THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

FEBRUARY 1996 £2.35

A REED BUSINESS PUBLICATION

Digital radio from space

Tatung 190 chassis faults

Recording the chroma signal

Amstrad SRD510 1D mod

Servicing PC monitors

Fault reports

Satellite

Video

TV

02>

9 770032 64706

PHILEX THE MARKET LEADERS IN HIGH PERFORMANCE COMPATIBLE VIDEO HEADS

8 good reasons why you should stock the Philex range of Replacement Video Heads

PHILEX PLC

RANGE the largest range of replacement heads in Europe

AVAILABILITY extensive stocks available

CROSS REFERENCE full listings are available for easy identification

VALUE quality replacement heads at very competitive prices

SERVICE the Philex "availability" network through major distributors and wholesalers offers fast and efficient service

QUALITY manufactured using the latest engineering concepts from top grade components

ALL TYPES AVAILABLE including camcorder, time lapse and professional heads

SPEED OF RESPONSE new heads can be developed in as little as 10 days

CERT NO. 12702

For more details on: Video Heads, Other products & Distributors Contact Phliex on: Tel: 0181-202-1919 Fax: 0181-202-0015

CONTENTS

FEBRUARY 1996 VOL. 46 NO. 4

This month's cover.

REGULARS

NEXT MONTH

Servicing the Panasonic Z1 Chassis John Coombes on fault-finding with this popular chassis that's found in 14, 16 and 21in. models. **The Problem of Pre-echo** This is a problem that can arise in strong-signal areas. It is often unexpected and can cause a variety of strange symptoms. The basic cause is direct signal pick-up within the set. Communal systems are particularly likely to be affected by pre-echo problems. Bill Wright provides guidance on how to tackle the situation. **More on the Toshiba V3** Michael Maurice with further information on this recent VCR range, including some fault hints. **A Visit to the Bowling Alley** The monitors were the problem here, all out of adjustment and difficult to get at. Chris Watton let himself in for the job – and didn't even get a free game! **VCR Signal Processing** A closer look at the techniques used in chroma signal recording. **Toshiba Service Briefs** More know-how from Toshiba Technical.

Our March issue will be published on February 21st

Editor
John A. Reddihough
Production Editor
Tessa Winford
Consultant Editor
Martin Eccles
Publishing Director
Susan Downey
Advertisement Manager
Carol Nobbs
0181 652 8330
Advertisement Sales Executive
Pat Bunce
0181 652 8339
FAX 0181 652 8931
Editorial Office
0181 652 8120
FAX 0181 652 8956
Newsagent Enquiries
David Sanders
0181 652 8152
Fax 0181 652 8997

Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than given in our Spares Guide

