutch). The customer was quoted another £70 as the fault was not the same. He then called us in. Needless to say the bill was considerably cheaper, and the job was done on the spot.
- (5) A customer who was quoted £70 for "replacing power transistors" in a TV set. When the set was brought to us we found that the on/off switch was the only defective item.
- (6) A customer with a Grundig TV set had pushed the control panel in. The "engineer" had repaired the set by holding the panel in with cable ties. We advised the customer that this was dangerous and replaced the complete panel.

I recently went on a VCR servicing course and was disgusted with the quality of those attending it. Apart from myself only one, out of fifteen of us, knew how to use an oscilloscope. Several couldn't use a multimeter properly.

We all know that electricity is a potentially dangerous form of energy that must be treated with respect. It follows therefore that bodged TV and VCR repairs can be dangerous. I consider that a good, fully qualified engineer is worth good money and is more skilled than a plumber, a carpet fitter or a drain cleaner, but the public obviously doesn't think so. TV sets and VCRs are getting more complex all the time, and the test equipment needed to service them fully is also getting more complex – and expensive. The TV service engineer needs to be aware of the latest technology. If the public is to get a first class

service it must (a) be prepared to pay for this while (b) we must find a way of rooting out the cowboys in the business.

It would be interesting to hear some other views on the subject.

M.D. Maurice, Managing Director, Maurice Electronics Ltd., Wembley, Middx.

INTERFERENCE AND VCRs

While looking through some old issues of Television I came across Alex Clapton's letter (May 1987) concerning interference experienced with a VCR on playback. From his comments it would seem that the unwanted signals are being picked up on the braid of the downlead (see page 12 of the Department of Trade and Industry's booklet "How to improve television and radio reception" – it's obtainable free from main post offices). The braid acts like a longwire aerial and the signals picked up flow through the chassis or earthy parts of the receiver (the same will happen with a VCR of course), with the result that r.f. voltages are developed across parts that should be at equal potential. These r.f. voltages give rise to interference in various circuits. The booklet talks about amateur radio transmissions in the 3.5 and 7MHz bands affecting the colour decoder circuits. In a VCR however, 3.5MHz falls within the luminance signal f.m. sidebands, so any unwanted signals at this frequency will find their way into the demodulator during playback and will show up on the picture. In this situation connecting an earth wire to the VCR's case will only make matters worse, since it will improve the performance of the long-wire aerial system (hence the presence of aerial and earth sockets on some SW/MW/LW radio receivers). The DTI advise fitting a braid breaker filter (details are given on page 20 of the booklet) as a cure for this type of interference.

Turning next to the comments in Service Bureau on a G11 chassis with remote control (August 1987 issue), I'd also recommend changing the battery in the handset. Failure here would of course prevent the set being activated via the remote control system. Whilst agreeing with the diagnosis of a possible on/off switch fault (the switch has a mains-on reset contact for the remote control system) replacing T85 and T86 in the power supply circuit is unlikely to cure the fault. Although failure of T85 and T86 will cause shut-down of the h.t. supply removal of connection 4A2 (the bottom three-pin connector with just one connection) will, if the fault is associated with the remote control circuitry, restore operation of the set.

Going back to the battery, I've seen a G11 do odd things when the remote control handset's battery is exhausted – such as illuminate the red LED when the set is not in standby, nor were any commands being sent although attempts at the latter had been made. Fitting a new battery restored normal operation.

R.P. Harris, Salisbury.

FOR DISPOSAL

I would like to offer a couple of items for disposal to a good home. The first is an Ultra Model 53 v.h.f. TV set which was in full working order when last used several years ago. The second is a v.h.f. pattern generator, mains powered, giving crosshatch patterns etc. Both are available free if someone collects them.

M.A. Cox, 31 Boot Hill, Grendon, Atherstone, Warks CV9 2EL.

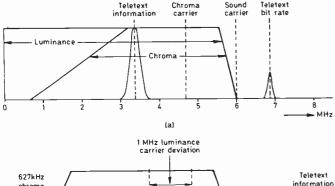
Recording Teletext Subtitles

Harold Peters

How often do you get asked why a VCR won't record teletext? It used to be the "clever lad" but today it's usually the hard of hearing who pose the question – because they'd like to record the page 888 subtitles. In the heat of a Saturday showroom it's not always easy to provide a quick explanation. It may help to keep the following brief notes handy.

Why you can't do it

There are three basic reasons why teletext can't be recorded. First, the teletext information is transmitted at the time when the VCR is switching from one scanning video head to the other. Secondly, with domestic VCR systems the fine picture detail is removed – and with it most of the teletext signal (see Fig. 1). Finally, it's not



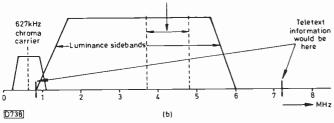


Fig. 1: Comparison of the TV channel spectrum as transmitted (a) and the signal converted for VHS system recording (b). In (a) most of the teletext information is in a narrow band centred on 3·45MHz. Note the blip at bit rate, 6·9MHz, which will be seen on a spectrum analyser even though out of band. In (b) the chroma and luminance signals change position and the teletext information is "out of band" beyond the upper and lower luminance sidebands.

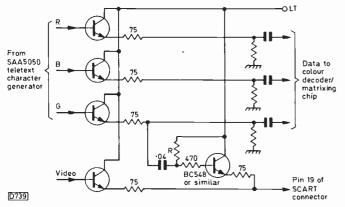


Fig. 2: To add subtitles to a teletext TV set's scart socket output, pass the green data line via a buffer stage to the video output pin. See text for details.

possible to record the mixed picture and data seen on the screen of your TV set from its video output socket (if it has one) because the decoded teletext information is added to the signal path at a later point.

Whilst there is a way round the problem, as we shall see, let's first consider these points in more detail.

Video head switching normally occurs three and a half lines before the end of the picture in each field. Picture start is about 24 lines after the beginning of the next field. This gives the TV set just under 30 lines for the line sync fully to recover from the switching disturbance. The TV set's VCR time-constant is arranged so that the picture is straightened during this period, but the data entry window occurs within this time and with the timebase not yet fully stabilised there's a possibility that the clock run-in pulses, which are essential for data capture, will not be gated correctly, producing errors.

The teletext bit rate is 6.9375 megabits/sec. With the non-return-to-zero format used the highest rate of change is the clock run-in, i.e. the two bytes of 1010101, which represents a frequency of 3.46875MHz. Because of the limitations of VCR systems the luminance information is band limited to 3MHz, losing most of the teletext data. The full HQ format extends the upper luminance sideband of the f.m. modulation beyond 5MHz. This gives little improvement however as the asymmetry of the detected waveform reduces the teletext eyeheight below the data capture level. Teletext should be recordable with the forthcoming S-VHS system, but for the moment it's too early to be sure.

For page 888 subtitles only you would think that it's simply a matter of extracting the detected video from the scart (or similar) connector but since this outlet port carries only the detected picture signal and not the decoded data, which is added during the final matrixing, this is sadly not the case. GEC used to make a unit that did the job, but it's no longer in production – though there may still be some around.

And how you can!

If you have a modern teletext set with a mains-isolated chassis and a scart (or similar) connector and you are prepared to carry out a simple modification there's a way of recording fairly legible subtitles on your video tapes.

The page 888 subtitles are either white, green, yellow or cyan and are put into a black, blue or red box. Thus all the subtitle wording contains green, and the circuit shown in Fig. 2 simply adds the green data line to the video available at the scart connector. By recording this output and the baseband sound from the TV set via the VCR's auxiliary input sockets the subtitles will be superimposed in white, unboxed, on the recording.

Some of you may be wondering why the luminance output from the teletext decoder's character generator isn't used instead. This output normally "punches holes" in the picture when the mixed or graphics mode is being used, so it's of the wrong polarity and is mixed with the blanking which provides the boxes for subtitling and newsflashes. The green channel was chosen to keep the circuit simple and avoid the possibility of white boxes on

the tape. Besides, it's a lot easier to find the green data line in the set.

Recording from the TV set's scart output connector has its snags. You can't monitor that the subtitles are "going on", and because the TV set has to be on and set to page 888, with the VCR switched to auxiliary, making timed recordings is impractical unless you are at home with the machine. In operation the VCR usually adjusts the video input to 1V peak, so subtitles on a bright scene reduce the picture level and maintain legibility.

The circuit is not critical. Any general purpose npn transistor will do. The brightness of the recorded text is set by the value of the bias resistor R. With a 5V supply $100 \mathrm{k}\Omega$ was found to be optimum while $1\mathrm{M}\Omega$ was used with a 12V supply. Too high a value gives weak subtitles: too low a value makes the picture distort and cog.

Because you can't monitor the results on the parent TV

set in the normal way it's best to watch the VCR's r.f. output on another set whilst fitting the modification. Loading on text with the sets so far modified has been negligible, and only slight on the scart connector's video output. Severe loading of the green data line will produce mauve subtitles in a green box on the set being modified. To cure, reduce the value of the coupling capacitor.

Emitter-followers are shown in Fig. 1 between the teletext decoder's character generator and the colour decoder. These are included to permit text brightness presetting. With later set modifications buffer diodes were used instead – in this case take the data from the colour decoder side of the buffer diode.

The circuit can be mounted on a stamp sized piece of Veroboard which can usually be supported on the three connecting wires, the longest of which is invariably the l.t. feed.

The ED Beta Specification

George Cole

Of the two basic domestic VCR formats, the Betamax system tends to give better pictures than VHS. The reasons for this are Beta's wider luminance carrier deviation (1·2MHz compared with 1MHz for VHS) and the faster writing speed (5·08msec compared with 4·85msec).

The launch of the Sony SLHF950 VCR, which features "Super Beta PRO", marked a further improvement in Beta picture quality. By raising the luminance carrier's nominal frequency by 500kHz the luminance bandwidth was increased and the resolution improved to around 300 lines (the number of vertical lines that can be resolved without blurring). This performance has however been eclipsed by the introduction of Super-VHS (S-VHS) which achieves a resolution of over 400 lines – see Steve Beeching's account in the July issue. S-VHS and the expected launch of extended-definition TV in Japan in 1989 have prompted Sony to introduce a new format, Extended Definition Beta (ED Beta).

Sony originally announced ED Beta in March: an engineering prototype was shown to Japanese journalists and specifications were released. The system promises a definition of 500 lines.

As with S-VHS, the higher specification achieved by ED Beta is the result of several improvements: the luminance bandwidth has been increased, the frequency deviation widened, the chroma and luminance signals do not overlap and high coercivity tape is used. In comparison with S-VHS the luminance bandwidth is wider at

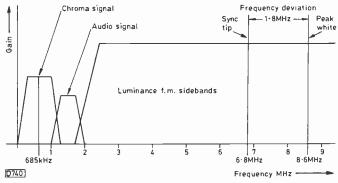


Fig. 1: Frequency spectrum for the ED Beta system.

about 6MHz compared to 5MHz while the frequency deviation is 1.8MHz compared to 1.6MHz. Further comparative details are shown in Table 1. In ED Beta the luminance white clip is raised to 230 per cent. The dark clip is 70 per cent.

Unlike the S-VHS system, which uses refined ferric oxide tape, Sony has opted for metal particle tape. The ED Beta tape is relatively thick (19 microns compared to Video-8's 13 microns). It has a very high coercivity – 1,450 Oersteds.

Sony has developed a new video head called a tilted sputtered sendust head (TSS). To date no details of the composition or characteristics of this head have been divulged.

Because of the use of metal particle tape there's no possibility of standard Beta VCRs using ED Beta tape. As with S-VHS, the cassettes have a special identification (ID) hole to ensure that conventional machines cannot play or record with the new tape.

ED Beta recorders will be able to play and record in three modes: standard Beta, Super Beta and ED Beta. Like S-VHS machines, ED Beta VCRs will have separate chrominance and luminance terminals.

Apart from the improved picture quality, Sony claim that third and fourth generation copies should show little picture degradation. Sony intends to release Profeel TV sets with separate Y and chroma sockets.

ED Beta is due to be launched in Japan this autumn. It will probably reach the UK next year. Since Sony is energetically promoting the Video-8 system the launch is likely to be a low-key affair.

Table 1: Format comparisons.

Characteristic ED Beta	S-VHS
F.M. peak white 8-6MHz	7MHz
F.M. sync tip 6.8MHz	5·4MHz
Frequency deviation 1-8MHz	1⋅6MHz
White clip 230%	210%
Dark clip 70%	70%
Tape type Metal particle	Cobalt-doped
	ferric oxide
	800-900 Osersteds
Horizontal resolution 500 lines	Over 400 lines

TV Fault Finding

Reports from Philip Blundell, Eng. Tech., Hugh MacMullen, Roger Burchett, Eugene Trundle and Mick Dutton

Focus Faults

A66-701X and A56-701X tubes seem to be prone to a focus fault, usually from cold. What happens is that the picture has a horizontal band of defocusing that changes with picture content. Replacement seems to be the only cure.

P.B.

Telefunken 615 Chassis

If you suspect that the line output transformer in one of these sets is faulty, look closely at its top to see whether the plastic is blistered and swollen. If so it's a very good bet that the transformer is faulty.

P.B.

Decca 90 Series Chassis

This set had no picture, just a plain white raster with a blue band on the left-hand side. The video signal was found to be missing at 2TP1 on the decoder panel, so attention was directed to the sandcastle pulses. A check at TP303 on the sync/line timebase panel revealed that the pulse amplitude was 4V instead of 8V. The 22Ω safety resistor R301 was found to be open-circuit. P.B.

Sharp C1491

Intermittent no sound or vision was the symptom with this set, and on the rare occasions when the fault showed up R245 in the 12V supply to the i.f. strip and tuner would overheat. A lot of time was spent disconnecting components and soak testing before the culprit was found. It was CF201, a packaged circuit, which was going leaky. **P.B.**

Philips K30 Chassis

This set would switch off after about three hours. If the mains supply was switched off for a few moments then on again the set would continue to operate for hours and hours. The cause of the fault was eventually traced by using a hairdryer inside the set. The culprit was the e.h.t. lead, not with a sparking short but a leak to its braid.

Н.МасМ.

Philips G8 Chassis

The picture faded out or went very dim after a couple of hours. We eventually found that the 12V stabilising zener diode D7315 (BZX61/C12) on the decoder panel was going high resistance. It's a difficult fault to diagnose because the voltage change is only about IV, but this is sufficient to upset the rather critical conditions in the TBA520 chip.

H.MacM.

Philips CTX-E Chassis

The set was working but there was no sound or vision. A naughty one this: when R3101 ($15k\Omega$) which supplies the 33V tuning voltage stabiliser goes open-circuit there's still 150V from D6583 to burn your fingers. How about a nice high-resistance bleed to tame this condition? **H.MacM.**

Thorn 9000 Chassis

Two of these sets have passed through the workshop recently, both with the same fault. In the first case some

time had to be spent over diagnosis. The symptom was no-go and pumping. The cause was that rectifier diode W706 was open-circuit. We use a BY299 in this position as a replacement: it's easy to obtain and seems to be more reliable (at this stage) than the type originally fitted. This one is worth remembering since the diode can fail intermittently, setting a difficult puzzle for the engineer.

Going open-circuit intermittently is a nasty habit of some SKE prefixed diodes, as we've spent many hours learning from Grundig and other TV sets in the past . . . E.T.

Panasonic TC2203 (U1 Chassis)

Another horrible intermittent fault: at random and very long intervals the picture would contact and jump, as if the mains supply was arcing. At length we discovered that the way to instigate the fault was to switch on from cold then thrash the channel selector pads with the brightness and contrast at maximum! If the symptom then appeared it could be cleared by turning down the contrast control setting. This dependence of the fault on beam current led us to suspect the tripler – until we found that a diode-split line output transformer is used in this chassis. Replacement of the e.h.t. lead (line output transformer to c.r.t.) cured the problem.

Ferguson TX90 Chassis

Fuse blowing has been a big nuisance with these sets lately. In one case the line output transistor was short-circuit but in others the fuse blowing has been of an intermittent nature. Replacing the BY127 mains rectifier diodes (D120-D123) with Ferguson supplied alternatives (BYD33G) seems to have cured the problem in the sets where the fuse blowing was random.

If you get intermittent lack of line lock, look at the thin tracks roughly in the centre of the board. They tend to lift and crack with repeated thermal cycling. The one in question goes to pin 5 of the TDA4500 chip (pulse feedback). It would be prudent to add wire bridging links to all four of the tracks.

R.B.

Rediffusion Mk 3 Chassis

Experienced ex-Rediffusion men (and women!) will no doubt laugh their heads off at this one, but here goes. I've come across several of these sets with 5R6 (27 Ω) opencircuit. It's a safety resistor that's used as a surge limiter in series with rectifier diode 5D6 (BY298). This diode produces the 270V supply for the RGB output stages and is fed from a winding on the line output transformer. When 5R6 goes open-circuit the 270V supply is no longer present and the result is a bright raster with flyback lines. There's also no tuning voltage supply to the tuner. Up to now replacing 5R6 has provided a complete cure.

On this set 5R6 was open-circuit and the current limiting resistor 2R142 ($1k\Omega$, another safety resistor) in the blue output stage was burnt. After replacing these two resistors I switched on confidently, only to get sound but no raster. There was just time to check the RGB output voltages before the 1.6A time-delay power supply fuse blew with a bang. The regulating thyristor 6ITR1 was now

short-circuit cathode-to-gate. After changing this I powered up with the line scan panel unplugged. No bang. Then I cautiously powered up with the tripler disconnected. Sound o.k. Deep breath and try with the tripler connected. Tripping. I see. This job was being done in the field, so it was a question of see you tomorrow morning madam (and sir).

Next day I fitted the new tripler in a trice and switched on. No bangs and no tripping – and no raster either! This turned out to be due to 2D15, a 7.5V zener diode, being open-circuit – it stabilises the voltages at the emitters of the RGB output transistors. Replace this and we were home and dry.

So we had an intermittent tripler fault, only the second time that a tripler has caused me trouble in the Mk. 3 chassis. There was no pinhole when I examined it later, but it must have been breaking down somewhere, and violently too. The moral would appear to be to leave the tripler disconnected whilst making tests when 5R6 is found to be open-circuit. No doubt those more familiar with the Mk. 3 chassis will have their own approach to testing. The worst thing about this saga is that I went to see the set after personal recommendation and then floundered.

R.B.

Rediffusion Mk 4 Chassis

This set was dead. We removed the back and noted that 4R2 had sprung open. This resistor provides a start-up voltage for the power supply. As we could find no evidence of a short we resoldered 4R2 and switched on. There was still no sign of life and 4R2 quickly got very warm. The culprit was 4D6 (BA157) which had gone short-circuit. It should take over from the start-up supply when the set gets going but, being shorted, was placing a heavy load on 4R2.

M.Du.

Hitachi NP81CQ Chassis

This set came in because of intermittent field collapse. We solved the problem by removing the thick-film field output module and carefully resoldering all the dry-joints. After running the set for a while we noticed that there was slight field bounce, particularly on channel change. C610 $(220\mu F, 50V)$ was found to be virtually open-circuit.

M.Du.

Sharp C1891

No luminance was the problem with this set. Freezer soon, located the cause – transistor Q409 (2SA495). M.Du.

Hitachi CPT2051 (NP80 Chassis)

This set was dead. There was no h.t. output from the power supply though voltage was present at the input to the STR440 chopper chip. When we tried to measure this voltage the power supply came to life. The problem was no start-up supply at pin 4 as R902 (82kΩ) had gone opencircuit.

M.Du.

Thorn 1590 Chassis

The fault, poor sound and a blank white raster, is common with these sets. It's usually caused by a defective i.f. transistor, usually the second one. In this case the voltages were o.k. until we came to the base of the fourth i.f. amplifier transistor VT5, which had no base voltage. R26 $(10k\Omega)$ had gone open-circuit. We didn't find this out until after changing the transistor of course! M.Du.

next month in

TELEVISION

ANOTHER GIFT!!

This time assembly tweezers. As electronic components get ever smaller and PCB assemblies more compact so component handling becomes more of a problem. The tweezers that come free with next month's issue make component placement a much easier operation.

SERVO SYSTEMS IN PRACTICE

If you have yet to come to terms with the servo systems used in VCRs and disc players to maintain correct motor speed and phase conditions next month's article will open up the subject for you. Servo systems are not difficult to understand, but many TV engineers seem reluctant to get involved with them – despite the fact that for years all TV sets have incorporated a servo system in the form of flywheel line sync. J. LeJeune's article keeps to the practical aspects, e.g. the waveforms involved and their significance, and explains the different types of servo systems employed – basic, twinloop and digital. Both VCR and disc systems are covered.

• TRANSPORT FOR SERVICING

The service engineer's traditional mode of transport has been the estate car. Is it the type of vehicle best suited to the needs of today's field service engineers, in terms of both convenience and economy? Harold Berkley thinks not and presents his own opinions on the best solution.

PYE/PHILIPS PROBLEMS

Gordon Haigh provices servicing hints on various TV chassis from the Pye/Philips stables.

AN ALTERNATIVE RADIO/TV REBROADCAST SYSTEM

Geoff Lewis explains how a system known as "multichannel microwave distribution services", which generally uses the 2-5GHz band, can provide an effective solution to the provision of TV and radio services for small communities in isolated areas where reception of the normal terrestrial broadcast transmissions is not possible.

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Simple Polar Mount Adjustment

John Breeds

Practical experience has proved the following method of setting up a polar mount in a satellite TV receiving system to be both simple and effective. Once the technique has been learnt you'll find that it takes less than five minutes to obtain very accurate geo-arc tracking. The technique eliminates the need to use a magnetic compass, with all the attendant problems of magnetic correction factors, to find true south. There's no need to go half-blind squinting at the sun at lunchtime to study solar transit times – something you shouldn't do anyway. No special high-tech instruments are used, nor is any complicated trigonometry required to calculate the angles. So how's it done?

Key Angles

The installer needs to know three key angles for the receiving site. These are the polar elevation, the apex elevation and the elevation to receive the Intelsat VA-F11 satellite at 27·5°W. The difference between the polar and apex elevation angles automatically gives the correct declination angle, something that's difficult to measure at the best of times. Table 1 shows modified polar and apex elevation angles for various site latitudes – modified simply means that a modifying angle has been added to the polar angle and subtracted from the apex elevation angle to allow very accurate tracking across the whole visible arc (otherwise there will be a small tracking error at extreme azimuths). The modifying angle is dependent

Table 1:	Modified	polar and
apex	elevation	angles.

apex elevation angles.			
Site latitude	Modified polar elevation (degrees)	Modified apex elevation (degrees)	
50	39·3266	32·6856	
50∙5	38·8294	32·1411	
51	38·3323	31·5972	
51⋅5	37·8355	31·0542	
52	37·3389	30·5119	
52⋅5	36·8424	29·9702	
53	36·3462	29·4294	
53·5	35·8501	28·8891	
54	35·3543	28·3498	
54·5	34·8586	27·8110	
55	34·3631	27·2730	
55·5	33·8678	26·7358	
56	33·3727	26·1993	
56·5	32·8778	25·6635	
57	32·3831	25·1286	
57·5	31·8885	24·5942	
58	31·3941	24·0606	
58·5	30·8999	23·5278	
59	30·4058	22·9957	
59·5	29·9120	22·4644	
60	29·4183	21·9338	

on receiving site latitude and is calculated from mathematical fundamentals.

Finding True South

The third angle the installer needs to know, the elevation angle for receiving Intelsat VA-F11 at 27.5°W, enables true south to be located very quickly. This quick but accurate method exploits the VA-F11 satellite's station keeping accuracy. Inability to locate true south is the usual cause of poor quality pictures from one satellite with good pictures from another satellite. The Intelsat VA-F11 elevation angle could be gauged from Fig. 1, but this method is not sufficiently accurate. Another way of determining the angle is to use trigonometry - but how many of us are mathematicians? A simple method of finding the elevation angle for Intelsat VA-F11 has been provided by my whiz son Robert, an undergraduate at Bath University. The following equation he came up with greatly simplifies the workings while retaining an accuracy of within $\pm 0.5^{\circ}$ for any receiving site in the UK:

Elevation =
$$77.083 - LAT + (0.386064 \times LONG)$$

where LONG is a positive value if west of south and a negative value if east of south. Mathematically minded readers will notice that the equation is based on an assessment of several straight-line gradient plots across the UK (Y = MX + C) where M is the gradient and C is the Y-intercept).

Here's an example of the calculation, for a receiving site at Swindon which is at latitude 51·3°N and longitude 1·8°W:

Intelsat VA-F11 elevation

 $= 77.083 - LAT + (0.386064 \times LONG)$

 $= 77.083 - 51.3 + (0.386064 \times 1.8)$

= 25.783 + 0.6949152

 $= 26.48^{\circ}$

The actual angle is 26.5°, but this is accurate enough. The procedure may seem complicated but really is simple (it must be, otherwise I couldn't do it!).

Aerial Alignment

Just follow the sequence of adjustments for a particular dish and you'll be able to set up the angles in less time than it takes to boil an egg. As an example, the procedure with the Salora/Luxor dish is as follows.

- (1) Set the dish in its apex position, as shown in Fig. 2, i.e. when viewed from behind the square frame is at 90° to the pivot assembly. Temporarily hold the dish in this position by means of the actuator or a similar sized rod. Carefully loosen the bolts that secure the base plate assembly to the central pillar then turn the entire assembly until the dish, in its apex position, points roughly south. Temporarily tighten the bolts.
- (2) Determine the latitude of the receiving site from an Ordnance Survey map. Obtain the corresponding modi-

fied polar elevation and apex elevation angles from Table

- (3) Carry out the polar elevation adjustment. Place an inclinometer or elevation meter on the rear edge of the square frame. Ensure that the meter or protractor is accurately aligned across the polar axis. See Fig. 3. Adjust the polar axis by means of the two nuts on the polar axis adjuster for the correct polar elevation.
- (4) Carry out the apex elevation adjustment. Place the inclinometer or elevation meter on the westerly rear side edge of the dish. Set the apex elevation by means of the two upper adjusters which connect the back ring to the square frame. This adjustment automatically sets the declination offset: be as accurate as possible!
- (5) Find true south. First work out the elevation of Intelsat VA-F11 using the equation previously given. Keep the inclinometer on the rear, west side edge of the dish. Move the dish westwards until the angle corresponds with the angle for Intelsat VA-F11 at your receiving site. Hold the dish in this position with the actuator or a similar fixing arm.

Slightly loosen the bolts that secure the base plate assembly to the central mast. Turn the whole upper assembly around the central pillar slowly until a meter used to give an indication of signal strength produces a reading and you get a picture on the TV set (pretune the receiver to Children's Channel or RAI – these have a similar frequency and polarisation). With Salora/Luxor satellite TV receivers use a voltmeter set to read d.c.: connect it to the test point provided. The voltmeter's reading will decrease as the signal strength increases with the Salora/Luxor Model 9570 (Mk 2). With the Salora Model SRV1150 the reading increases as the signal strength rises. Carry out fine adjustment for the appropriate meter reading by rotating around the aerial mast

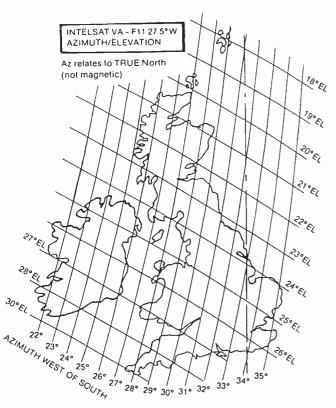


Fig. 1: Dish azimuth/elevation chart for Intelsat VA-F11.

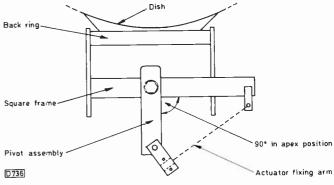


Fig. 2: Rear view of the dish polar assembly, shown in the apex position.

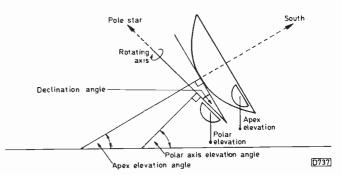


Fig. 3: Polar and apex elevation adjustment.

only – if you alter the polar or apex elevation settings you'll have to start all over again.

This procedure will have automatically set the apex position to point at true south.

- (6) Fine tune the polar clevation. Activate the actuator or slacken the fixing rod in order to move the aerial eastwards until you get a picture from the Eutelsat satellite at 13°E. This will be RAI, assuming that you've been receiving Children's Channel from Intelsat VA-F11. Finely adjust the polar setting for the best picture and optimum meter reading.
- (7) Move the dish back for reception from Intelsat VA-F11 and recheck the picture. If the picture has deteriorated the true south setting is incorrect. Repeat operation (5).
- (8) Note that the polar elevation adjuster has been used for best results with Eutelsat at 13°E and the true south adjustment for best results from Intelsat VA-FI1 at 27.5°W.
- (9) Carry out polariser offset adjustment as appropriate for the equipment in use.

For a multi-satellite system, set the dish to its apex position then clear the aerial control unit (with the ACU1160 enter code F5 then press store). Twist the assembly to ensure that the pick-up probe is truly vertical or horizontal.

(10) Carry out focal distance adjustment if provided. The distance between the mouth of the feedhorn and the centre of the dish is critical. With the Salora/Luxor aerial there are screw threads at the ends of the three support rods to provide fine adjustment of this position for best results.

Servicing Mechanical VCRs

Part 6 Mike Phelan

The first thing we'll talk about in this final article in the series is the keyboard, or the function key assembly as it's more correctly called.

The Key Assembly

The key assembly (see Fig. 1) consists of a rectangular metal frame that's secured to the deck. The keys are pivoted on a steel rod and located transversely by slots in the frame. Each key consists of an identical metal lever on to which a plastic knob is firmly cemented. Hairpin springs return the keys to the rest position. A pivoted latching bar locks the keys in the down position, with the exceptions of the eject, stop and pause keys. This key locking is accomplished by notches in the latch bar: steps in the key levers locate in these notches. The latch bar is actually in two parts, the smaller one on the left allowing the record and audio dub keys to be latched separately. The stop solenoid engages with a vertical tongue on the longer bar. Except for pause and eject the keys, when pressed, raise the latch bar, releasing the previous function selection. All the keys except the eject key project through slots in the deck. The pause key engages with a lever that slides through a latch, allowing the key to be alternately locked and released independently of the main latch bars.

A bank of sliding levers (the function plates) is arranged at the front of the key assembly. Their purpose is to limit the combinations of keys that can be depressed simultaneously. There's also an interlock with the mechanism to prevent eject or fast wind when the tape is laced up, even though stop has been selected. Details vary with different models. The record interlock is operated by one

of these function plates.

The two main function plates A and B extend for the full length of the key assembly and are centralised by two small springs. They both have notches in line with each key lever. These notches are of three types: a wide notch has no effect, a sloping notch allows the key to move the plate, while a narrow notch prevents key depression when the plate is moved by another key. Plate A allows the rewind and fast forward keys to lock all the others; plate B does the same for the play key. Plate E is the record interlock.

A strip of PCB carrying all the microswitches operated by the keys is mounted atop the key assembly. It also carries the record indicator lamp.

Machine Trips after Loading

So much for the good news, now for the bad - though it's not all that bad. The key assembly suffers from a few problems that are not too difficult to put right. The most common problem applies mainly to the 3292/HR3300. It shows up when the machine apparently trips out on completion of the loading sequence. What might at first appear to be an electronic fault is actually due to wear on the play key lever (see Fig. 2) as a result of which the lock plate has a very precarious hold on it: when the loading mechanism clunks to a halt the shock jars the play key free. The cure is to replace the lever or swap it over with either the stop or pause key, as the locking latch is not used with these. The key colour will be different of course. The trouble may recur when this latter course of action is taken, as its root cause is the soft material used for the key levers. This point was put right with the

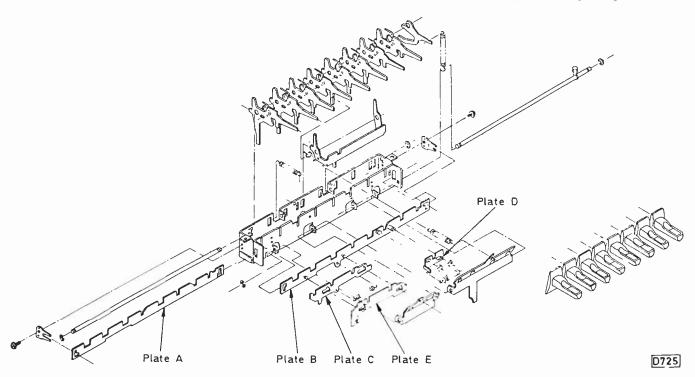


Fig. 1: The function key assembly.

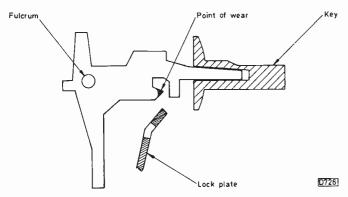


Fig. 2: Key lever assembly.

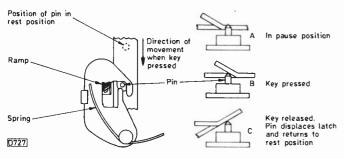


Fig. 3: The pause latch.

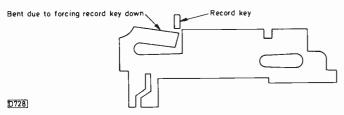


Fig. 4: Problem that occurs with function plate E.

subsequent 3V00/HR3330.

The keys are driven on to the levers and also cemented, so there's little chance of removing one without damage.

Changing a Key Lever

To change a key lever, first remove the cabinet except for the back and right-hand side. Unsolder the record lamp leads from the audio/servo or audio PCB. Remove the function switch PCB and put it out of the way. Remove the cassette carriage, then swing the audio/servo or audio board down. Remove the circlip from the righthand end of the key pivot bar. Note that there's another similar bar upon which the lock plates pivot. Release all the key springs by unhooking them. Carefully draw out the pivot bar, then lay the freed keys and springs on the bench in order until you reach the required key. Reassemble in the reverse order, applying a touch of moly grease to the key levers. When resoldering the record lamp leads do this neatly as there's a piece of earthed print next to the supply connection. Note also, as should be well known by now, that the rods that operate the audio dub and record/playback switches do not go into the holes in the switches.

Switch Problems

While on the subject of these switches, although this is not strictly a mechanical fault these two switches do cause problems. The symptoms include intermittent sound on record, buzzing, no erase, etc. They can occasionally be cleaned, but more often than not require replacement. Needless to say the same symptoms will occur if there are no screws in the audio/servo board!

Common Faults

Another common fault is caused by the pause latch (see Fig. 3). This operates on a much-used principle employed in light switches, door catches and a multitude of other items. The idea is that a pin on a sliding bar follows a zigzag path in the spring-loaded latch: two back and forth movements are required to complete the path. A ramp releases the pin to the start position. The problem is that the latch is rather delicate and gets bent by heavy-handed use. Don't bother trying to repair it – it's well nigh impossible to get the shape right.

The other common complaint is that the record key can't be depressed. This is because someone has tried to force the record key down with a cassette with the tab knocked out inserted in the machine. The result (see Fig. 4) is that function plate E gets bent and the record key notch closes up. Repair or replace it – if you decide to repair it, note that the plate must be perfectly flat.

The other function plates will be damaged when someone tries to force keys, but can be put right by judicious use of a needle file.

Removing the Key Assembly

It's occasionally necessary to remove the complete key assembly for renewal, or because the machine has been dropped on its front and most of the keys have been bent (in such a case the best way to tackle the job is to remove the assembly). It's a rather daunting prospect but it's not too difficult. The key frame is used as an anchorage point for springs in the brake and reel drive department, so there are several springs to be unhooked above the deck and parts below the deck to be removed to gain access to the fixing screws. The stop solenoid must be detached: ensure that the peg engages with the slot correctly when you reassemble it. Also make sure that the rewind and fast forward key lever tails project into the U-shaped ends of the levers.

Miscellaneous Points

This virtually concludes our treatment of the mechanical side of these machines. Before we come to the end however there are one or two odds and ends that should be mentioned.

The hinge pins for the tuning door fall out and get lost, as does the spring. These pins are not listed as replacement parts, but half inch panel pins with the heads cut off will do. Check that none of the pins are loose inside the machine.

The rubber feet tend to work loose – a spot of cellulose paint on the ends of the screws inside the bottom cover cures this.

Don't stand the machine on a thick pile carpet that obscures the ventilation slots.

The remote pause socket is a prolific source of trouble due to the tags shorting against the chassis metalwork, giving permanent pause.

Well that's it! We hope that this series may prompt those who tend to avoid complicated mechanisms to have a go and revive some of these excellent but dated machines – they'll give service for a few more years yet.

The TDA3562A

Joseph Cieszynski

One of the recent additions to the Mullard range of TV chips is the TDA3562A colour decoder. Although similar to the well-known TDA3561, the new decoder chip incorporates extra features. When fault-finding it's essential to be aware of these.

One of the main features of the TDA3562A is automatic grey-scale compensation. The tube's first anode voltage and the highlights are manually set, but once this has been done the chip automatically controls the background, compensating for any variations in tube emission.

The Auto Grey-scale System

We'll consider first the operation of the grey-scale compensation system. A simplified block diagram is shown in Fig. 1. Compensation is applied to all three guns in the same way: to simplify matters we'll concentrate on the red gun.

All three guns are blanked in the usual way during the field flyback period. On line 23 the red gun is turned on by a test pulse from the i.c. This line is normally off the top of the screen and is thus visible only when the height is reduced. With a good gun the test pulse will produce a $10\mu A$ beam, which is the assumed black level. This current is sampled and feedback is applied to pin 18 of the i.c. At $10\mu A$ beam current the voltage at pin 18 should be 5V. During the test line the buffer amplifier is switched off to prevent red channel signals reaching the c.r.t. and thus affecting the beam current.

For comparison purposes a 3.48V reference voltage is present at pin 19 of the i.c. During the test period the i.c. checks that the gun is emitting $10\mu A$. If the emission is low the feedback voltage will be less than 5V and a correction voltage will be stored by the capacitor connected to pin 10. This capacitor forms part of the internal feedback system which sets the red amplifier's gain to obtain a $10\mu A$ black level. The voltage stored by this capacitor is used throughout the duration of the field scan, after which the process is repeated and the voltage is updated as necessary.

The same procedure is used on lines 24 and 25 for the blue and green guns respectively. The blue storage capacitor is connected to pin 21 and the green storage capacitor to pin 20. Flyback blanking and beam current limiting are overridden during the test period to prevent them interfering with the feedback action.

Cold Start

When the TV set is first switched on there will be no beam current of course. The result could be a bright white raster once the tube has heated up, as the feedback system would turn up the gain of the RGB channels. This momentary bright white raster is undesirable both from the point of view of the customer and the line output stage. To avoid it, a cold-start circuit is employed. The cold-start procedure is as follows.

(1) For the first 1.5 seconds pin 18 of the i.c. is held at chassis potential to prevent feedback while the main supply rails are being established. Feedback during this

period could confuse the i.c.'s internal logic. In Fig. 1 this action is performed by Tr1/C1/R1. The time-constant of the charging network C1/R1 is 1.5sec.

(2) From switch on multiple test lines are generated within the chip, at a rate of 20 per field, until beam current is detected. As soon as the first beam current is detected the i.c. blanks the c.r.t. for a further four seconds, the estimated final warm-up time.

(3) Tube blanking is then removed and the picture should stabilise. The total warm-up time takes about 12 seconds.

The usual signs of c.r.t. ageing will not be apparent. This means that the picture is liable to rapid deterioration once the emission has fallen outside the parameters set by the i.c. A way of checking whether the tube is ageing is to measure the voltages at pins 10, 20 and 21 – use a digital voltmeter. A difference of more than 0.2V is a clear indication that the chip is compensating heavily for differing gun emissions and that the tube is deteriorating.

The Sandcastle Pulse

The TDA3562A requires a three-step sandcastle pulse (see Fig. 2) which is fed in at pin 7 – the TDA3561 required a two-step pulse. This three-step pulse is produced by the sync processor/timebase oscillator chip, normally a TDA2578A. The levels are as follows:

- (1) 2.5V, derived from the field oscillator. This is used for field flyback blanking. In the event of field collapse a continuous 2.5V d.c. is applied, blanking the screen to prevent phosphor burn. The blanking period is 21 lines.
- (2) 4.6V, derived from a line flyback pulse. This is used for line flyback blanking.
- (3) 11V, derived from the sync separator. This is used for

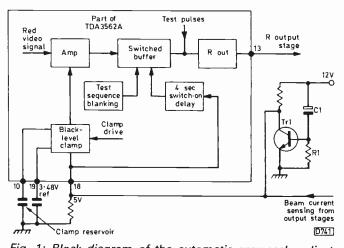


Fig. 1: Block diagram of the automatic grey-scale adjustment system (red channel only shown).

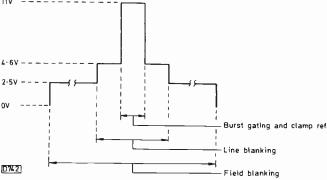


Fig. 2: The three-step sandcastle pulse.

burst gating and as the black-level clamp reference.

The absence or attenuation of any of these three levels will mute the i.c., resulting in a very dark raster which under normal lighting conditions is not visible.

Servicing

Engineers who have to deal with sets that employ this i.c. will be aware of the fact that many faults produce the no raster symptom. In some cases it can be difficult to identify where the fault lies.