GRANDATA LTD

K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE, SOUTHWAY, WEMBLEY, MIDDLESEX, ENGLAND HA9 0HB

Telephone: 0181-900 2329 Fax: 0181-903 6126

TRANSISTORS / LINEAR ICs

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
AAY32	9p	BD246A	50p	BFY64	25p	MJ15004	300p	2N1613	24p	3.276	115p	BR84D	37p	6502A	360p	AN7156	240p	HA13108	350p
AC107	40p	BD265	45p	BFY90	45p	MJ2501	100p	2N1711	24p	4.0	110p	2A/400V		65C02	930p	AN7168	200p	HA13412	600p
AC125	30p	BD267	45p	BLY48	85p	MJ2955	55p	2N1893	30p	5.0	130p	BR86D	43p	6522	280p	AN7178	180p	HA13432	400p
AC126	30p	BD269	45p	BR100	14p	MJ3000	100p	2N2102	50p	10.0	140p	2A/600V		6800	210p	AN7222	75p	HA17524	250p
AC127	30p	BD278	50p	BR103	37p	MJ3001	100p	2N2218A	24p	11.0	250p	BR88D	43p	6802	220p	AN7254	150p	ICL7106	650p
AC128K	40p	BD311	100p	BR303	85p	MJE29A	30p	2N2219	24p	12.0	120p	2A/800V		680	500p	AN7256	250p	ICL7660	240p
AC141K	45p	BD314	100p	BSS74	33p	MJE30A	30p	2N2221	23p	14.756	200p	BR32	43p	36808	500p	AN7310	60p	KA2102	150p
AC176	22p	BD315	150p	BSX20	15p	MJE340	25p	2N2222	23p	15.0	160p	2A/200V		6809	500p	AN7311	90p	KA2130	150p
ACY18	48p	BD317	150p	BT100A	70p	MJE350	80p	2N2369	15p	24.0	250p	BR34	43p	6810	150p	AN7410	150p	KA2206	150p
ACY19	48p	BD331	40p	BT106	180p	MJE520	30p	2N2484	15p			2A/400V		6818	380p	AY3-1015	290p	KA2209	125p
AD149	60p	BD332	40p	BT109	90p	MP8112	45p	2N2646	40p	*VOLTAGE REGULATORS*		BR36	44p	6821	130p	AY3-1270	800p	KA2210	230p
AF125	50p	BD361	60p	BT119	100p	MPSA05	15p	2N2904	20p			2A/600V		6840	290p	AY3-1350	450p	KA2212	80p
AF139	30p	BD362	60p	BT146	99p	MPSA06	15p	2N2905	20p	7805	25p	BR62	80p	6845	900p	AY3-8910	360p	KA2213	130p
AF239	30p	BD370	30p	BTY79	140p	MPSA13	15p	2N2906	18p	7806	25p	6A/200V		6850	90p	AY3-8912	400p	KA2214	150p
BB105B	18p	BD371	30p	BU105	80p	MPSA20	15p	2N2907	18p	7808	25p	BR64	72p	8085A	300p	BA301	55p	KA2261	100p
BB205B	24p	BD410	50p	BU108	100p	MPSA42	15p	2N3019	28p	7812	25p	6A/400V		8086	500p	BA311	80p	KA2263	100p
BC107	8p	BD433	28p	BU109	80p	MPSA43	15p	2N3053	18p	7815	25p	BR251	150p	8088	480p	BA313	60p	KA2264	100p
BC108	8p	BD434	30p	BU110	90p	MPSA70	15p	2N3054	40p	7818	25p	25A/100V		8156	300p	BA333	80p	KA2284	100p
BC109	8p	BD435	31p	BU111	100p	MPSA92	20p	2N3055	38p	7824	25p	BR252	165p	8224	240p	BA401	60p	KA2401	150p
BC109C	10p	BD436	30p	BU124	60p	MPSA93	20p	2N3055H	50p	7905	25p	25A/200V		8226	240p	BA402	50p	KA2412	350p
BC140	20p	BD437	28p	BU126	65p	MR510	35p	2N3442	85p	7906	30p	BR254	185p	8250	750p	BA511	145p	KA2912	125p
BC141	20p	BD438	36p	BU180	100p	MR856	36p	2N3702	9p	7908	30p	25A/400V		8251	200p	BA514	160p	KA2914A	300p
BC142	20p	BD439	40p	BU184	100p	OC28	350p	2N3703	9p	7912	30p	BR256	200p	8253	160p	BA516	150p	LA1130	240p
BC143	20p	BD440	40p	BU204	65p	OC29	250p	2N3704	9p	7915	30p	25A/600V		8257	220p	BA521	100p	LA1150	150p