An oscilloscope will usually show that the luminance signal is present at pin 8 but that there are no RGB outputs at pins 13, 15 and 17. If the i.c. is mounted in a holder a logical step would be to change it. In most cases however the fault condition will persist. At this point we strongly recommend a check on the sandcastle pulse at pin 7 (or an associated test point), not only to ensure that all three steps are present but also that they are of the correct amplitude. I've had experience of receivers with no raster where each step of the sandcastle was about 1V too low. On the first occasion I came across this I broke the golden rule of oscilloscope use and on seeing the correctly shaped waveform failed to check its amplitude. I eventually noticed that the pulse was about 4V larger at one end of the track than at the other. The cause was an invisible crack in the PCB.

If the sandcastle pulse is correct and the luminance signal is present at pin 8 it's worth checking that the 12V supply has not risen, possibly by only IV, due to a defective regulator. Also check any external blanking transistors, diodes, etc. It's worth checking that the teletext or scart interfaces are not making the chip blank—this can in many cases be done simply by unplugging the interface input to the i.c.

There are various ways of finding which stage is at fault when the receiver fails to display a raster. As previously mentioned field collapse will result in loss of the first step of the sandcastle pulse and a blank raster. One way to check on this is to use a scope to look at the pulse. Since the field output chip is a power device however it's the most likely culprit. A much simpler check therefore is to short between the grid and cathode of one of the tubc's guns — this can easily be done in the field. The relevant gun will then turn hard on, giving an immediate indication as to whether the field timebase is working. A warning is necessary however: this check won't tell you whether the field blanking is correct. In other words it's just possible that a raster will appear but that the first step of the sandcastle pulse is incorrect.

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Z718 Basic unit DECCA: 1210, 1211, 1511 1700, 2001, 2020, 2401, 2404 CS1730, 1733, 1830, 1835 30, 70, 80, 90, 100 120, 130, 140, 160	11.50 9.20 9.20 9.20 9.20 P.O.A.	PYE: 169, 173, 569, 368 CT200, CT200/1, CT213 725-731, 735, 737, 741 PHILPS: 170, 210, 300 9.20 320 series TX, T8, TX2, TX3 mono P.0.J.	8
FERGUSON, THORN: 1590, 1591 1690, 1691. built in rect. 1600, 1615, 1700, 1790 3000, 3500, 8000, 8500, 8800 9000, 9200, 9300 series 9500, 9600, 9650 series 9800, TX9, TX10,TX90, TX100 MOVIESTAR 3781, 3787, 8180 TX10 facus unit	9.20 9.78 P.O.A. P.O.A. 12.00 10.99 P.O.A. 12.00 10.87	G8 and G9 Series £9.20 KT2. KT3. series 9.20 CTX G11. K30. K4. K40. split diode P.O.A BINATONE: 9909, 9860, 9488 P.O.A DORIC Mk3, Mk1 11.5 SONY KV 1400, 1612, 2000 P.O.A GRUNDIG: most models in stock NORDMENDE: 8290, 2206, 2306 P.O.A SANYO: 5101, 5103, 7118, 7130 P.O.A SHARP: C1851H, C2051H, 1405 P.O.A	0 0 1. 0 1.
FIDELITY: FTV12 mono ZX2000 ZX3000	10.35 16.43	TOSHIBA: C800, C800B P.O.A TANDBURG: 190, CTV2, CTV3 P.O.A	ĺ.
G.E.C. 2047 to 3135 mono 1201H, 1501H, 2114, 3133, 3135 DUAL & SINGLE hybrid col. SINGLE STD solid state SINGLE STD split diode	9.20 9.20 10.00 12.00 P.O.A.	TELEFUNKEN: most models in stock HITACHI: 1471, CPB260, 2501 P.O.A AMSTRAD: CTV2200, CTV2210 P.O.A Delivery by return of post. Shop callers welcome. Tidman Mail Order Ltd	
INDESIT: 24EGB, 12LGB, 12SGB	10.35	·	
WINDINGS TYNE: main winding RBM: T20, T22, T26, Z179 WALTHAM: W125 eht winding WALTHAM: W190, W191 eht coil KORTING: hybrid winding THORN: 8000, 8500, 8800 eht	6.80 6.33 2.37 6.00 6.90 6.70	236 Sandycombe Road, Richmond, Surrey TW9 2EQ Approx. 1 mile from Kew Bridge. Phon-Fri 9 am to 12.30 pm & 1.30-4.30 pm Sat 10 am to 12 noon.	

A method of overriding the beam current sensing at pin 18 is to disconnect the feedback from the RGB output stages and apply 5V from an external power supply. The i.c. will then assume that the tube's emission is correct and will attempt to produce a raster. If a raster is obtained by making this check you'll be on your way to identifying the fault. Even if a raster doesn't appear you'll at least have ruled out the auto-grey-scale system and, depending on the fault, you may be able to scope RGB outputs at pins 13, 15 and 17.

In conclusion, when dealing with this chip in a TV set always bear in mind that any fault that would make the tube turn on hard will in most cases result in no raster or the loss of one colour, also that a fault in either timebase will often upset the sandcastle pulse, again leading to a blank screen.

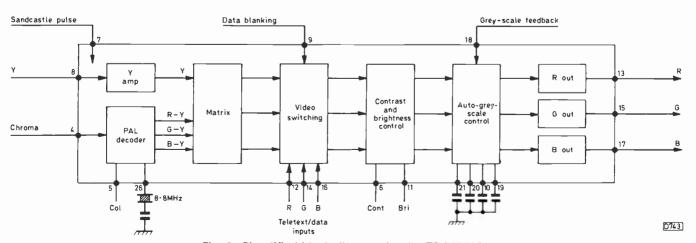


Fig. 3: Simplified block diagram for the TDA3562A.

EC	ONOM	IC DEV	CES &	QUICK	SAVE	T.V. S	PARES		
15/80H 15/85R	3.71 2SA940 3.30 2SA940	0.59 2SC535 2 2.14 2SC536	0.79 AF180 0.33 AF181	0.55 BA656 0.53 BA7100	5.46 BC560C 11.35 BC635	0.14 BDX63A 0.30 BDY20	1.96 BFY52 1.21 BFY79	0.27 BYX71-350 0.49 BYX94	0.95 0.18
16039 16181	0.79 2SA950 1.04 2SA951	0.72 2SC537 1.75 2SC605L V 116 2SC620	0.54 AF186 1.16 AF239 0.95 AF279	0.53 BA841A 0.43 BA843 0.89 BA854	28.98 BC636 3.96 BC637 5.76 BC639	0.28 BDY81 0.24 BF115 0.20 BF117	1.05 BFY90 0.40 BLY49 0.66 BB100	0.61 BYY56 2.20 BZY93C30 0.20 BZY88 RANGE	1.20 1.86 0.10
16182 16334 16335	1.04 2SA966- 0.98 2SA999 0.94 2SB774	1.36 2SC643A 2SC668	1.54 AL113 0.67 AN115	1.36 BAV18 BAV19	0.21 BC640 0.11 BC879	0.24 BF118 0.39 BF121	0.66 BR100 0.67 BR101 0.25 BR103	0.29 BZX61 RANGE 0.65 BZX79 RANGE	0.18
16446 16600	0.98 2SB185 1.38 2SB375	1.13 2SC681 2SC682 3.87 2SC684	1.88 AN155 1.65 AN206	1.89 BAV20 BAV21 2.58 BAW62	0.35 BC880 0.12 BCX34 0.29 BCY70	0.31 BF123 0.40 BF127 0.30 BF137	0.13 BR303	1.23 C106M	0.46 0.76
16802 17052	1.27 2SB400 5.61 2SB405	0.40 2SC693 1.03 2SC710	0.63 AN208 0.69 AN210	3.55 BAX12 2.28 BAX13	0.48 BCY71 0.11 BCY72	0.30 BF157 0.21 BF153 0.20 BF154	0.29 BRC300 0.58 BRC300 0.26 BRC5296	2.01 CA3046 0.77 CA3089	0.58 1.55 0.83
17053 17074	5.61 2SB449B 9.30 2SB511	6.98 2SC711A 2.26 2SC717	0.50 AN211 1.28 AN2140	3.25 BAX16 1.50 BC107	0.11 BD115 0.13 BD116	0.34 BF157 0.70 BF158	0.33 BRC6109 0.18 BRC82	0.83 CA3090AQ 1.08 CA3094	3.25 2.20
17089 17127 17376	3.45 2SB54 3.51 2SB546 1.58 2SB56	1.39 2SC734 3.75 2SC761-Y 2.80 2SC783	1.43 AN234 0.95 AN236 3.98 AN239	5.92 BC107A 3.78 BC107B 4.68 BC108	0.11 BD124 0.18 BD124P+KIT 0.15 BD131	1.31 BF159 0.69 BF160 0.57 BF167	0.18 BRC83 0.31 BRC84 0.38 BRY44	2.19 CA3131EM 2.08 CBF16848N-07 0.60 CD4001	2.95 1 1.56 0.34
1N4001 1N4002	0.06 2SB618A 0.06 2SB631	2.22 2SC790Y 1.45 2SC828	1.85 AN240P 0.28 AN241	1.25 BC108B BC109	0.15 BD132 0.12 BD133	0.42 BF173 0.53 BF177	0.38 BRX44 0.34 BRX49 0.35 BRY39	0.60 CD4001 0.67 CD4002 CD4008	0.34 0.27 1.35
1N4003 1N4004	0.06 2SB643 2SB669 0.08 2SB681	0.35 2SC867A 3.67 2SC876 3.96 2SC930	3.84 AN245 0.96 AN253	4.49 BC109B BC109C BC113	0.15 BD135 0.12 BĐ136 0.14 BD137	0.36 BF178 0.26 BF179 0.36 BF180	0.36 BSS38	0.87 CD4011 CD4012	0.29 0.24
1N4005 1N4006	0.08 2SB695 0.08 2SB75	1.98 2SC935 1.04 2SC936	4.13 AN260 8.66 AN262	3.85 BC119 1.20 BC126	0.36 BD138 0.23 BD139	0.46 BF181 0.34 BF182	0.32 BSTC0246 0.34 BSTC0233	6.99 CD4016 7.25 CD4017	0.33 0.46 0.82
1N4007 1N4148 1N4448	0.07 2SB774 0.03 2SB819 0.05 2SC1034	0.61 2SC940 1.13 2SD1128 6.75 2SD1138	4.68 AN272 2.90 AN295 0.78 AN301	8.25 BC132 5.52 BC135 3.60 BC137	0.14 BD140 0.14 BD144	0.29 BF183 1.70 BF184	0.39 BSTCC0143 0.43 BSTD1043	3.07 CD4020 2.85 CD4021	1.23 0.39
1N5401 1N5402	0.14 2SC1050 0.15 2SC1096	5.06 2SD1273	0.78 AN301 1.56 AN302 5.39 AN303	3.60 BC137 3.99 BC138 4.39 BC139	0.18 BD150 0.34 BD157 0.28 BD160	1.25 BF185 0.67 BF194 1.60 BF195	0.39 BSV57B 0.14 BSW68 0.14 BSX19	3.49 CD4023 0.60 CD4025 1.29 CD4028	0.28 0.64 0.84
1N5403 1N5404	0.16 2SC1104 0.15 2SC1106	4.54 2SD198	2.64 AN305 3.87 AN315	8.95 BC140 2.46 BC141	0.45 BD163 0.34 BD165	0.71 BF196 0.62 BF197	0.17 BSX20 0.18 BSY52	0.34 CD4040B 0.50 CD4047	0.85 1.06
1N5408 1N914	0.35 2SC1114 2SC1116 2SC1124	4.95 2SD235	0.49 AN316 0.60 AN318 2.29 AN320	5.53 BC142 5.44 BC143 5.47 BC147	0.23 BD166 0.19 BD168 0.08 BD175	0.42 BF198 0.73 BF199 0.20 BF200	0.17 BSY79 0.17 BT100A 0.37 BT108	0.51 CD4049 1.61 CD4052 1.45 CD4066	0.46 0.75 0.30
IR3403 1S1555 1S44	0.31 2SC1129 2SC1131	1.65 2SD257 0.64 2SD292	2.94 AN321 2.59 AN322	2.25 BC148A 5.85 BC148B	0.11 BD179 0.13 BD181	0.49 BF218 0.99 BF224	0.36 BT119 0.17 BT120	1.76 CD4069 2.17 CD4070	0.29 0.66
1S5012A 1S921	0.10 2SC1158 0.81 2SC1162 0.10 2SC1172	0.55 2SD325D	2.59 AN331 2.26 AN337 16.13 AN340P	4.59 BC148C 3.81 BC149 1.17 BC149B	0.11 BD182 0.11 BD183 0.13 BD184	0.99 BF237 0.99 BF240 1.21 BF241	0.65 BT121 0.17 BT123 0.17 BT151-800R	2.48 CD4081 1.98 CD4093 0.89 CD4511	0.35 0.72
2N1303 2N2219A	0.38 2SC1195 0.33 2SC1212	5.80 2SD350 A 1.97 2SD350A	5.20 AN355 2.80 AN362	5.98 BC153 1.50 BC154	0.14 BD187 0.14 BD189	0.53 BF245 0.69 BF245A	0.50 BTT6018 0.52 BTT8124	2.42 CD4528 4.89 CD4556	1.10 2.04 1.47
2N2222 2N2646 2N2904	0.38 2SC1213 0.80 2SC1226 0.36 2SC1293	1.46 2SD389	8.38 AN370 2.41 AN5010 0.97 AN5111	3.95 BC159 5.70 BC160	0.36 BD190 0.40 BD201	0.69 BF245B 0.40 BF246A	0.49 BU106 2.52 BU108	2.48 CR02AM-8 1.50 CV12E	1.70 4.09
2N2905 2N2906	0.43 2SC1306 0.38 2SC1316	1.98 2SD414	0.97 AN5111 1.98 AN5120N 2.13 AN5132	2.92 BC161 4.50 BC168 4.39 BC169C	0.28 BD202 0.36 BD203 0.16 BD204	0.60 BF255 0.50 BF256 0.61 BF256LB	0.20 BU109 0.38 BU110 0.42 BU111Y	2.65 CX095D 5.69 CX104 4.16 CX108	3.14 9.64 10.50
2N2926 2N3053	0.15 2SC1317 0.27 2SC1364	0.87 2SD560 0.49 2SD588A	2.95 AN5250 2.36 AN5435	3.93 BC170 2.80 BC171	0.16 BD207 0.11 BD208	1.79 BF256LC 0.34 BF257	0.82 BU125 0.34 BU126	2.48 CX109 1.23 CX130	7.86 8.76
2N3054 2N3055 2N3442	0.99 2SC1383 0.61 2SC1391 1.56 2SC1398	2.45 2SD601R	3.25 AN5610 0.65 AN5612 1.03 AN5613	7.42 BC172 4.68 BC172B 4.63 BC173	0.13 BD222 0.27 BD225 0.17 BD228	0.44 BF258 0.49 BF259 0.63 BF262	0.36 BU137 0.34 BU205 0.57 BU206	6.53 CX134 1.35 CX136 1.27 CX139	12.32 11.49
2N3702 2N3703	0.14 2SC1413 0.18 2SC1446	A 3.05 2SD621 1.25 2SD636	12.85 AN5630 0.55 AN5701N	3.95 BC174B 1.66 BC177	0.27 BD229 0.35 BD232	1.05 BF263 0.50 BF271	0.57 BU207 0.34 BU208	1.65 CX157 1.46 CX158 -	11.83 4.84 5.52
2N3705 2N3706 2N3707	0.16 2SC1447 0.14 2SC1475 0.16 2SC1505		0.77 AN6250 0.98 AN6300 3.50 AN6310	2.95 BC178 4.40 BC179 8.74 BC182	0.26 BD234 0.26 BD237 0.08 BD238	0.42 BF273 0.47 BF274 0.39 BF324	0.20 BU208/02 0.20 BU208A 0.35 BU208D	1.97 CX177 1.12 CX187 1.95 CX755	6.46 6.84
2N3711 2N3771	0.13 2SC1514 0.70 2SC15730	1.69 2SD661A Q 1.25 2SD731	0.80 AN6320N 1.05 AN6340	4.28 BC182L 10.14 BC182LB	0.10 BD 239 0.14 BD 240	0.45 BF336 0.57 BF337	0.33 BU209 0.45 BU226	1.50 CX885A 2.95 DEC1	12.95 6.85 2.20
2N3772 2N3773 2N3819	1.71 2SC1578 1:65 2SC1583 0.42 2SC1617		0.60 AN6341 7.65 AN6342 1.98 AN6363	2.02 BC183L 2.77 BC183LB 16.00 BC184	0.11 BD241 0.26 BD242 0.13 BD243A	0.39 BF338 0.39 BF355 0.33 BF362	0.33 BU326 0.31 BU326A 0.62 BU326S	2.00 DEC2 2.20 DS3486N 2.20 DS3487N	2.20 4.33 4.95
2N3823 2N3904	1.17 2SC675 0.62 2SC1678	1.41 2SD837 1.98 2SD841	1.56 AN6371 2.60 AN6387	9.24 BC184L 10.65 BC184LB	0.14 BD243C 0.26 BD244	0.29 BF363 0.51 BF371	0.60 BU406 0.50 BU406D	1.49 E1222 1.79 E5024	0.40 0.28
2N3908 2N4101 2N4240	0.62 2SC1741 1.73 2SC1810 3.30 2SC1815	1.25 2SD856 1.70 2SD8570 0.45 2SD882	1.55 AN6531 1.84 AN6551 1.15 AN6552	1.95 BC186 1.35 BC187 0.68 BC204	0.27 BD244C 0.28 BD245C 0.16 BD246C	0.79 BF391 0.99 BF417 1.25 BF418	0.25 BU407 0.84 BU407D	0.82 E5386 0.99 E9003	0.25 0.46
2N4444 2N5293	0.99 2SC1826 0.50 2SC1829	0.67 2SD894 3.34 2SD898	1.63 AN6610 3.45 AN6677	2.40 BC207 10.45 BC212	0.14 BD253 0.11 BD278A	1.05 BF422 0.60 BF423	1.87 BU412 0.29 BU426A 0.52 BU500	9.15 E9005 1.13 ESM310BP 1.45 FND500	0.50 4.15 5.78
2N5294 2N5296 2N5297	0.50 2SC1875 0.49 2SC18818 0.50 2SC1893		2.15 AN7111 2.50 AN7114E 0.76 AN7115	1.25 BC212B 8.54 BC213L 3.38 BC213LB	0.26 BD317 0.10 BD318 0.15 BD375	2.60 BF450 2.85 BF451 0.42 BF457	0.35 BU508A 0.29 BU536	1.25 GC374 1.86 GD243	1.65 4.95
2N5298 2N5771	0.61 2SC1906 1.18 2SC1921	0.98 2SK41 1.37 2SK79	1.07 AN7120 2.98 AN7145	4.65 BC214 2.80 BC214LB	0.15 BD375 0.10 BD380 0.26 BD410	0.42 BF457 0.76 BF458 0.52 BF459	0.41 BU608 0.26 BU705 0.52 BU806	2.72 GF758 1.85 GH3F 1.79 HA11215	0.84 1.82 2.45
2N6109 2N6130 2N6133	1.58 2SC1923 0.72 2SC1929 1.25 2SC1942	0.30 40408 2.25 40594 1.65 40636	0.50 AN7146 1.53 AN7151 1.43 AN7156	4.35 BC225 2.26 BC237	0.40 BD433 0.10 BD434	0.47 BF460 0.49 BF469	0.60 BU807 0.22 BU826A	0.80 HA11211 2.15 HA11225	2.53 1.50
2N6180 2N6292	0.95 2SC1945 1.65 2SC1959	7.99 4EX581 1.18 741	0.80 AN7158 0.30 AN7218	2.85 BC237BJ 2.32 BC238 1.64 BC238A 4.25 BC238B	0.12 BD435 0.10 BD436 0.13 BD437	0.49 BF470 0.60 BF471 0.49 BF472	0.55 BUW84 0.33 BUX84 0.33 BUX85	1.39 HA11226 1.00 HA11229 1.10 HA11235	10.44 0.85 2.48
2N696 2N698 2SA1006	0.43 2SC1957 0.43 2SC1953 1.50 2SC1962	1.09 7805-T022 1.93 7806 1.93 7808	0.63 AN7223 0.73 AU107	3.50 BC239	0.13 BD438 0.12 BD441	0.40 BF479 1.42 BF480	0.35 BUY69A 1.38 BY126	2.04 HA11124 0.13 HA11244	5.25 4.02
2SA1011 2SA1015	1.65 2SC1969 0.49 2SC1983	3.10 7812-T022 2.00 7815	0.85 AU110 0.35 AU113 0.64 AY105K	2.25 BC239B 5.25 BC251A 2.08 BC294	0.25 BD442 0.31 BD509 0.50 BD510	1.41 BF491 1.65 BF495 0.62 BF506	1.99 BY127 0.64 BY133 0.43 BY164	0.08 HA11251 0.12 HA1125 0.44 HA1137W	4.47 4.29 2.87
2SA1012 2SA1020Y 2SA1027R	1.25 2SC1985 0.89 2SC2009 0.45 2SC2029	1.55 7818 0.34 7824	0.92 AY106 0.64 BA524	1.09 BC300 8.21 BC301	0.35 BD519 0.45 BD529	1.50 BF509 0.62 BF523	0.41 BY176 0.24 BY179	0.52 HA1138 1.08 HA11414	5.03 5.65
2SA473 2SA766S	0.75 2SC2028 4.95 2SC2063	2.33 7905 2.11 9368 0.99 AA133	0.80 B250 10.70 B40 0.12 BA130	2.65 BC302 1.55 BC303 0.14 BC307	0.53 BD530 1.04 BD533 0.18 BD534	1.18 BF532 0.67 BF596 0.53 BF597	0.45 BY182 0.18 BY184 0.27 BY187	0.95 HA1144 0.40 HA1156 0.77 HA1160	7.87 1.16 4.78
2SC1173Y 2SC1474	1.25 2SC2078 1.25 2SC2073	3.11 AC133 2.25 AC123K	0.12 BA1310 0.43 BA1320	1.98 BC307A 1.38 BC308	0.14 BD535 0.18 BD536	0.79 BF694 0.61 BF757	0.22 BY189 0.59 BY198	1.79 HA1166 1.62 HA1166X	1.96 6.43
2SC1509 2SD1391RL 2SA1095	1.35 2SC2085- 3.95 2SC2091 3.74 2SC2141	-Q 1.65 AC127 1.30 AC128 2.44 AC138	0.27 BA1322 0.34 BA1330 0.24 BA145	3.95 BC308A 2.75 BC309 0.19 BC317A	0.11 BD537 0.17 BD538 0.13 BD544B	0.80 BF759 1.45 BF761 0.83 BF762	0.47 BY201/2 1.05 BY203/20 0.50 BY207	1.50 HA1167 0.59 HA11706 0.22 HA11705	5.36 9.50
2SA1103 2SA329	6.55 2SC2166 0.40 2SC2216	1.98 AC141 0.69 AC142K	0.29 BA148 0.35 BA154	0.25 BC327 0.40 BC328	0.15 BD598 0.10 BD677	1.25 BF869 0.69 BF870	0.47 BY208 0.30 BY210-400	0.46 HA11703 0.19 HA11701	8.00 4.22 4.56
2SA489 2SA490 2SA493	1.17 2SC2233 2.25 2SC2236 2.25 2SC2278	2.20 AC151 1.65 AC176 1.69 AC179	0.28 BA155 0.30 BA156 0.28 BA159	0.12 BC337 0.05 BC338 0.08 BC368	0.09 BD679 0.34 BD680 0.24 BD681	0.57 BF959 0.76 BF960 1.48 BF970	0.42 BY210-600 0.49 BY210-800 0.50 BY218	0.27 HA11710 0.34 HA11713 1.64 HA11711	9.50 9.75
2SA562 2SA564	0.57 2SC2314 0.75 2SC2335	2.17 AC183 +KIT 13.44 AC187	0.72 BA182 0.39 BA222	0.24 BC440 1.66 BC441	1.09 BD696 0.44 BD699	2.47 BFR39 3.49 BFR61	0.44 BY223 0.92 BY224-600	1.23 HA11715 1.88 HA11714	20.16 3.25 9.75
2SA614 2SA628 2SA639S	4.88 2SC2551 1.14 2SC2565 1.75 2SC2570	1.26 AC187K 3.92 AC188 2.88 AC188-01	0.43 BA302 0.47 BA311 0.49 BA312	1.24 BC454 1.32 BC460 1.05 BC461	0.36 BD700 0.42 BD707 0.35 BD709	3.70 BFR62 0.98 BFR79 1.05 BFR81	0.50 BY225-100 0.29 BY226 1.65 BY227	1.13 HA11716 0.25 HA11725	13.10 18.26
2SA659 2SA673	0.49 2SC2577 1.50 2SC2578	3.58 AC188K 6.75 AC193K	0.43 BA313 0.65 BA317	0.76 BC462 0.08 BC463	1.15 BD710 0.64 BD809	0.80 BFR86 0.85 BFR89	1.08 BY228 1.63 BY229-1000	0.49 HA11725MP 0.60 HA117555P 1.12 HA11781	16.00 6.23 8.90
2SA684 2SA697 2SA699	1.61 2SC2671 1.05 2SC2826 1.75 2SC288A	1.99 AC194K 2.07 AD140 1.85 AD143	0.65 BA318 1.06 BA328 1.93 BA333	0.02 BC477 1.65 BC478 1.37 BC479	0.37 BD810 0.22 BD879 0.41 BD880	0.69 BFR90A 0.74 BFT42 0.79 BFT43	0.70 BY229-600 0.43 BY255	0.92 HA1180 0.69 HA1196	5.15 7.43
2SA715 2SA747	0.95 2SC3153 10.74 2SC372	6.84 AD145 1.40 AD161	1.60 BA335 0.56 BA5102A	6.27 BC532 2.86 BC546	0.28 BD895 0.14 BD899	2.31 BFT84 2.48 BFW10	0.40 BY298 0.60 BY299	1.03 HA13001 0.36 HA1306 0.45 HA1338	2.25 2.26 7.50
2SA748 2SA817 2SA818	1.36 2SC373 0.65 2SC383 1.82 2SC388	1.16 AD162 1.33 AD262 0.50 AF114	0.45 BA511 1.25 BA514	2.92 BC547 2.20 BC548	0.10 BD901 0.10 BD902	0.79 BFX29 0.84 BFX84	0.34 BY407 0.37 BY409	0.90 HA1339 1.49 HA13402	2.33 7.87
2SA835 2SA836	2.50 2\$C394V 0.89 2\$C403C	0.81 AF115 0.60 AF118	2.47 BA521 0.79 BA524 1.20 BA526	8.94 BC550 7.98 BC556	0.10 BDW83C 0.10 BDW84C 0.10 BDX32	1.45 BFX85 1.56 BFX86 1.75 BFX87	0.41 BY448 0.36 BY713 0.55 BYW19/1000	1.35 HA13342 1.10 HA13365 0.69 HA1366WR	2.65 4.02 1.50
2SA844 2SA872 2SA884	0.65 2SC41 0.80 2SC458 2.15 2SC495	2.19 AF127 0.39 AF139 0.92 AF178	0.50 BA527 0.53 BA532 1.45 BA536	2.98 BC557 1.56 BC558	0.10 BDX53A 0.10 BDX53B	4.93 BFX88 1.85 BFX89	0.34 BYW56 0.44 BYX10	0.24 HA1367 0.29 HA1368R	4.32 2.45
2SA937R	0.97 2SC515A	2.85 AF178 2.85 AF179 STED ASK FOR QU	0.55 BA6209	1.35 BC559 4.55 BC559B	0.10 BDX54B 0.11 BDX62A	2.16 BFY50 2.15 BFY51	0.32 BYX55-600 0.25 BYX71-600	0.23 HA1368 0.90 HA1370	2.07 3.30

90 <u>B</u>	(0)	(15,	W	<u>OLV</u>	ER	HAM	PT	ON,	W	124	AZ	স্ত	135	0902	27	1208	<u>:E</u>
A1374 A1377	4.80	LR3419 LR3471	9.37 9.37	NE565N NE645BN	1,33 3.35	SKE4F2/08 SKE4F2/06	1.24 0.44	STK3042 STK3044	9.95 5.75	TA7312P TA7313AP	2.45 1.36	TD62105F TD62104F	2.50 2.50	TDA3560 TDA3571Q	5.25 3.48	TUA2000 TV106	8. 2.
389R	2.05	LU1141	7. 2 7	NP1106 0A202	8.60 0.11	SKE4F2/10 SKE4G2/02	1.24 0.96	STK4019 STK430	4.50 10.55	TA7314 TA7323P	5.94 3.15	TD62706F TDA1001B	4.50 2.31	TDA3576 TDA3590	5.98 5.79	TY6010B U05G	1
389 39 2		LU52012 LU52011	5.95 14.95	OA47	0.16	SKE5F3/10	1.60	STK433	6.25	TA7325P	1.15	TDA1003A	2.25	TDA3591 TDA3650	6.45 7.95	ULN2204 UPA53C	11.
94	3.95	LU03112	12.37	0A91 0A95	0. 0 9 0.12	SKS1/10 SL1310	2.15 3.14	STK4332 STK435	8.25 5.94	TA7339P TA7340P	1.85 5.95	TDA1005A TDA1006A	2.38 2.11	TDA3652	2.95	UPC1003	5
197 198		M193 M21C	6.83 1.13	0C28 0C29	2.95 2.15	SL1430T	2.32	STK4352	12.25	TA7607AP	3.10	TDA1010AF	4.25	TDA3651AQ TDA3651	2.95 1.95	UPC1009C UPC1025H	8
406 452	2.47 0.85	M23C M293	2.83 6.95	0C36 0C44	1.28 0.35	SL414 SL432A	3.69 3.44	STK436 STK437	4.70 9.65	TA7609 TA7611AP	3.91 3.25	TDA1011 TDA1010	1.65 1.28	TDA3651A TDA3950	1.75 2.95	UPC1026C UPC1028H	1 2
4030AF	2.48	M51102L	4.95	OC45	0.18	SL439	2.48	STK4372	3.85	TA7616P TA7622AP	5.25 12.87	TDA1011A TDA1028	1.03 2.45	TDA4050B TDA4280	3.95 5.95	UPC1020H UPC1032H	2
14538 38702-A2	2.07 8.95	M5115P M51203L	5.24 3.15	0C72 0C75	0.44 0.44	SL471 SL480	4.78 3.98	STK439 STK441	7.25 10.25	TA7628P	5.06	TDA1034B	2.42	TDA4290	4,47	UPC1042C	- 1
38750A53	11.78	M51231P M5134-9341	0.95 4.13	ON236 ON782	1.06 1.98	SL490 SL901B	2.44 6.95	STK443 STK457	10.29 13.45	TA7629P TA7630P	7.50 1.55	TDA1035S TDA1035T	2. 95 1. 8 5	TDA4400 TDA4420	2.27 4.02	UPC1156H UPC1158	
38750A-7 38800A50	7.25 14.09	M51353P	5.25	OT121	1.45	SL918A	6.98	STK460	6.10	TA7640AP	2.29	TDA1037	1,78	TDA4422 TDA4427S	3.65 9.00	UPC1161C UPC1182H	
44801A05 F4001BP	19.98 0.67	M51381P M51393AP	5.09 9.35	PT6042 PT8504	2.45 4.98	SN16861AN0 SN16862AN	1.65 2.98	STK461 STK463	9.68 11.85	1A7672P 1A7676P	2. 4 0 2. 8 1	TDA1037D TDA1044	2.05 2.41	TDA4431	2.27	UPC1186H	
SH1010	8.59	M51394P M5142P	14.05 6.85	R1038 R1039	2.19 2.19	SN16966N	10.25	STK466	11.77	TA7726P	12.50 1.27	TDA1047 TDA1059B	4.10 0.98	TDA4440 TDA4442	3.26 4.15	UPC1181H UPC1185H	
SH1004 SH1002	6.00 9.50	M5144P M51513L	2.97 2.06	R2008B R2009	1.33 1.98	SN29717N SN29716N	7.19 3.66	STK4833 STK501	16.95 6.32	TAA320A TAA350A	6.45	TDA1054M	1.35	TDA4500 TDA4600	4.75 2.10	UPC1188 UPC1212C	
16231	9.81	M51515BL	3.23	R2010B	1.33	SN29715N SN29722	6.04 11.95	STK502 STK5314	5.74 12.32	TAA570 TAA621AX1	1.74 4. 8 5	TDA1060 TDA1082	2. 60 2.95	TDA4610 TDA4620	1.78 4.78	UPC1225H UPC1230	
M6232 M6251	10.65	M51517L M5192	2.90 2.20	R2029 R2030	1.33 1.33	SN29723AN	8.77	STK5730	3.95	TAA621A12	2.14	TDA1151	1.22	TDA5500	6.03	UPC1238	
Л7103 40022	4.85 9.98	M5194AP M5231L	5.74 1.95	R2257 R2265	3.71 1.49	SN29764AN SN29767	0.99 4.98	STK7216 STK772	14.50 6.95	TAA661B TAA691	2.62 8.58	TDA1170S TDA1190	2.25 2.11	TDA5700 TDA7270S	2.75 2.25	UPC1263 UPC1277H	
И9032 И 90 12	3.22	M53274P	1.33	R2305	1.18	SN29770BN SN29772BN	1.95 2.95	STR1096	5.45	TAA700 TAA930	3.75 4.87	TDA1190Z	3.96	TDA8190 TDA9403	2.47 2.35	UPC1278H UPC1351C	
/19015 1420 7	3.24 17.16	M54532P M54544L	1.71 3.45	R2322 R2323	0.59 0.76	SN29771BN	1.48	STR4090 STR440	11.98 7.85	TAA970	2.83	TDA1200 TDA1235	1.50 3.88	TDA9503	4.20	UPC1350C	
4208	20.65	M58478P M58485P	8.77 13.65	R2354A R2354B	2.01 2.01	SN29791 SN29798N	2.98 5. 56	STR441 STR451	3.95 5.36	TAA110 TAG232 600	2.52 0.79	TDA1236 TDA1270	4.30 3.55	TDA9513 TDB1033	5.44 2.68	UPC1353 UPC1355C	
5401 2403	0.11 4.25	MA06 MA8001	1.07	R2443 R2461	0.88 1.50	SN2709 SN7400N	0.44 0.34	STR453	8.16	TAG626-600 TBA120AS	1.20 0.85	TDA1327A	1.33	TDE1081 TE626	7.05 1.49	UPC1363 UPC1362	
2 C0 5	4.25	MA8003	1.16	R2540	1.95	SN7401N	0.36	STR454 STR6020 + KIT	7.50 8.31	TBA120SB	1.05 0.65	TDA1412 TDA1420	1.05 2.55	TEA1002 TEA1009	2.30 1.86	UPC1365C UPC1366	
3P06 3P08	2.25 4.95	MB3705 MB3712	1.98 1.85	R2540X R2615	3.30 0.67	SN7402N SN7404N	0.65 0.24	T6029V	5.75	TBA120T TBA120U	0.62	TDA1440:	3.45	TEA1014	2.50	UPC1360C	
9 4558 751	6.25 2.85	MB3713 MB3730	1.69 2.94	RCA16029 RCA16600	2.01 1.38	SN7408N SN7410N	0 <i>2</i> 7 0 <i>2</i> 7	T6035V T6036	0.73 0.67	TBA120A TBA1440	1.05 1.80	TDA1476	2. 25 4. 25	TEA1020SP TIC106C	8.21 0.61	UPC1378H UPC141C	
T425	0.18	MC13002	3.69	RCA16802 RCA17074	1.08	SN74121 SN7413N	1.60 0.37	T6037 T6044V	2.11 0.97	TBA1441 TBA1441	1.95 2.80	TDA1506 TDA1510	7.85 4.60	TIC106M TIC116Y100	0.57 2.07	UPC1458 UPC151C	
0003GE 0020GE	5.37 5.93	MC1310P MC1327P	1.33	RCA17376	1.58	SN74141N	2.65	T6045	1.20	TBA240A	2.65 1.10	TDA1512 TDA1515	3.69 6.98	TIC44 TIC45	0.72	UPC2002 UPC30C	
74 YP 2101	3.46 2.92	MC1330P MC1350P	1.45	RCA17524 RCA17523	0.83 0.83	SN74151AN SN74154N	1.51 1.27	T6049 T6052V	1.45 0.87	TBA395 TBA395Q	1.10	TDA1559	3.15	TIC47	0.35	UPC324C	
581C 582C	6.32 3.97	MC1351P MC1352P	3.96 2.50	RCA2060 RGP01-15	2.00 1.65	SN74190 SN7420N	1.35 0.34	T6058 T6059	3.08 2.77	TBA396 TBA400	2.90 2.39	TDA1670 TDA1779	4.48 3.85	TIP120 TIP110	1.06 0.45	UPC32C UPC339C	
583C	6.63	MC1357P	2.15	RGP10	0.30	SN7430 SN7440N	0.49 0.27	T9003V T9005V	1.25 2.38	TBA440P TBA480Q	1.55 1.30	TDA1905 TDA1908	1.76 1.95	TIP112 TIP117	0.54 0.50	UPC41C UPC4558C	
00CV 1201	1.69 1.02	MC1358P MC14001	1.55 2.40	RGP30M RT402	1.58	SN7472	1.54	T9011V	0.49	TBA510	2.11	TDA194®	1.95	TIP121	0.87 0.73	UPC474 UPC554C	
.1210 .1230	1.56 1.10	MC14013 MC14493P	0.41 5.64	RT905A S1299	2.38 7.98	SN7474N SN7490AN	0.44 0.93	T9013V T9014V	7.22 2.60	TBA520 TBA5200	1.84 1.68	TDA195# TDA2005	2.95 3.95	TIP126 TIP132	1.40	UPC566H	
1320 1352	2.87 1.75	MC14494P MC14497	2.15 3.15	S175 S2062D	31.48 0.95	SN74LS26N SN76001N	0.53 1.65	T9016 T9019W	1.02 1.98	TBA530 TBA530	1.30 1.30	TDA2006 TDA2004	1.55 3.49	TIP137 TIP29	1.50 0.84	UPC574 UPC575C2	
1357N	11.07	MC14510BAL	3.75	S2800D	5.54	SN76013ND	7.50	T9034V T9035V	1.45 1.95	TBA540 TBA5400	1.15 1.15	TDA2008 TDA2008	0. 90 1.75	TIP2955 TIP29A	0.95 0.46	UPC576H UPC577H	
1363 1364	1.05 3.02	MC14511BCP MC14528BCP	1.10 2.15	\$2802 \$2818	3.47 4.05	SN76023N SN76023ND	5.15 3.96	T9051	6.80	TBA560C	1.40	TDA2010	1.68	TIP29B	0.63	UPC578C	
(1365J (1385	0.95 1.94	MC1712 MC5192	3.88 19.50	S3702S S40W	6.15 10.50	SN76033N SN76110N	3.65 0.90	T9054V T9057V	0. 77 0.70	TBA560CQ TBA570Q	1.60 1.60	TDA2020 TDA2030	1.95 1.99	TIP29C TIP29D	0. 40 0.75	UPC580C UPC587C2	
A1387	8,10	MC7724CP	3.49	\$6080B	8.80	SN76115AN SN76131	1.61 1.92	T9062V T9064	0.49	TBA570A TBA641A12	1.71 4.13	TDA2140 TDA2150	1.68 6.20	TIP3055 TIP30A	0.75 0.41	UPC592H UPC595	
N3155 N3301	1.25 1.65	MC7818C MCR100/7	2.18 1.65	SA8063 SAA1006	5.17 1.75	SN76227N	1.33	TA6002	4.35	TBA641B72	3.03	TDA215#	2.07	TIP30C TIP31A	0.16 0.34	UPC596 UPD1514C	
3350 3361	1.43 3.89	MCR106-5/6 MCR220/7	0.95 2.28	SAA 1020 SAA 1025	4.76 4.40	SN76226DN SN76228N	1.98 3.27	TA7027 TA7050	4.80 1.74	TBA651 TBA673	0.87 2.60	TDA2160 TDA2161	4.01 1.85	TIP31B	0.38	UPD2819C	
A3365 A33 90	3,98 5,52	ME0402 ME0404/2	0.17 0.47	SAA1024 SAA1075	2.81 6.25	SN76242 SN76243	8.95 8.50	TA7051 TA7054	1.74 2.55	TBA700 TBA720	1.85 2.65	TDA2170 TDA2270	2.88 4.65	TIP31C TIP32A	0.50 0.53	UPD4013B UPD4066B	
4030P	3.16	ME0411	0.28	SAA1121	7.44	SN76396	2.90 2.47	TA7060AP TA7061AP	0.71 1.27	TBA730 TBA7500	3.55 2.90	TD A2510 TD A252D	7. 8 5 2.37	TIP32B TIP32C	0.69	UPD553-164 UPD8049C-1	1
44031P 44032P	3.20 2.35	ME6002 ME6102	0.26 0.28	SAA1124 SAA1130	3. 30 4.99	SN76533N SN76532N	2.95	TA7069	3.13	TBA760	1.71	TDA2522 TDA2524	3.46	TIP33	0.85	X0007TA	·
\4100 \4101	1.25	ME8001 ME0411	0.34 0.75	SAA1174 SAA1250	7.77 4.15	SN76545 SN76546N	1.95 3.47	TA7070P TA7072P	1.83 2.57	TBA800 TBA810S	0.85 1.61	TDA2521	4.50 3.71	TIP33A TIP33C	1.05 0.80	X0022CE X0029CE	
4102	0.99 0.56	MJ2501 MJ3001	3.30 1.76	SAA1251 SAA11351	5.98 4.95	SN76549 SN76570	2.59 3.08	TA7073P TA7074P	5.86 1.98	TBA810T TBA810AS	1.50 1.00	TDA2525 TDA2532	3.80 2.50	TIP34 TIP41A	1.25 0.49	X0031CE X0035TA	
4125	2.25	MJ481	1.53	SAA3027P	2.55	SN76611	2.59 2.59	TA7076P TA7089P	7.80 3.10	TBA820 TBA820M	1.52 1.10	TDA2530 TDA2541	2.55 2.48	TIP41B TIP41C	0.65 0.30	X0040TA X0042CE	
\4138 \4140	3.45 0.60	MJ802 MJE2955	4,90 1.89	SAA5000 SAA5010	2.40 5.39	SN76620 SN76660N	2.48	TA7092P	8.65	TBA890	2.50	TDA2540	2.15	TIP42A	0.49	X0043CE	
\41 92 \4220	4.29 1.00	MJE3055 MJE340	1.05 0.49	SAA5012 SAA5020	5.20 5.78	SN76666N SN76708	1.20 4.86	TA7093P TA7102P	3.99 5.88	TBA920 TBA9200	1.53 2.31	TDA25450 TDA2560	5.94 2.17	TIP42B TIP42C	0.53 0.35	X0056CE X0057GE	
\4250 \4400	6.75 3.92	MJE520 ML231	0.49 3.33	SAA5030 SAA5050	8. 25 7.74	SN76707N SN76705N	5.11 6.60	TA7108P TA7109	1.61 3.71	TBA940 TBA950	1.87 1.84	TDA2575A TDA2576A	0.50 3.00	TIP47 TIP48	0.37 0.92	X0062CE X0065CE	
44420	1.72	ML232B	3.65	SAB1009B SAB3011	5.98 7.34	SN76730 SN76810N	6.00 0.60	TA7122B/P TA7124P	0.92 2.34	TBA970 TBA990	3.56 1.82	TDA2571A TDA2578A	4.45 2.57	TIP49 TIP55A	3.61 3.65	X0074GE X0077GE	1
1442 2 1 44 30	1.72 1.56	ML237B ML238	2.51 5.77	SAB3013	3.76	SN76832N	3. 2 5	TA7129P	1.50	TBA9900	1.68	TDA2576A + TDA25#1		TIS43 TIS90	1.43 0.28	X0079CE X0092CE	
\4440 \4445	2.95 3.95	ML923 ML926	3.35 3.98	SAB3021 SAB3024	7.90 6.36	SN94041 SN94042	5.54 5.54	TA7130P TA7136AP	1 <i>2</i> 7 1 <i>2</i> 7	TC4001BP TC4011BP	3.50	TDA25#2	1.30	TL011CP	0.95	X0096CE	
14460 1 44 61	2.32 2.95	MM5314N MM5316N	8.99 9.16	SAB3209 SAB3210	5.82 3.10	SP8385 SPS5384	0.55 1.98	TA7137P TA7141AP	0.98 3.87	TC4013BP TC4016BP	3.75 3.15	TDA2591 TDA2594	2.50 3.26	TL072 TL494CN	1.85 8.95	X0109CE X0113CE	1
4505	5.85	MM5318N MM5369N	3.11	SAF1032P SAF1039	5.50 3.35	ST1702L STA401	0.99 6.76	TA7146 TA7146P	2.50 4.23	TC4053BP TC4069	4.34 2.25	TDA2543 TDA2545	2.47 2.06	TL072CP TMP4320	2.55 15.00	X0195CE X0204CE	
.5112N .7020	1.68 13.86	MM5387AA/N	2.01 6.20	SAS5010	8.39	STA441C	3.00	TA7148P	1.67	TC4071BP	2.76	TDA26#0 TDA26#1AQ	6.50	TMS1024NLL TMS1025N	13.75 16.95	X0261CE X1222AF	
.7025 .7027	11.97 10.92	MM5841N MN1400VL	6.64 13.65	SASS60S SASS60T	2.26 5.42	STA471C STK0029	7.56 5.54	TA7149P TA7152P	3.26 2.09	TC4081BP TC40H000	3.25 1.98	TDA2612Q	4.68	TMS3720ANS	19.50	1X0111CE	
7040 7042	9.20 3.58	MN1405 MN1435VX	12.95 12.75	SAS570T SAS570S	5. 42 2.61	STK0039 STK0040	5.11 12.78	TA7161P TA7162P	5.45 3.25	TC4514BP TC9002BP	5.44 11.34	TDA2611A TDA2610	1.05 3.08	TMS3748NS TMS3755	14.95 13.65	Y969 TDA3310	
7800	1.65	MN6016A	20.56	SAS580	2.25	STK0050 STK0080	7.72 9.16	TA7169 TA7172P	7.80 1.41	TCA270Q TCA270S	1.71 1.27	TDA2620 TDA2630	2.15 1.96	TMS3894NL TMS5102NLL	19.25 6.25	ZPY120 ZTK33	
7801 1274	1.92 3.61	MP1192 MP2794	5.07 4.00	SAS6600 SAS660	1.33 2.97	STK011	5.08	TA7176P	2.48	TCA270SQ	1.65	TDA2631	2.73	30.021122			
7800 3120	9.20 1.13	MP2812 MP8512	5.07 1.57	SAS6700 SAS670	1.33 3.96	STK013 STK014	9.25 9. 8 0	TA7201P TA7203P	2.71 2.18	TCA290A TCA420A	2.39 2.16	TDA2640 TDA2652	2.95 13.45	Eull I:-4	مائمين	المانية ماما	-
03150 V1017N	2.55	MPC596 MPF256C	2.13 0.60	SAS6710 SBA750	1.93 1.61	STK015 STK016	7.75 8. 45	TA7204P TA7205P	2.16 0.99	TCA440 TCA530	2.25 2.24	TDA2653 TDA2654	2.95 6.18	Full list a			
√118 7 7	12.50	MPS6570	0.48	SC84203	19.35	STK022 STK025	5.25 10.32	TA7206P TA7207P	6.35 3.34	TCA640 TCA650	2.25 3.05	TDA2670 TDA2680	2.54 3.20			ase 9" ×	
И224 И2808	1.75 6.25	MPSA42 MPSA56	0.65	SC9504P SDA2006	17.95	STK031	12.95	TA7208P	2.15	TCA660B	2.60	TDA2690A TDA2740	2.65 6.00			1902 - 71 2 ring machin	
И2877 И31 7С КС	5.25 1.00	MPSA92 MPSU05	0.72 0.86	SDA2112/2 SG264A	12.85 6.45	STK040 STK043	9.40 13.34	TA7210P TA7214P	3.58 3.63	TCA730 TCA750	3.81 2.25	TDA2730A0	5.14			rclaycard u	
И324N И339N	0.54	MPSU10 MPSU56	1.65 0.78	\$G613 \$G629	10.75 8.27	STK054 STK058	7,13 27.50	TA7215P TA7217AP	2.58 1.45	TCA8000 TCA830S	6.95 2.38	TDA2795 TDA2791	2.78 2.5	TEI	LEX	338490)
V1340K	11.85	MPSU60	1,98	SG6533	11.96	STK077	7.67 8.48	TA7222 TA7226	1.95 3.57	TCA890 TCA900	5.44 2.04	TDA2910 TDA3CD0T	13.25 2.88	Stock	queries	s by post on	ıly
VI348N VI380N	2.15 2.80	MR818 MR854	0. 33 0. 72	SI-1020H SI-1125HD	10.89 17.63	STK078 STK080	16.50	TA7227P	2.81	TCA910	2.04	TDA3300B	6.98	asi	k for spe)+ per line – ecial quote.	
M384N01 M567CN	3.25 1.71	MR914 MSM5816RS	1.20 17.35	SI1125H SI1225HD	7.50 19.27	STK082 STK086	11.86 13.59	TA7229P TA7230P	4.45 4.98	TCA940 TCA940E	2.47 2.53	TDA3330 TDA3506	2.95 7.98	Orders from	Govt. I	nstitutions, Sc ted with offici	
M6402/011 M6402A093	10.23 10.15	MSM5840H MVS460-02	9.70 0.61	\$11630HD \$16900	21.98 12.00	STK1039 STK2110	5.75 7. 33	TA7232P TA7233P	6.60 3.15	TCE330 TCEP1000	3.89 10.25	TDA3501 TDA3500	7.25 4.25	All go	ods shou	ld be delivered orking days.	
M748	0.69	NE542	2.65	SKE1/02 SKE2F1/04	1.85 1.39	STK2145 STK2230	16.25 7.70	TA7240AP TA7245P	3.55 5.92	TCEP100 TD3406AP	9.61 3.98	TDA3510 TDA3520	4.55 9.71	All item	as previo	ously advertise	
V18360	3.87 3.57	NE545B NE555	4.86 0.25	SKE2F1/04 SKE2G3/04	1.05	STK2230 STK2240	14.40	TA7270	7.50	TD3F800R	4.16	TDA3540	6.99			T.V. Spares ar	e
M8361 R2612	11.95	NE556	0.70	SKE4F1/06	0.35	STK2250	18.95	TA7310P	2.15	TD3F900H	4.16	TDA3541	1.95	Sui	ir avaliai	ble from us	

The Ferguson TX85 Chassis

J. LeJeune

As the evolution of colour TV chassis progresses more and more of the low-level signal processing circuitry is integrated in all-embracing LSI chips. Ferguson's new small-screen chassis, the TX85, is basically a tidied-up version of the TX90, though with some important changes. Gone are the mains transformer and the unconventional audio and power supply regulator circuits. Advantage has been taken of the redesign to introduce new or up-dated integrated circuits. The result is a neat design without the quirks of the TX90.

Chopper Power Supply

The TX90's mains transformer/rectifier/voltage regulator system has been abandoned in favour of a switch-mode power supply. Loss of the mains transformer removes about 2·5lb of weight, a useful saving in a chassis to be used in portable sets. One consequence of this is reversion to conventional mains-voltage degaussing. The shunt chopper transistor is controlled by a new i.c., type TEA2018A. Three rails are derived from the chopper transformer, 13V, 17V and 95V. The 17V line also feeds a 12V regulator which powers the signal processing sections of the receiver. The 95V rail is used by the line and field output stages while the 13V supply is used by the line driver and the audio stages. Fig. 1 shows the power supply circuit; Fig. 2 gives an idea of the TEA2018A's internal systems.

D3-D6 form a bridge to provide full-wave rectification of the incoming mains supply. Reservoir capacitor C69 charges to approximately 340V to start up the i.c. and supply the primary winding of the chopper transformer T1

The supply for the i.c. enters at pin 6. In normal operation it's derived from winding 3-2 of the chopper transformer, the rectifier circuit D7/C71 providing 11V d.c. At switch-on the supply is taken from R60/R89/R91 which charge C71 from the rectified mains rail: the voltage has to reach 5-8V before the i.c. will swing into life and deliver drive pulses to the base of the chopper transistor Tr6. C71's capacitance is sufficient to hold the voltage at pin 6 long enough to allow the chopper-derived supply to be established via D7.

Tr6's base drive current is derived directly from pin 5 of the i.c. To ensure rapid and positive turn-off the drive current swings negatively with respect to chassis. For this reason R102/D23/D8/D10 are connected in series between the negative side of the bridge rectifier and chassis. R97 and C74 smooth the supply of approximately -2.2V applied to pin 4.

Regulation of the output voltages is achieved by sensing the feedback provided by pins 2-3 of the chopper transformer. This time the rectifier circuit consists of D20 and C72: R61/RV9/R94 sample the resultant d.c. and pin 8 of the chip senses any changes in the switch-mode power supply's output – the control circuitry aims to maintain the voltage at this pin at a constant 2-5V. The set-h.t. control RV9 should be adjusted for 95V at the cathode of D12.

Unlike previous asynchronous chopper power supplies used by Ferguson, this one's operating frequency is held constant by R92 and C73. Control of the output voltage is

achieved in the usual manner, by adjusting the markspace ratio of the drive waveform produced at pin 5.

Two separate systems are used to provide protection against overload conditions. The first monitors the voltage at pin 3 of the transformer, feeding pin 7 of the chip via R93. This system looks for transformer saturation: the drive to Tr6 is shut-off in the event of saturation being detected. The second senses Tr6's collector current, which flows via R102 – this resistor is in series with Tr6,T1 and D23/8/10 across the rectified mains supply. The ramp produced across R102 is applied to pin 3 of the chip via R95. If the ramp voltage is excessive the drive to Tr6 is shut down. These two shut-down modes are short-term and cope with transitory conditions. A permanent overload will cause the supply to trip cyclically: as a result, T1 will emit a ticking sound.

Tr6 is protected by two networks in its collector circuit. C75/R101/D11 provide rate-of-rise limiting. When Tr6 is turned off, D11 is turned on as its anode voltage rises, connecting the snubber capacitor C75 across Tr6. This effectively diverts the major part of the back-e.m.f. energy away from Tr6. When Tr6 is switched on again, R101 discharges C75 in readiness for the next cycle. D9 and R99 limit the back-e.m.f. and prevent excessive ringing in the transformer. Fig. 3 shows the voltage waveform at Tr6's collector.

Tuner and IF Section

The familiar shape of the Ferguson SC4 tuner should be a reassuring sight to the engineer finding his (or her) way around this chassis. Manual channel selection models have the Preh switch-bank with the tuning tool-a.f.c. switch plunger while remote control models have the same basic system that went into TX90 sets with remote control.

The SC4 tuner's output is pi-coupled to the base of the i.f. preamplifer transistor Tr1. Gone is the i.f. preamplifier chip used in former models. The SAW filter is a new type from SigTech. It doesn't require a balanced input but has a balanced output to interface with current i.f. amplifiers. This results in a simpler and inherently more reliable design, with no loss of performance compared to what went before.

The main i.f. amplification and synchronous detection are carried out in the TDA4501H package (IC2). A feature of this i.e. is the very large number of functions it contains in relation to the peripheral component count. Fig. 4 shows the tuner, the i.f. preamplifier and IC2 circuitry. L4 is the synchronous detector tuning coil. No separate tuned circuit is necessary for a.f.c. - an on-chip 90° phase-shift network takes care of that – but the vision i.f. must be correctly tuned to 39.5MHz for it to work properly since this is the frequency at which the on-board phase shift network operates. The a.g.c. output at pin 5 can be positive-going for tuners with npn transistors or negative-going for tuners with pnp transistors. The polarity depends on the voltage at pin 1: for positive-going a.g.c. this voltage should be 3.5V while for negative-going a.g.c. it should be 8V. The onset can be adjusted by slight variation of these voltages - RV1 is included for this purpose. Pin 5 is connected to an open-collector circuit

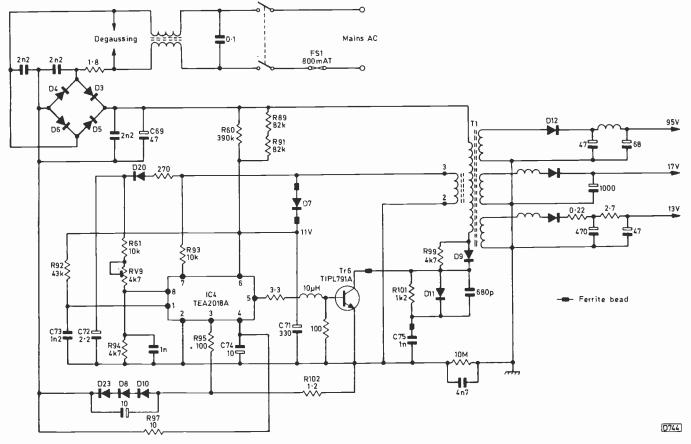


Fig. 1: The TX85's switch-mode power supply circuit.

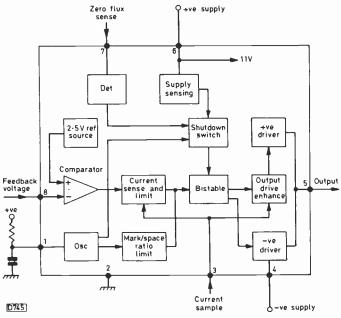


Fig. 2: Simplified block diagram of the TEA2018A chopper control chip.

capable of handling up to 2mA.

A video preamplifier follows synchronous detection. Its output at pin 17 consists of a 2.8V peak-amplitude positive-going video signal with the negative-going sync pulse tips sitting at a d.c. level of 1.5V. The intercarrier sound i.f. signal is also present at this pin. After passing through a 6MHz ceramic filter it re-enters the i.c. at pin 15. The luminance and chroma signals are passed to IC3 (TDA3565) for processing.

The usual quadrature detector is used to demodulate

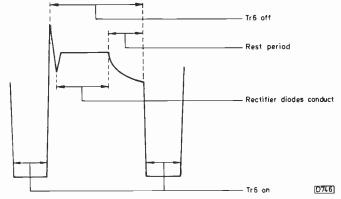


Fig. 3: The chopper transistor's collector voltage waveform.

the intercarrier sound signal – L2 is the tuning coil. The detected audio signal passes internally to the d.c. volume control (RV2) section. This is followed by a small audio amplifier stage to enable pin 12 to drive the TBA820M audio amplifier chip directly.

The TDA4501H's Other Circuits

In addition to the i.f. amplifier, synchronous detector, a.g.c., a.f.c., video preamplifier, intercarrier sound channel and audio preamplifier IC2 handles timebase synchronisation and incorporates the generator sections of both timebases. The i.c. offers some very sophisticated features.

Sync Separator

The video signal is passed to the sync separator stage via an internal low-pass filter. R15 determines the sync

slicing level. A noise inverter operates on negative-going impulses, disabling the sync separator to prevent false timebase triggering.

Line Generator

The line oscillator timing components C25/R23/RV3 are connected to pin 23 which also receives the output from the flywheel sync circuit via R22. There are the usual (nowadays) two line timebase phase detectors within the chip. The first compares the phasing of the incoming line sync pulses with that of the line oscillator signal. Its output is filtered and applied to the oscillator via the resistor just mentioned (R22). The operating conditions of this phase detector are determined by the strength of the incoming aerial signal (there's a feed from the a.g.c. circuit) and on whether the circuits are in or out of sync. With an unsynchronised signal the sensitivity of the catching circuit is set at 6kHz per μ sec, which guarantees a short catching time. As the switching of the operating conditions is done automatically within the i.c. any programme selector button can be used for the AV input, though for psychological reasons one selector is still labelled AV. On a strong synchronised signal the $6kHz/\mu$ sec catching rate is operative during the field flyback period to ensure lack of "top flutter" with an AV input: during the field scan this figure is halved (the time-constant is doubled) to 3kHz/ μ sec. If the input signal is synchronised but weak the time-constant during the field scan is further increased to give a catching rate of $2kHz/\mu$ sec to ensure that the picture is steady.

The second phase detector has an external connection at pin 28. It compares the timing of the line flyback pulses with the synchronised line oscillator output and adjusts the timing of the line drive to counter switching-time delays in the line output stage. The reason for this is to maintain correct centring of the picture within the raster over the full range of c.r.t. beam current. A degree of horizontal shift can be achieved by varying the voltage at pin 28. In the TX85 however this voltage is fixed.

A coincidence detector within the chip monitors the in or out of sync conditions by comparing line flyback derived pulses with the line sync pulses. In the synchronised condition the d.c. output at pin 22, smoothed by C27, will be about 9.5V. When synchronism is lost the voltage falls to less than 2.5V. At this voltage the audio channel is muted via an internal connection.

A noise inverter blocks negative-going noise pulses to prevent disturbance of the sync separator. External sync pulses can be fed in at pin 25 if pin 19 is switched to a low state. This feature is important where the chassis is to be used as an RGB or video monitor.

The line drive output appears at pin 26. This is connected to an open-collector transistor whose load is R26. The positive-going edge of the waveform initiates the flyback. Under start-up conditions the "on" portion of the drive waveform is 50 per cent: under normal operating conditions this reverts to 45 per cent.

Field Generator

The TDA4501H incorporates a highly sophisticated field sync divider system. It has three modes of operation: which one is used depends on the quality of the incoming sync pulses. Optimum protection is thus provided against upsets due to interference or noise. The modes are selected by a counter system which looks for valid field

sync pulses such as those found with a broadcast standard vision signal. Blanking and top-flutter prevention pulses are also derived from this counter, which measures the time of arrival of the field sync pulses.

If no sync signal is found, only noise, the field divider is reset at line 628. The effect of this is to provide a raster of normal height. With a video signal present the counter operates first in the seek mode, in which it can be reset between the counts of 488 and 722, giving a wide acceptance range. The counter will try to move into the third mode, which has a narrow acceptance range, checking for a field sync pulse between counts 622 and 628 for a 625line signal or 522 to 528 for a 525-line signal. If no more than six field pulses have been clocked after 16 attempts the wide range mode two is adopted. Should the count of valid field sync pulses be fifteen however narrow mode three is adopted. In this mode the counter is monitoring the timing accuracy of the incoming field sync pulses: it reverts to the wide acceptance range (mode two) if fewer than seven out of 16 successive field sync pulses fall in the narrow acceptance range.

The top-flutter elimination pulse generated by this counter system is applied to the first line sync phase detector, disabling it to avoid disturbance caused by the field sync pulse.

The field blanking pulse derived from the divider system is very accurate. At the 50Hz field rate the duration of this pulse is 21 lines: for 60Hz systems the duration is 17 lines.

The composite field blanking anti-top-flutter pulse is present at pin 27 of the i.c.

The field sawtooth timing components R9 and C19 are connected to pin 2. The d.c. voltage here is 1.5V, with an 0.9V peak-to-peak sawtooth on top of it. Drive to the field output stage is provided at pin 3, with a peak of 0.5V at 1.5mA. Field feedback is applied to pin 4. Internal systems compensate for the 50/60Hz height variation – the difference is reduced to less than five per cent. The internal field failure guard system is also fed from this point. It gives video blanking in the event of the field timebase being inoperative. This is achieved by raising the field blanking to a permanent 2.5V d.c.

Sandcastle Pulse

The TDA4501H provides a sandcastle pulse output at pin 27. Its shape is shown in Fig. 5. The highest level, 7.5V, is the narrow burst gating pulse whose average duration is 4μ sec. This is generated by level detection on the line sawtooth signal. The intermediate level 4.5V pulse, of 12μ sec duration, is derived from the line flyback pulse. This is used for line blanking. At 2.5V we have the field blanking pulse whose duration depends on the standard, i.e. 50 or 60Hz.

Audio

Pin 11 of the TDA4501H can be used for either a manual d.c. volume control or the d.c. input from a remote control circuit. Minimum volume is with this pin at 0V, maximum at 2·4V. The audio output at pin 12 is taken via a de-emphasis network (R58/C30) to the TBA820M audio chip which delivers 1W r.m.s. at ten per cent total harmonic distortion.

Luminance and Chroma Processing

Luminance and chroma signal processing are carried

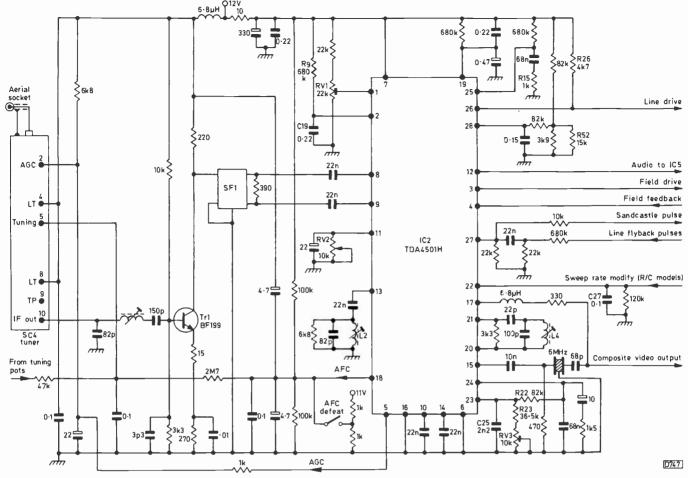


Fig. 4: The tuner, i.f. preamplifier and TDA4501H sections of the chassis.

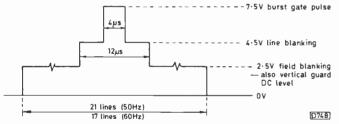


Fig. 5: Characteristics of the three-level sandcastle pulse produced by the TDA4501H chip.

out by a TDA3565 chip (IC3). Fig. 6 shows the circuitry. The composite video signal from IC2 is separated into luminance and chroma in the combined luminance delay line and separation filter DL1. Points to notice about this chip are the use of the red channel black level for proportional black-level clamping, adjusted via the user brightness control, and the single pin connection for the 8-8MHz crystal.

Beam limiting is carried out at the contrast control pin 6. The earthy side of the e.h.t. system is decoupled to

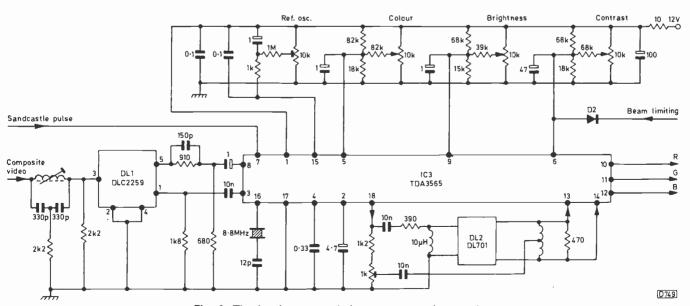


Fig. 6: The luminance and chroma processing section.

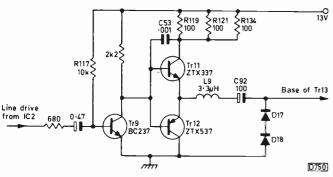


Fig. 7: The line driver stage.

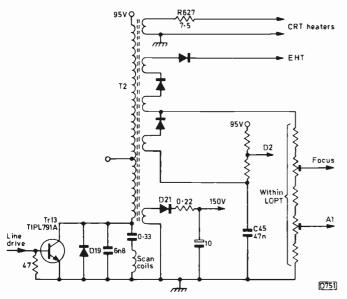


Fig. 8: Line output stage circuit.

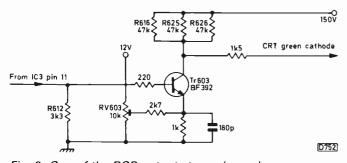


Fig. 9: One of the RGB output stages (green).

chassis by C45. As the beam current rises the voltage across C45 becomes increasingly negative. D2 will conduct at a point set by the voltage applied to pin 6 of the i.c. by the contrast control network and the voltage at its cathode. When it conducts it reduces the voltage at pin 6, preventing excessive video drive. The onset of beam current limiting can be modified by including a link which is in the field scan plug. On 14in. models the limiting is set at 600μ A: with larger tube sizes the field scan plug link is added to raise the limit to lmA (if you have the full circuit, the link adds R56 in parallel with R46).

Line Driver and Output Stages

The line driver stage is particularly interesting as it dispenses with the usual transformer coupling to the output stage. Line output transistors require a low-voltage, high-current base drive which is most easily achieved by using a high-voltage, low-current amplifier coupled to

the output transistor by a step-down transformer to give the low-impedance input required.

The needs of the TX85's line output stage can be met more simply by using a complementary-symmetry drive stage (see Fig. 7). With no drive from the TDA4501H chip Tr9 is biased on by R117 and the emitters of Tr11/12 are at near chassis potential. The line output transistor Tr13 is off. A negative-going line drive pulse from IC2 switches Tr9 off. Tr11/12's emitter voltage then rises to a value close to 12V for the duration of the pulse. R119/121/134 form a 33 Ω resistor to limit the current flowing via Tr11/12. C53 provides a degree of h.f. roll-off to avoid waveform overshoot. The line drive is coupled to Tr13 by L9 and C92: D17 and D18 limit the negative base drive excursion to 1-4V.

The line output stage (see Fig. 8) is entirely conventional. The output transformer is the same one that was used in the TX90 chassis. It's proved to be very reliable. The three-stage, diode-split secondary winding provides 20kV of e.h.t. There are two other windings. One supplies the c.r.t. heaters, via a 7.5Ω safety ballast resistor (R627). The other feeds a rectifier diode which produces a 150V supply for the RGB output transistors.

RGB Output Stages

A single class A transistor amplifier is used for each of the RGB output stages. BF392 transistors are used as the maximum dissipation in each stage does not exceed 400mW. As the three stages are identical we'll look at just one, the green output stage, see Fig. 9. Pin 11 of IC3 provides a 3V peak-to-peak drive across R612. RV603, which affects the background or low-light tracking, sets Tr603's d.c. operating conditions. No highlight colour adjustment is provided. Three $47k\Omega$ resistors in parallel are used as the load to cater for the dissipation. The use of parallel-connected resistors to obtain the required wattage dissipation is a cost-effective solution for two reasons: first the auto-insertion equipment has to handle only one size of component while secondly the purchase of only one resistor size in large numbers reduces the cost from the component manufacturer. For optimum performance the RGB output stages are mounted on the c.r.t. base panel.

Miscellaneous Points

The field output stage in the TX85 chassis is virtually identical to that used in the TX90.

The TX85 chassis uses narrow-neck (21·5mm) c.r.t.s which have a high deflection sensitivity. The trade-off is in purity reserve, which is no problem as long as a set is operated with an a.c. mains supply. A battery converter (type TA185) which is suitable for use with 12V or 24V d.c. supplies is available and is fitted to some models during production. When a set is operated for long periods with a battery supply, and hence without degaussing, a purity problem may arise. This can be resolved simply by plugging the set into an a.c. mains supply and switching it on. One attempt is usually sufficient.

A remote control version with sweep tuning is also being introduced. The extra circuitry is similar to that used in the TX90 chassis. The TX90 system is not completely compatible with the TX85 however, mainly because the switch-mode power supply requires different standby switching. There is also to be a version with a built-in teletext decoder.

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SONY SLC5

Lettering on the screen has a sideways wobble to the right and there are horizontal blue lines at different intervals down the screen. We've tried adjusting the tape path guides and the tension regulator arm. The net result is that the top four fifths of the picture flicker and produce double images, though the bottom fifth of the picture is perfect. It seems that the heads are faulty, but in this case why is the bottom of the picture so good?

When the heads are in an advanced state of wear the safety margin between the r.f. carrier level and the clip level becomes very small. As a result, tracking and tape tension become impossibly critical. The better tracking/tension conditions over the last fifth of the tape path account of the picture conditions you describe. A new head disc and careful adjustment of the tape path and tension will put matters right.

RANK T20 CHASSIS

There's a power panel fault in this set. To start with the chopper transistor and h.t. rectifier diode were found to be short-circuit. These were replaced and the board checked over but on applying power the d.c. fuse blew. When we tried again we found that the output rose to 250V before the fuse blew, instead of stabilising at 200V. The control transistor 7VT1 and switching thyristor 7THY1 have been replaced and all the diodes check all right in situ, but we still get BU326 failure and fuse blowing.

The chopper transistor seems to be running out of control. We suggest that you check $7R10 (1\Omega)$ and $7C5 (47\mu F)$ and replace 7THY1 as a precaution. Diodes 7D2 and 7D6 and capacitor $7C4 (47\mu F)$ in the stabilising part of the circuit can be responsible for this sort of trouble. When testing the unit, start with the slider of the set h.t. control 7RV2 at the 7R6 end – ideally you need a mains variac or some method of adjusting the a.c. input.

FERGUSON 3V29

There's an intermittent fault with timed recordings. On about one in six occasions the machine fails to make the recording, i.e. the tape hasn't moved and the machine hasn't switched on.

The cause of this problem is almost always a slipping loading belt on the underside of the deck. It's not very easy to fit!

HITACHI NP8CQ CHASSIS

When the set is switched on from cold in the morning it remains in standby. If left like this for half an hour everything works normally.

We have on several occasions known this fault to be caused by a faulty 18V regulator chip - IC1601. If

replacing this fails to cure the problem suspect the voltage sensing module CP901 in the power supply and the joints in this area, particularly around the chopper transformer, then suspect the transistors in the power supply. Use of a meter and scope when the fault condition is present should considerably narrow the field of search.

HG GRADE TAPES

This machine, a Panasonic NV366, doesn't seem to like HG tape. In record the machine squeals, suggesting increased tape tension due to additional drag over the surfaces of the tape transport system. The squealing also occurs in playback, with picture and sound distortion. E180 tapes work perfectly. The problem occurs with HG tapes of any manufacture but another Panasonic machine is quite happy with them.

Some middle-aged VCRs like this do give trouble with LP and HG tapes, and one sometimes has to accept that they are not compatible. We've found that judicious adjustment of the back tension and/or a check on the take-up torque can be beneficial.

THORN 1697 CHASSIS

Line hold is lost when anything – a light, fridge thermostat, etc. – is switched on or off near the set, the picture ending up as horizontal lines. The only way to restore the picture is to switch the set off for a few seconds. The controls have no effect on the fault.

The main suspect for this fault is the TDA1180 sync separator/line generator chip IC5. Before condemning it however check the following components, preferably by substitution, in the order given: the sync separator bias resistor R73 ($3.3M\Omega$); C71 (4.7μ F) in the flywheel sync filter network; the pulse feedback resistor R77 ($100k\Omega$); R70 ($820k\Omega$) associated with the coincidence detector; and the flywheel sync feed resistor R78 ($100k\Omega$).

SONY SLC7

New heads have been fitted but we're having difficulty setting up the machine. The problem is to obtain a steady colour picture free of noise, with good sound. The picture can be resolved at times – clear, sharp and steady – but with noise bars and at the expense of sound quality. The new head disc appears to have only one slug on the underside – the original had two. Known good tapes are being used.

The new heads supplied have only the one tacho magnet fitted. This is of no consequence. Check that the entire tape path is clean, that the new head has less than three microns eccentricity, and that the upper drum is correctly mounted. If all these points are in order the tape path will have to be set up as specified in the SLC7 alignment manual. An alignment tape (or a very good substitute) and a suitable oscilloscope are required for this

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TELEVISION OCTOBER 1987

GEC 20AX CHASSIS Mk. II

The original fault was a blank white raster with flyback lines. Replacing R281 (82k Ω) in the bias network for the RGB output stages cured this. Now, after about an hour, the brightness slowly increases with flyback lines appearing. Switching the set off and on restores a normal picture for another hour or so.

Check the supply to the TDA2530 colour matrixing/drive chip (pin 9) when the fault is present. If the voltage is outside its limits (11·5-12·5V) replace the 7812 voltage regulator chip (IC205). If the 12V supply is o.k. it's likely that the c.r.t. cathode voltages are falling as a result of problems with one of the zener diodes in the RGB output stages – D212 and/or D218. If the c.r.t.'s first anode voltages rise when the fault occurs check R554 (1·5M Ω).



298

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.

The reliability of consumer electronic equipment has increased by leaps and bounds in recent years. Instead of developing a fault due to a defective component, a fair proportion of the equipment we now receive for repair has been damaged by the user – faults due to liquid spillage for example have been featured in *Television* on several occasions recently.

While moving house one of our customers had an accident with a JVC Model HR2200. Not spillage this time but a violent trip down a flight of stairs. By the look of it the machine had bounced several times during its descent.

In the circumstances it appeared to have fared not too badly. There was some superficial damage to the cabinet, but electrically it didn't work at all. Some of the PCBs had hairline cracks, and in locating these we were somewhat misled by the fact that the fluorescent display didn't light up. Cracks in the power supply and servo boards were located and repaired, and after doing this the machine would play back and record satisfactorily – at least it would record from its audio and video line input sockets.

Investigation of the front PCBs revealed a crack across the timer/display panel. After repairing the broken tracks here we thought that our troubles would be over. The channel buttons now worked o.k. but the display panel remained in total darkness. We thought this was due to a further crack we discovered in the filament supply print on the board, but there was still no light after this had been repaired.

Diagnosis rather than repair was the next step: we shoved the soldering iron and fusewire to one side and made meter and scope checks around the display circuit.

The -22-8V unswitched line – accelerating voltage – was found to be present and correct, and the filament supply oscillator transistor Q403 was banging away at its prescribed 24kHz or thereabouts. We also found that the filament voltage was being applied between pins 1 and 25 of the display panel. A fault in the segment drive circuits perhaps? Laying a finger along the indicator's leadout pins sometimes lights things up, but not in this case. The ceramic resonator associated with the clock/display microcomputer chip IC401 was next checked and found to be oscillating, which suggested that the chip's supply voltage (10V at pin 21) was present – a meter check confirmed this.

Like all fluorescent displays the segments are pulse fed by a strobe system in order to reduce the number of connections required. A double-beam scope was used to check the digit-control and segment-control pulses simultaneously. They were found to be correct and also changed with the action of the programming keys on the panel. So it seemed that the operating voltage, the filament voltage and the drive pulses to the indicator were all present, but there was no response by way of light.

The cause of the problem was found soon afterwards, and the machine was then restored to full working order. The point to make is that careful inspection, bearing in mind the circumstances, would have led us to the cause of the problem much more quickly. It was something that couldn't have occurred in the very early JVC models – make of that what you can! See this page next month for the answer.

ANSWER TO TEST CASE 297 - page 774 last month -

The fault featured last month was a fairly straightforward one on a simple TV set – a Thorn/Ferguson monochrome portable, Model 4816, fitted with the 1590 chassis. The picture was streaked and shaded, but the main problem was a marked brightness gradation across the screen – the left-hand side was very bright.

The important test point was the 95V line, which supplies the video output transistor. With the scope probe connected to the cathode of the relevant rectifier diode, W14, a heavy line-rate ripple was revealed. It took the form of a misshapen sawtooth waveform. In fact the rectifier's reservoir capacitor C111 (1 μ F) had dried up, and the ripple waveform was modulating the video signal at the picture tube's cathode. This sort of thing is quite common in older TV sets, though the 1590/1591 chassis is a little unusual in using scan as opposed to flyback rectification to obtain the 95V supply. In designs that employ flyback rectification the fault would more likely brighten the right-hand side of the screen, when the energy from the flyback pulse would be reduced, giving the video output transistor a low operating voltage towards the end of the line scan.

Sage had the required $1\mu F$ capacitor ready and handed it to the technician to fit. He had been tempted to precharge it to give its recipient a nip, but could find no suitable voltage source in the 3V53 on which he was working!

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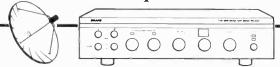
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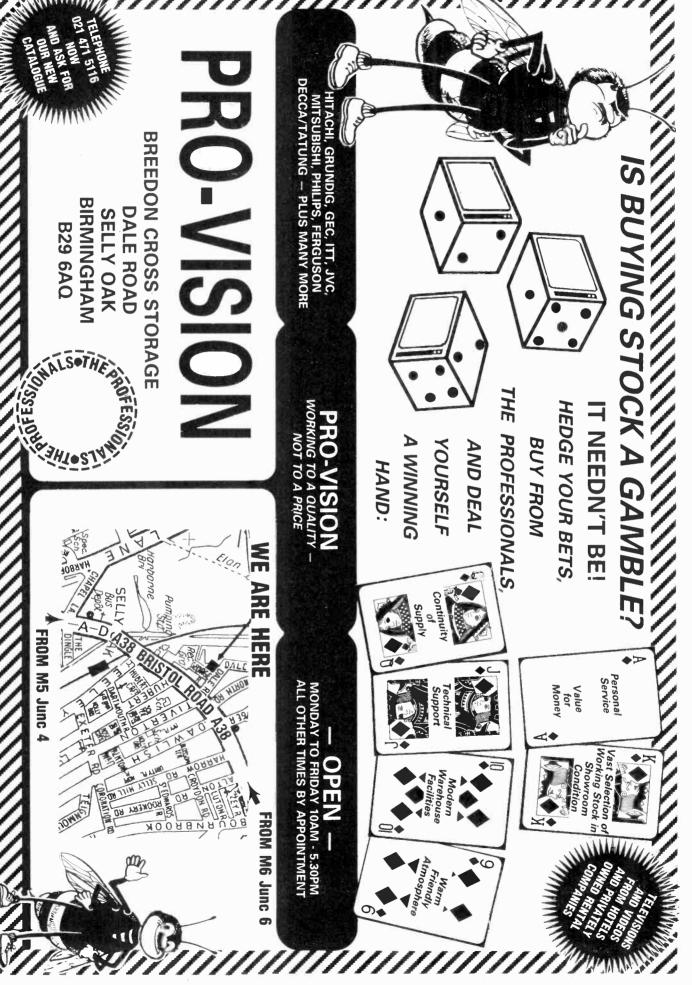




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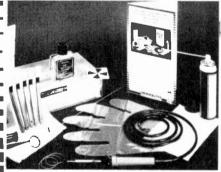
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2SA-771	£1.50	2SB-705	£2.50	2SC-1413	£3.00	2SC-3284	£1.50	AN-262	£1.10	BU-205	£0.68	TIP 20A CA-3089 £1.15 V-7450 £1.30 BR-2320 £0.7
2SA-794	03.03	2SB-716	£0.30	2SC-1445	21.00	2SC-3298	£1.50	AN-272	£2.90	BU-208	£0.68	V-8600 \$1.20 payorou BR-2325 \$0.7
2SA-798 2SA-808	£0.60 £1.50	2SB-717 2SB-718	20.60	2SC-1446	€0.75	2SC-3506	£2.30	AN-301	€2.35	BU-126	08.03	V-1220 10.7
2SA-808 2SA-817	£1.50 £0.15	2SB-718 2SB-757	£0.75 £1.30	2SC-1447	20.60	2SC-3519	£1.50	AN-302	£2.50	BU-500	21.00	TIP-30C F0 27 VC 10 CO 70 FERGUSOM CARTRIDGES CO-1020 CO 70
2SA-844	£0.15	2SB-757 2SB-772	£1.30	2SC-1454 2SC-1509	£3.50 £0.45	2SC-8050	£0.10	AN-303	€3.20	BU-326A	£0.95	TIP-31 Cft 22 US 250 SEC CO 02 3 3V00 C7 55 VMS-3U 17.50 CR 2032 Cft 7
2SA-850	£0.10	2SB-837	£0.50	2SC-1509 2SC-1567	£0.40	2SD-198 2SD-200	£1.90	AN-315	21.00	BU-508A	£1.30	TIP-31A,B £0.22 VS-7300 £1.35 3V16 £1.95 VMS-3S £7.50 CR-2316 £0.7
2SA-893	£0.30	2SB-857	£0.50	2SC-1568	£0.50 £0.45	2SD-200 2SD-235	£3.10 £0.35	AN-318 AN-340	£5.75	BU-508D	21.40	TIP-31C £0.22 VS-9700 C1 60 3V22 £2.00 CR-2420 £0.7
2SA-896	€0.35	2SC-352	08.03	2SC-1577	£7.70	2SD-233	£0.35	AN-360	£1.20 £0.75	BDY-20 TBA-120S	£1,20 £0,60	TIP-32 £0.22 3V23 £0.77 WATCH 2 CR-2430 £0.7
2SA-916	€0.18	2SC-372	£0.10	2SC-1550	03.03	2SD-299	£1.50	AN-5010	£0.73	TBA-231A	£1.05	TIP-32A,B £0.22 FISHER SV29 £0.75 CALCULATOR ALMALINE (Pour
2SA-921	£0.10	2SC-380	€0.12	2SC-1514	€0.75	2SD-313	£0.30	AN-5111	£3.50	TBA-231A	03.03	TIP-32C £0.22 VBS-7000 £2.40 DRIVE RELTS FOR MICRO Cells
2SA-940	€0.45	2SC-458	€0.15	2SC-1584	£5.50	2SD-315	€0.75	AN-5410	£2.80	TBA-520	£1.00	11P-33A E0.50 VBS-9000 E0.88 AUDID CASSETTE BATTERIES 810 (N) E0.4
2SA-950	€0.25	2SC-460	20.06	2SC-1586	£5.50	2SD-325	€0.45	AN-5431	£2.20	TBA-540	\$1.00	11P-41
2SA-958	€0.75	2SC-495	20.60	2SC-1627	£0.20	2SD-352	€0.50	AN-5435	£1.80	TBA-800	€0.45	111 410.0 LU.23 17 500AF 04 FF 110/14/ADLES
2SA-968	€0.75	2SC-496	€0.75	2SC-1667	£1.40	2SD-357	£0.35	AN-5440	£2.15	TBA-810S	00.03	TID 424 D CO
2SA-985	20.60	2SC-497	21.50	2SC-1669	€0.75	2SD-358	£0.35	AN-5510	£2.50	TBA-810P	£1.00	TIP 42C C124 JVC 68×1 2 to RW-48 50.42 A1604 (61 F22)
2SA-992	£0.30	2SC-536	90.03	2SC-1670	€0.75	2SD-381	90.90	AN-5612	£2.80	TBA-810AS	£0.90	TID 40 CO 27 HH-3330 12.00 86×1.2 20.12 RW-49 10.45 11
2SA-1048	£0.10	2SC-644	€0.25	2SC-1675	£0.10	2SD-386	€0.75	AN-5700	20.60	TBA-810AP	£1.20	TIP-102 C0 50 HR-7200 £0.75 120×1 25 £0.12 RW-410 £0.45
2SA-1060 2SA-1062	£1.50	2SC-681	£1.95	2SC-1722	£0.50	2SD-388	£1.80	AN-5720	£1.25	TBA-820	£0.68	TID 405 00 48 NN-3300 11.99 135×1 25 EU.12 NW-411 10.49 PHOTO
2SA-1062 2SA-1094	£1.20 £1.90	2SC-693	€0.25	2SC-1756	€0.45	2SD-389	€0.95	AN-5722	£1.35	TBA-820M	£0.60	TID 421 00 40 INC-4100 E1.90
2SA-1102	£1.90	2SC-710 2SC-717	£0.20 £0.25	2SC-1760 2SC-1775	€0.75	2SD-400	£0.15	AN-5730	£1.35	TBA-950	£1.90	TID 105 CO 46 TIN-0300 12.23 CO 05
2SA-1102 2SA-1104	£2.05	2SC-717 2SC-733	£0.25	2SC-1775 2SC-1815	£0.15 £0,15	2SD-401 2SD-426	€0.45	AN-5732	£1.25	TBA-1441	£1.05	TID 130 CO 46 HTC-3300 12.39 to CO 36 DW 30 CO 39 DDV 14 C1
2SA-1106	£1.50	2SC-738	€0.25	2SC-1819	£0.71	2SD-428	£1.50 £1.50	AN-5738 AN-5900	21.00	TCA-660	\$2.50	HCF4001BE £0.18 HB-7650 CO 77 88×0.5×4 £ HW-33 £0.45 HPX-23 £1.2
2SA-1110	£0.45	2SC-741	£1.95	2SC-1845	€0.15	2SD-428	£0.30	AN-6248	£1.50 £1.20	TCA-750 TCA-760	£3.00 £2.00	HCF4008BF £0.50 11177555 20.77 88×0.5×5 £ RW-36 £0.48 RPX-27 £2.0
2SA-1142	\$2.90	2SC-783	£1.10	2SC-1875	€2.40	2SD-468	£0.30	AN-6249	£1.20	TCA-760	£0.75	HCF4017BE £0.52 MATIONAL 122×0.5×5 £0.60 RW-37 £0.31 RPX-28 £2.3
2SA-1145	£0.20	2SC-789	€0.35	2SC-1890	€0.20	2SD-476	£0.45	AN-6250	€0.40	TCA-940N	£0.73	110140230E 10.23 114-333 1105 0 5 0 00 00 DW 200 00 E9 DDV 675 00 0
2SA-1147	£1.90	2SC-790	£0.90	2SC-1906	€0.25	2SD-478	20.90	AN-6320	£2.00	TCA-3089	£1.65	TICT4UZOBE 10.46 NV-8000 11.85 205 0 5 0 5 0 PW-310 CM 39 PDV-825 CM 6
2SA-1156	08.03	2SC-828	€0.15	2SC-1913	20.90	2SD-525	€0.75	AN-6338	£5.00	TDA-440	£1.45	HCF4U5UBE £U.32 NV-7/7 £U.95 RW-311 £0.39 RS-76 £0.6
2SA-1180	£1.80	2SC-829	£0.15	2SC-1914	€0.15	2SD-526	£0.75	AN-6341	£2.80	TDA-1011	£1.15	HCF40103BE £0.99 NV-7200 £0.84 CASSETTE HEADS RW-313 £0.44 LONGLIFE
2SA-1220	£0.45	2SC-839	€0.25	2SC-1922	£2.50	2SD-600	£0.90	AN-6342	£1.50	TDA-1012	£1.85	HCF40106BE £0.35 NV-7000 £0.95 MDND £0.90 RW-315 £0.42 (Supercell)
2SA-1232	21.80	2SC-929	£0.15	2SC-1941	£0.40	2SD-612	€0.40	AN-6360	£2.80	TDA-1054	£1.10	L-123CTB £1.30 NV-600 £1.45 STEREO £1.50 RW-316 £0.51 AC-3 (PP) £0.5
2SA-1262	£1.55	2SC-930	£0.15	2SC-1942	£2.70	2SO-613	€0.65	AN-6551	21.00	TDA-1059	£0.85	PLEASE PHONE US FOR TYPE NOT LISTED ABOVE.
2SA-1265	£1.30	2SC-941	€0.25	2SC-1986	£0.45	2SD-669	€0.45	AN-6651	€0.45	TDA-1151	€0.75	ALL ITEMS DELIVERY IS SUBJECT TO AVAILABILITY.
2SA-1303 2SB-324	£1.50	2SC-945	€0.15	2SC-2003	€0.25	2SD-716	£0.85	AN-6884	£0.90	TDA-1170	£1.00	ABOVE PRICES ARE EX-VAT, PRICES CAN CHANGE WITHOUT NOTICE.
2SB-324 2SB-337	£0.45 £1.50	2SC-959	03.03	2SC-2022	£0.30	2SD-718	£1.25	AN-6912	£1.25	TDA-1180	£1.45	SPECIAL QUOTATIONS ARE GIVEN FOR LARGE AND EXPORT QUANTITIES
2SB-407	£1.38	2SC-998 2SC-1012	08.03 08.03	2SC-2073 2SC-2120	£0.75 £0.06	2SD-733 2SD-745	€2.30	AN-7060	£1.25	TDA-1220	£1.20	FULL LIST AVAILABLE WITH ORDER OR SAE PLEASE 9" × 4".
2SB-492	20.30	2SC-1012	£0.80	2SC-2120 2SC-2229	£0.06	2SD-745 2SD-748	£2.40	AN-7105 AN-7110	63.12	TDA-1510	£4.10	ALL THE GOODS ARE NEW AND TOP QUALITY.
2SB-507	20.30	2SC-1010	£2.20	2SC-2229 2SC-2236	£0.25	2SD-748 2SD-761	£1.50 £0.45	AN-7110 AN-7116	£1.20 £0.90	TDA-1905	20.99	ORDERS BELOW £5.00 (EX-VAT) ADD P&P £0.78 (For U.K. only).
2SB-511	20.90	2SC-1050	£3.20	2SC-2240	£0.15	2SD-761 2SD-8228	£4.50	AN-7116 AN-7117	£0.90	TDA-1908 TDA-1670	£1.20 £2.70	BUT ORDERS ABOVE £5.00 (EX-VAT) P&P FREE (For U.K. only).
2SB-512	£1.25	2SC-1060	£0.45	2SC-2274	€0.20	2SD-837	£0.85	AN-7118	£1.30	TDA-1670	Σ0.80	VISITING TIME: 10AM TO 6PM (MON-FRI) 10AM TO 12OM SAT.
2SB-514	€0.40	2SC-1061	€0.75	2SC-2278	€0.75	2SD-838L	£7.50	AN-7130	20.60	TDA-2002V	20.80	
2SB-528	£0.35	2SC-1096	£0.50	2SC-2275	€0.50	2SD-845	£1.75	AN-7140	£1.50	TDA-2003H	£1.20	ACIAN INTEDNATIONAL LTD
2SB-534	£0.35	2SC-1106	£1.80	2SC-2320	€0.15	2SD-850	£2.60	AN-7143	£1.50	TDA-2003V	£1.20	ASJAA INTERNATIONAL LTD
2SB-536	€0.50	2SC-1115	£2.90	2SC-2335	£1.10	2SD-859	£0.95	AN-7145	£2.20	TOA-2004	£1.88	36 GLOUCESTER ROAD, NORTH HARROW, MIDDLESEX HA1 4PW
2S8-537	00.02	2SC-1116	€2.90	2SC-2371	€0.50	2SO-869	€3.20	AN-7146	€2.20	TDA-2005M	£2.50	
2SB-544	£0.40	2SC-1162	£0.35	2SC-2427	08.03	2SD-880	€0.50	AN-7156	£2.80	TDA-2006V	£1.40	Tel: 01-427 8213
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SC1778 C) 28 SHUADD C) 2.0 C) 44100 C) 1.28 TSA1200 C) 1.10 UPC1026C C) 2.50 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C) 2.00 C) 44125 C) 2.92 TSA1395 C) 1.40 UPC1031 C) 2.00 C	BC1	59	€0.12	BU406	21.00	LA4032P	£2.00	TAA550	£0.40	UPC1020	£2.96
Bot1982					£1.20	LA4100	£1.28		Ω2.50 Ω1.10	UPC1025H UPC1026C	£1.25
BG183	BC1	77B	€0.28	BU426A	£1,54	LA4102	€1.46	TBA120U	€1.10	UPC1028H	£1.25
BG16381				BU508A	£2.00	LA4420	£1.80	TBA396	£1.34	UPC1032H	£0.70
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BC184				BU807	£1.60	LA4460	£3.00	TBA560	£1.30	UPC1182H	£1.70
SEC213	BC1	84L	£0.13	BYW56	£0.34	LM1011	\$2,24	TBA750Q	£3.00	UPC1186	£4.00
SEC213				BYW96E	08.03	M5152L	£1.06	TBA800	£0.84	UPC1365C UPC2002	£5.50
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BC223F D1 4 BY227 D3 ML237 C2.56 D1A1002 S1.56 S1.56 C2.40 D1A1025 C2.40 D1A1036 C2.40	BC2	14	£0.14	BY206	€0.16	MB3712	£1.80	TCA800	€7.00	STR441	£5.75
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0.000	BC3	103	€0.48	BY299	€0.26	SAA5010	96.83	TDA1074	€1.70	8 pin	€0.30
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BC5578	BCS	47 48	£0.12 £0.12	TIP30C	£0.68 £0.50	STK013 STK014	£10.00	TDA2006	£1.80	MHXED	
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BEF640	BCS	58	£0.09	TIP32C	£0.46	STK080	£16.00	TDA2151	£3.00	047mfd 100	X0v£0.45
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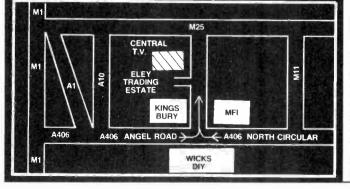
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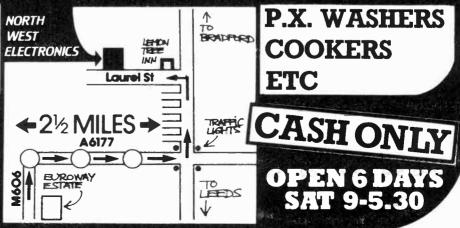
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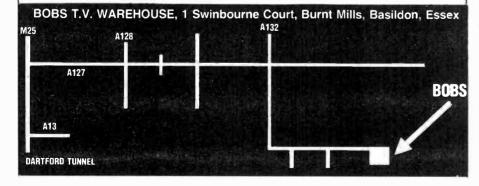
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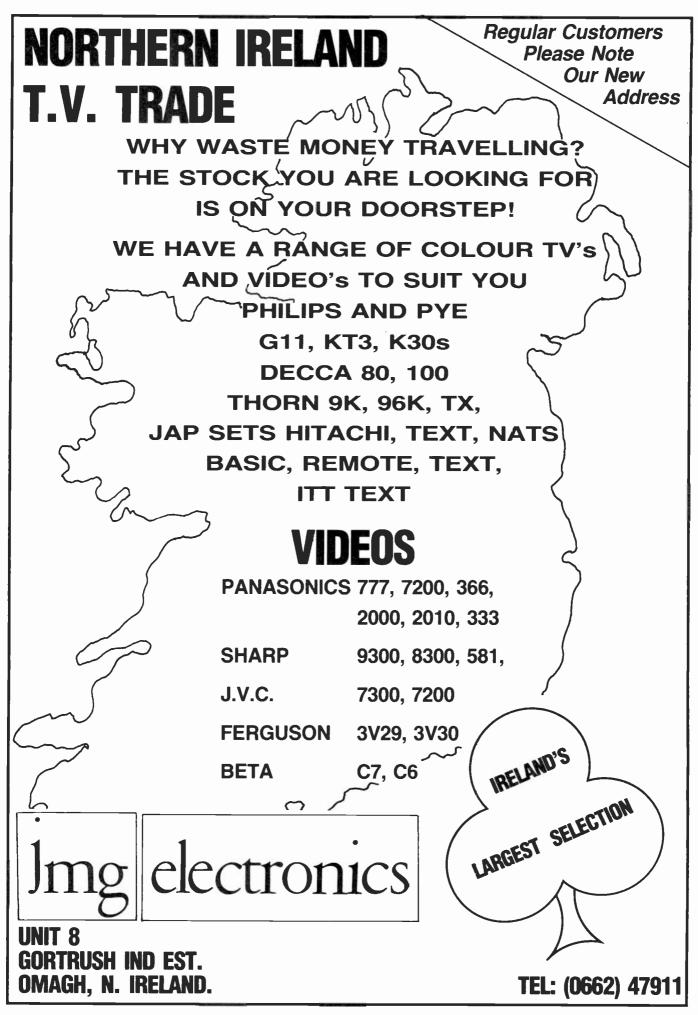
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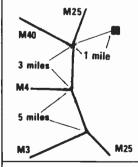
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NEW 2110 GEC Sound O/P	BU 407 BU 426V	60p 60p	BYF 1202 10p BYF 1204 10p	Contact Cleaner Philips Cans of Anti Static, Degrease Lorlin Full Remote Relay Sw	e Cleaner and Anti-	Corona	All at	£1.20 £1.40 £1.00
Panel £1 2110 GEC L.O.P.T. Panel £6	BU 500 BU 500D BU 508A	£1.10 £1 £1.20	BYF 3214 40p BYX 10 10p	Mains timer. 13 amp — up to Screen locking agent, large ca	o 2 hours: easy to u an	ise, plugs in	to socket	£3.00 £1.50
2110 GEC Power Panel £5	BU 705 BU 807 BU 824	£1 £1 50n	BYX 36/600 35p BYX 38/300 25p	Red E.H.T. LAED and Ano Weller solder iron 15 watt/25 Hitachi Silver Oxide Battery	rde Cap watt	CDAA I EV		£1.00 £5,00
Line o/p frame panels GEC 20AX £10.00	BUT II BUW II BUW 84	50p 75p	BYX 55/350 10p BYX 55/600 (Bead) 10p	100 Coax Plugs De-solder pump + 2 nozzels		V6.1 447ic		60p £12.00 £4.00
ITT CVC40 Push Button Unit & Mains Switch £12	BYW 20-08-9 BYW 95	60p £1 10p	BYX 71/350 20p BYX 71/600 50p	Flat Red LED and Green 500gm 60/40 solder reel				5p £6
▽ 25% OFF ▽	TIC 106a TIC 116m TIC 116n/Y 1003	30p 40p 35p	BYX 72/300 20p BYX 36/600 50p BYV 95B 10p	Solder 1 kilo reel Dual v/u meter -20 = +10db K30 thermistor 232266298009				£5.50 £1
Rank Panels Z736 Tuner I.F. £10 A805 Conv. 7/8 £2	TIC 126N TIC 206m	40p 30p	BVY 95C 12p BYV 96D 10p	De-solder Pump Portasol Flameless Gas Solder	ring Iron			75p £2.50 £16.00
Z780 Line O/P £10 Z968 £10	TIC 225S TIC 226E TIC 226m TIC 236m TAG 226/600	40p 40p 30p	BYZ 106 10p BPW 41 15p BYW 56 2A/1000v G11 8p		KT3 PANEI	LS		
Z582 1.F. Panel £5 KT3 Teletext Power	TICA TOOD	30p 50p	BZU 15/24 54p BZY 93c75 50p	Tube on Panel Sound Output RGB Output Ch	hroma Panel, I.F. Par	nel, Power I		£1.00 each
Supply £10	(TD92 case 2A/400V) TIP 29 TIP 30	10p 20p 35p	BZV 15/18 30p BZV 15/30 30p BZW 70c6v2 10p		P P	Plastic Boxes	s 4¾ × 4 × 1 × ¾	50p
BA 301 £1 TA 4127 £1 HD 3884 2A23 £3	TIP 30A TIP 30B TIP 30C	35p 35p 40p 45p	BZX 79.3v 10p Bush thyristor RCA 76122 £1	SONY 1400KV Chroma Pane SONY 1400KV Touch button	unit £3.50	00 Fuses 100 W/W Re BF 199	es.	£2.00 £1.50 for £1
TA 4184 £1 TA 2125 £1 TA 4190 £1	TIP 31 TIP 32 TIP 33B	30p 25p 50p	Transformer 240v/20v-500Ma75p Chassis type Transformer	GEC Decoder Panel PC772A PC446A	3		m 100k pots. Rank	£2 for £2
TA 4138 £1 TA 4196 £1 TA 4174 £1	TIP 33C TIP 34A TIP 34B	30p 25p 70p 50p 50p 50p 50p 70p 80p 70p 40p 70p 30p 30p	CVC 20 tube base £2 Tube Base Rank & G11 £1.20	Tube Base 20AX GEC PC85	2B3 £1 so	ome with lo	IF Aerial Isolating Sock ong leads. Fit ITT, GEC	c.
TA 4139 £1 TA 4198 £1 TA 4167 £1	TIP 34C TIP 35B TIP 35C	70p 50p	6v-9v-13v tape motor 75p Infra red led	Thom Aerial Socket TX10	£I	Philips, Pye	Mixed Packs	£1.00
TA 4199 £1 BA 546 £1 BA 328 £1	TIP 35D TIP 36	80p 50p	LD57CA 15p AT 4041/41 transductor £1	12 Volt Mains Trans 500M/A			wer Trans RCA 16182 t for BD124 and Mount	
TA 4176 £1 TA 4145 £1	TIP 36C TIP 41B TIP 41D	70p 40p 70p	15K-20 turn pots 20p Thorn panel 6×100 pot + changeover switch (Irish) 50p		- K	Kits 50 Mixed At	C series Transistor	£1.00 £4.50
TA 4191 £1 HA 11710 £1 TA 4188 £1	TIP 42/BRC 6109 TIP 48 TIP 49	30p 40p 30n	Thorn 3500 2A cut out 50p		s 1: 25 for £1.00 2	10A 25 LED red/	/yellow/green	£1.50 £1.50 £1.50
TA 4197 £1 TA 4183 £1 TA 4197 £1	TIP 57 TIP 100	30p 30p	Stereo GEC amp 20 watt + pre-		25 for £1.00 2 20 for £2 2	201/C Holder 20 Large LE	rs ED Red	£1.20 £1.00
TA 4183 £1 TA 4195 £1 TA 4175 £1	TIP 102 TIP 115 TIP 117	30p 50p 50p 35p 40p 40p 30p 25p 30p	amp with 4 pots + mains power unit with circuit £6	G11 touch button red K30 full remote Dawer Ass w	6 for £1 1	20 Small LE 10×20 Turn 100 Transiste	100K Pots	£1.00 £1.00 £2.50
TA 4177 £1 TA 4192 £1	TIP 125 TIP 126 TIP 127	35p 40p 40n	SPECIAL OFFER	I.C. K30 VHF. UHF Dawer Ass	£7.00 2 £6.00 1	0 Converge 0 Thermiste	nce Pots ors	80p 50p
TA 4146 £1 TA 7265 £3 TA 7699P £3	TIP 130 TIP 131 TIP 136	30p 25p	Decca-TTT etc. FEO4/1/250AC/4 Mains filters	BU126 BU205	10 for £6.00 3 10 for £8.00 4	20 Slider Pot 30 Presets 40 glass reed	I switch	£1.00 50p £1
The Service Engineers Guide to Teletex £2	TIP 140 TIP 640	50p	(grey type) × 4 50p	BU105 BF458	10 for £6.00 10 10 for £1.00 4	0 press to n 10 Pots	nake switch	70p £1.50
4 Types Fedility front panels with i.e. & pats	TIP 2955 TIP L761A-1000V/4Am T 6032	35p p 75p 30n	BRIDGES KBL 005 30p	OA90 50 Ceramic Condensers	40 for £1.00 1 £1.50 H	Tube Base (00) Diodes Bandolier	 Condensers, Resistors 	£1.00 s on £2.00
£2 each BB 103 10p	T 6036 T 6040 T 6047	40p 40p	KBL 02 30p KBP 04 30p W02 15p	Mixed Mounting Kit for Powe Transistors	er 50p 2	Omm Fuse I Thassis Mou	Holders nt 20 f	for £1
BB 105A×12 £1 BB 105B×12 £1	T 6049 T 6051	40p 40p 40p 40p 40p	W004 15p W005 20p	300 Condensers 300 Resistors 150 Electrolytics	£1.50 11 £1.50 E £2.00	N4001/6 100 EHT Diodes	mixed s, small 20 f	£2.50 for £1
BB 105G×12 £1 BB 121a 10p 47 10p each	T 6052 T 9004 T 9005	40p 40p 40p 10p	Thorn Chassis U916D Complete £10	15 Bulbs Philips Antistatic Discloth	40p 5 for £1	00 Mixed D		£I
LA/1600V 10p DG3P EQV-BY228 10	ZTX 107 ZTX 108c ZTX 109k	10p 10p 5p 5p	Thorn TX9 Remote Panels with	SEND7 C.	1.1	100-500M/A 100-1,225 Ai Mixed V/Car		£1 £1
for £1 2 amp bridge rec. wire	ZTX 213 ZTX 341 ZTX 342	5p 10p 10p	I.C.s £2.50 Front Panel Thorn 9000 with	SENDZ CON TO ORDER SEE BAC	CK PAGE 🏻 🗀	Philips etc. TT Mains S		for £1
end 15p	ZTX 384	10p	Slider Touch Unit £4		- 10			£I

SENDZ TO ORDER S	COMPONENTS EE BACK PAGE	Rank T20 Z136 Panel NEW 1617 THORN Chassis with ICs & AU113 NEW GEC 20AX Power Supply Switch Mode Complete new GEC portable chassis M1201H/M1501H with P.B.U./ y.cap/LOPT1	£6.00 £5.00 £12.00	Tube Thermpath 167 £1 Rank Secam Decoder Panel UHF & V T115A £13 10 off .91 CAP G11 Philips ACAP LOM/395V
Toshiba VHF/UHL EG411	77 K35 Decoder £8.00 K35 Sound OP £4.00 K35 Split Dode 3(22-138-3593) £10.00 Inick Film Daughter K73 3122-127-43891	Field + Jungle panel for GEC 3133/3135 GEC 2110 line panel with transformer	£1.50 £7.00 £12.00 £12.00	Philips K4 CAP 150M/385V 5 Multi-Caps 220 MFD Sprague 385V 5 350V 300M + 300M £1. 4400V 400M 6
Thorn Spares New 9000 Decoder £8.5	25 12 C H	Pye 205 T/unit Pye 205 Line op panel Pye 713 IF pamel and tuner	£3.90 £7.50 £7.00 £10.00	350 V 400 M 6 Thorn 3500 175/100/100/350v £1.
KKO) Cyclops panel £1.5 KKO/85(K) timebase panel £	80	Pyc/Chelsea Timebase panel with LOPTI Pyc 731 Frame Panel Pyc 731 Convergence Panel Pyc 731 Chroma ALL	£10.00 £5.00 £5.00 £10.00	KT3/200/25/25/385v £1, KT3-K30 220+40+40 7 200+200+75+25M 325V £1, 300+300+150+100+50MFD
500 convergence panel 4 000 Power supply 4 600 Mains lead, switch	Pridelity Tube Base with transitor & focus pot £1.50	Pyc 731 IF panel + tuner Pyc CDA/205 panel GEC portable chassis + LOPTI 2114 New Thorn 1613/1713 chassis	£10.00 £6.00 £4.00	350V GTT CAP 470/250 47/220/350v 6
500 Focus unit £1.5	I Bush Tube Base on panel £1.00	G9 Power Panet Mono RANK Chassis 127A NEW NEW G9 Frame Panet	9,75 £6,00 £10,00 £4,00	150/150/160/160/160/320v £2. 2500/2500/63v 5 150/200/200/30hv 7 300/100/160/275v £1.
00 cut outs 10 for £ 00 IF panel £ 00 Frame panel £	Line Transformers	NEW GH IF Panel G8 Tuner Unit + Panel	£10.00	100/200/325v
00 A1 Diode 26 port 3500 IF panel 4 board with set of SN74LS 4	-2 Dhilim	G8 Power Supply £5.00 .7.250AC7.250AC	20p 20p 5p 25p	300/300/100/32/32/3005/ 2, 1500/2000/305/ 5 150/150/100/100/3205/ £2,
X) Al pots 50 am limiter panel £1.5	4 Thorn 1690 LOPT £6.50 P 2 J/Pots 3.500 F off each type £3.00 0 G8 Trans. Philips £7.00	G8 Chroma £3,00 17(00 × 10 22/100 4.7M/100 4.7M/100 4.7M/100	30p 10p 5p 20p	100/350 + 300/200/100/16/275v £2, 225+25/380 GEC 70, 200/100/100/350v £1, 500/500/25v 5
Vay regulated adaptor 240V 6V/ /9V/300mA £3.5 nk/Toshiba preh anit (1354 £9.5	0 Lead £1.50	G11 Selector gain module 23.00 47(M)/100 47(16) Complete CVC 825 Chassis (both 300 300)/300V	75p 10p 80p	150/150/100/300v 7 200/150/150/300v 1. ITT 8 and 6 Push Button £1,
ush button unit preh ush button VHF/UHF for ap. GFC-Decea type ush button for CVC5 111 \$8.0	GEC 2110 £7.00 Mullard AT 2036 £1.50 Pvc 169 Line Trans £3.00	AEC V/Cap Resistor Unit UHF with IC SAS66H SAS670 23.00 2714 RANK IF Panels 6MHz 1 LC. "NS 1500V	50p 5p 10p 15p	Pye 725 LOPTs
3 12 Push button unit £2.0 3 (Export) 12 P.B.u	0 Pye mono £3.00 Rank mono 1704A £3.50 £3.50 \$2.	SL437F £3.00 3n,3/250 A.C. ZW/9B RANK IF Panels Export 5,5MHz 2 I.C.'s 39/250V TBA (21/5B TCA2705Q £2.50 4n7/250 tested 5KV	10p 20p 15p 25p	CMC 301 front panel £8. CMC 303 front panel £8. CMD 800 Chassis. No tuner £20. CMD 800 Decoder £8.
ush button Unit Thorn ush button GRC ush button PYE 731 string aid unit nk Z718 4 P/B/Unit MECH	0 Rank L O P T, Z970 £3,00 CVC32 £6,00 CVC32 £6,00 AT2080/15 £5,00 CVC30 1TT £5,00	X35 F 26.00 22/250 Z743 RANK F Panel 47/250 Export 5.5M t2 3 1.C s 100/250	15p 10p 20p	CMD 800 IF/Tuner £20. UPC 574 3 BSS 38 3
utton Unit GEC with Lamps £ Push Button Unit £6.0	4 CVC32 Line Tran	TBA750+SC9504P+ SC9503P Pve G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead £5.00 G11 479/250 GEC600/250 709/250 309/2300 MFD 350v	60p 11 00.13	G11 £1. 11.C. Receiver Panel 31.C. Power Supply G11 Full Remote
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374 Thorn £ orn 1600-1700 £1.5 ik Toshiba Tube Bases 30	S I.C Universal Empler £5.00 II 1JT £2.50 II TGA £2.00	CVC9 slider pots panel 50p 220/385 (ITT) CVC 5 Mains on/off + 5 pots £2 330/385 CVC 820HT 0.1/400 Decca Units. 515 Pyc, Thorn and Decca Units. 52 KT3 E/W39/400	75p 60p 15p	HD1000 Digital £20. HD3000 Digital £25. HD5000 Digital £25.
Speakers E1.0 E1.0 G1f	0 Rank HTCP A823 £3.50	T147 Rank tube base on panel £1.00 .56K/400x Z718 Focus Unit £1.50 .56K/400x T70 Focus Unit £1.50 .22/400	20p 10p 10p	HD8000 Digital
50 ohm 50 35 ohm 70 15 ohm £1.0 speaker 16 ohm	p 11 TEZ Rank £3.00 p G9 Philips £4.00	Large Type 75p 8/4001 Decea Small 75p 33/400 KT3 Focus Unit 75p 4/01/400	40p	Hanset Tester Works at 24 feet – Sound repeater. Works off 9 volt battery Fits in top pocket.
70 ohm £1.0 8 ohm 15 watt £ 8 ohm £ 8 ohm 70	0 8500 Thorn £4.00 2 9000 Thorn £6.00 1 9500 Thorn £4.50	R30 Tube Fase on panel \$1.00 22/04/80	40p 25p 15p	Repaired Handsets Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day
16 ohm £1.0 ia 16 ohm £1.0 ia 8 ohm £1.5	D 2040 GEC £3.50 D GFC FVM25 Tripler £2.00 D Universal Tripler £5.00	Fedility Focus Unit 14R-14S 30p 0.1/450 A/C wire end 22/10/10 1TT Small for use with Split (0.1/450 A/C wire end 22/10/10 (0	15p	RC4001 Full Remote KT3 K30 Teletex Handsets exchanged £9.
dia	D CVC20-32 £5.00 Decca 80 100 £4.50 Grundig TVK 52 £2,50	Z718 Bush Focus Z2.00 0.047/10(x)	100	GEC Full Remote Infra-red, 1983 mode £15. Timers, 60 mins, small £1.
sq 15 ohm 75 speaker K30 75 a 15 ohm 60 5×3 12 ohm £	b HTHY £4.00 D22 for Pve 18" colour portable £4.00 1 1.P 1193/63 £4.00	16/0 Thorn EHT Rec and Lead 50p	10p 10p 10p	HAND SE S 24 Button CT938 Fulirem ate 32 Button CT983 Videotext £6.
Philip 15 ohm 75 15 watt £ K f 3-K 30	LRO Tripler print type with foacs PO7 BG2087 £5 T/text ultrasonic rec'r panel £14.00	TV18	15p	Large type ITT TV and V.C.R. Handset £15. GEC Ultrasonic 8CH Full F.emote £15.
550 F.W 107 513 correction 107 557 507	GFC's fouch unit assy complete with all LC's + pots £4.00 GH L.W. Transformer 500	2021300 01/1600 G11 drawer ASS 3 pots Mains switch 01/08/V	15p 15p 20p	G11 Full Remote Ultrasonic £ G11 Touch Unit Full Remote £ G11 Ultrasonic Teletext Handset £20. 8 C.H. Ultrasonic GEC Full Remote
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198 107 204/4 81 206 81 208/200 81	KT3 AE Sockets 50p KT3 receiver panel £8 KT3 line driver transformer 50p	PHILIPS BATTERIES (Small Types) HAND SETS (Small Types) HAND SETS (SR4) (40p (1,0082/2500)	10p 10p 15p 15p	7228/7324; K12 26C 797/IST 66K 1826 £12. G11, Full remote top button assy. £12.
210/400 5j 210/800 10j 223 60j 224/600 4.8/A/6005 bridge 50j	Switch £1 E5 Decca 80/100 IF panel £5 NPN PNP 80V 6 Amp TO66 O.P	\$R43 40p 150/35(0) 150/35(10p 5p 10p	GH, Full remote repair service (exchanunit) £18. GH, Full remote new ultrasonic £32. GEC infra red full remote 8 channel
226 15j 227 15j 228 1500c 20j BY 229 black 15	5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T \$7.00 Control panel 5 sliders + mains lead\$1.50	LR43 40p 1898KV 1844 40p 1898KV 2108KV 2108KV 2108KV 2108KV 2108KV 1000/100KV 47/100V	10p 10p 10p	(1.C.SAA1250) £14. Philips infra red full remote 9 channel for 60 CP2605 £6. Philips infra red full remote 12 channel
299 Red 207 229/400 307 2599/60p Fig 300 237 5	PBU £24 OH 6 touch unit replacement with dat £14.00	CVC 20-25-30 Mains Switches	40-	for 60 CP2605 £12.0 K35 KT3/K30 T/Text £15.0
254 10 255 30 298 10	chassis £4.00 GEC Line O/P Trans & Rec Stick for Portable £3.00	Infra Red and Ultrasonic GH Teletext Decoder Panel RANK & ITT Mains Remote On-Off Switch (720R) RANK & ITT Remote Switch 2800 ohm GH Mains Switch	£30 £1.50 £1.50	KT3/K30 Full remote £15.1 KT3 Power supply £4.0 GEC infra-red 2236-2026 £4.1 GEC 8 button full remote £14.1
406 85 527 205 407a 106	CVC 20/25/30/35/40 decoder panel (untested) £5 CVC 40/45 IF panel £5	4 amp Mains Switch GEC Mains Switch 4 amp KT3 Mainswitch	25p 30n	GEC push pad handset button blobs 10 each Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177.
527 10p 602 10p 7 10p (KG 5p	PHILD'S NE511N £1.20 LM337M Reg 30p 20 GFC Black Spark Gaps £1.00	G8 Mains Switch G11 Preh Red LED P/Button for C.H. Change RANK TOSHIBA Transductors TPC-2011 Mains Switch ITT Long Type Print	20p 50p 75p	No RC\$150-RC\$176-RC\$171-RC\$177. Special Price £13.6 RC4001 KT3 and Teletex £14.6 IT CVC 32 handset repaired £15.6
3102 50g V 28/200 20g v/2 75 amps 10g rmational Rectifier EHT Diodes G	K13 Front Panel Control Assy £2.50 BTW 30/50 50p	Mains Switch ITT Long Type Print Mains Switch Philip Long Type TAG Mains Switch GEC Long Type TAG 2000 Chassis Fidelity Mains Switch (4 TAG) 250V/4A White Lorlin Mains Switch	75p 75p 60p	CVC 32 Hand Set £15.0 CVC 45 3 and 2 Pin PHILIPS
600V Stud Diodes 20p 1000V Stud Diodes 20p	BTW 92/800R £3	2507/4A White Lorlin Mains Switch KT3-K3b-K35 Full Remote Mains Switch (6 TAG) Teletext Adaptor Kit TY-500 Panasonic	60p £1 £12	UNIVERSAL HAND SET £20.00 KT3 - K45 We have all parts for Philips Handsets

Tuner Units 240 Volts Aerial Amps VIIIUHF 3 Was	Mullard Video Modulator. Application, video tage recorders, TV cameras, video games, closed circuit T/V, C C L R. system. Data supplied £10.00	SAA1276 £3,00 SAA3027P £4,00 SAA50000A £1,50 SAB3013 £2,00 SAB3210 £2,00 SAB4209 £2,00 TBO0124 £1,00 TBO0124 TBO0124 \$1,00 TBO0124 \$1,00 TBO0124 \$1,00 TBO0124 T	TBA920 TBA950 TBA950 TBA950 TBA950 TBA9800 TBA9800 TBA9800 TMSP801 TMSP801 TMSP801 TMSP801 TMSP801 TMSP801 TMSP801 TMSP801 TMS2703IG45 TMS3720ANS TMS4014 TA-012 TMS9720ANS TMS4014 TA-012 TMS9720ANS TMS4014 TA-012 TMS9720ANS TMS4014 TA-012 TMS970ANS TMS4014 TMS970ANS TMS4014 TMS970ANS TMS4014 UPC1363 U	€1.50 TDA2611A €1.00 €1.50 TDA2611AQ €1.00 €1.50 TDA3651A €1.00 €1.00 TDA3652 €2.50 €2.00 TDA3651A €1.00 €1.00 TDA3652 €2.50 €2.00 TDA2653 €4.00 E1.00 €1.00 TDA2653 €4.00 TDA2660 €1.00 €1.00 TDA2660 €1.00 €1.00 TDA2560 €4.00 TDA3560 €4.00 E1.00 TDA3560 €4.00 E1.00 TDA3561 €3.00 TDA3571A €2.75 70p TDA3650 €4.00 €1.00 TDA3581 €3.00 E1.00 TDA3581 €3.00 E1.00 TDA3581 €3.00 €1.00 TDA3651 €3.50 €1.00 TDA3651 €3.50 €1.00 TDA3651 €3.50 €1.00 TDA3651AQ €3.00 E1.00 TDA3661AQ €3.00 E1.00 SP141S 125AN 30p €1.00 SP141S 125AN 30p €1.00 SP141S 125AN 30p €1.00 SP141S 125AN 30p €1.00 SP141S 125AN \$610 E1.00 SP141S 125AN \$610 SP1
BRX38X	10p 310 201 30p ML 287B £4.00 10p 310 578S 30p ML 288B £4.00 10p 310 578B 50p MI 50p MI 50p 10p 310 588B 50p MI 50p MI 50p 10p 310 373B 50p MI 50p MI 50p 10p 310 373B 50p MI 50p MI 50p 10p 310 373B 50p MI 50p MI 50p 10p 310 343B 50p MI 50p MI 50p 30p 310 438 30p MI 400R 60p 10p 310 567S 30p MI 50p MI 50p 10p 310 681 50p MI 50p MI 50p 10p 310 681 50p MI 50p MI 50p 10p 310 567S 30p MI 50p MI 50p 10p 310 567S 30p MI 50p MI 50p 10p 310 681 50p MI 50p MI 50p 10p 310 567S 30p MI 50p MI 50p 10p 310 567S 30p MI 50p MI 50p 10p 310 567S 30p MI 50p 10p 310 567	TA7699P	TDA.2560 1DA.2575 1DA.2577 1DA.2579 1DA.2581 1DA.2581 1DA.2581 1DA.2560 1DA.2560	CL. 00 A 1222 A 1223 A 1223 A 1223 A 1223 A 1224 A 1225 C 12

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