BC147	8p	BD441	40p	BU205	70p	OC35	350p	2N3705	9p	7918	30p	BR258	240p	8271	3400p	BA524	240p	LA1185	150p
BC149	8p	BD533	50p	BU206	100p	OC36	250p	2N3706	9p	7924	30p	25A/800V		8279	270p	BA526	180p	LA1201	75p
BC159	8p	BD534	38p	BU208	70p	OC45	50p	2N3707	9p	78L05	24p	BR351	185p	8283	400p	BA527	95p	LA1210	140p
BC160	30p	BD535	38p	BU208A	75p	OC200	180p	2N3710	12p	78L08	24p	35V/100V		8284	440p	BA532	100p	LA1222	80p
BC171	10p	BD536	38p	BU208AT	200p	R2008B	100p	2N3711	12p	78L12	24p	BR352	200p	8287	260p	BA534	220p	LA1230	130p
BC172	10p	BD537	40p	BU208D	130p	R2010B	100p	2N3771	85p	78L15	24p	35V/200V		8288	650p	BA536	150p	LA1364	200p
BC177	14p	BD538	40p	BU209	90p	S2000A3	175p	2N3772	90p	78L18	24p	BR354	220p	8748	700p	BA546	160p	LA1365	120p
BC178	14p	BD643	50p	BU225	120p	S2000AF	175p	2N3773	100p	78L24	24p	35V/400V		8755	800p	BA612	120p	LA1368	220p
BC179	14p	BD645	50p	BU226	120p	S2055A	175p	2N3799	18p	79L05	35p	BR356	230p	8T26	95p	BA656	110p	LA1385	170p
BC182	7p	BD647	50p	BU312	90p	S2055AF	200p	2N3819	29p	79L08	35p	35V/600V		8T28	110p	BA658	350p	LA2000	150p
BC182L	7p	BD649	50p	BU325	55p	S2530A	100p	2N3903	11p	79L12	35p	BR358	260p			BA684	400p	LA2101	270p
BC183	7p	BD675	40p	BU326A	75p	S2800M	72p	2N3906	11p	79L15	35p	35V/800V		*LINEAR ICs*		BA685	400p	LA2200	190p
BC183L	7p	BD676	40p	BU406	60p	TIP29	15p	2N4031	25p	LM309K	100p	BY164 1.5A/				BA1310	180p	LA3160	120p
BC184	7p	BD677	38p	BU406D	85p	TIP29A	22p	2N4401	12p	LM317T	100p	100V	40p	AN203	210p	BA1320	75p	LA3210	85p
BC184L	7p	BD678	40p	BU407	55p	TIP29C	25p	2N4403	12p	LM323K	350p	BY176 1.5A/		AN210	165p	BA1330	120p	LA3300	140p
BC212	7p	BD679	40p	BU407D	75p	TIP29E	40p	2N5061	20p	78H08KC	800p	800V	40p	AN214Q	170p	BA1360	160p	LA3301	110p
BC212L	7p	BD680	40p	BU408	60p	TIP30	25p	2N5088	20p	79H12KC	700p			AN228	280p	BA4403	220p	LA3361	100p
BC213	7p	BD681	45p	BU408D	75p	TIP30C	25p	2N5192	50p	79HGKC	800p			AN252	150p	BA5101	350p	LA3375	300p
BC213L	7p	BD682	45p	BU409	85p	TIP31A	22p	2N5241	500p			*TRIACS*		AN259	250p	BA5102	140p	LA4030	180p
BC214	7p	BD705	50p	BU426A	70p	TIP31C	27p	2N5245	45p	*VALVES*		TIC206D	60p	AN262	140p	BA5204	200p	LA4031	140p
BC214L	7p	BD707	50p	BU500	100p	TIP32	24p	2N5294	30p			4A/400V		AN271	230p	BA5402	180p	LA4032	140p
BC237	7p	BD709	50p	BU505	90p	TIP32A	21p	2N5296	30p	DAF96	100p	TIC225D	69p	AN274	250p	BA5406	180p	LA4051	160p
BC238	7p	BD711	50p	BU505D	90p	TIP32C	28p	2N5448	12p	DY87	80p	6A/400V		AN301	330p	BA5408	180p	LA4100	85p
BC239	7p	BD736	50p	BU505DF	90p	TIP33	50p	2N6107	40p	EBF80	60p	TIC226D	68p	AN303	250p	BA6104	250p	LA4101	80p
BC300	20p	BD826	50p	BU506	100p	TIP33C	60p	2N6292	40p	ECC84	80p	8A/400V		AN304	360p	BA6208	175p	LA4102	100p
BC301	20p	BD828	50p	BU506D	70p	TIP34	50p	2N6385	120p	ECH84	90p	TIC236D	85p	AN315	210p	BA6209	85p	LA4110	120p
BC302	20p	BD839	55p	BU506DF	120p	TIP34C	60p	2N6403	160p	ECL84	100p	12A/400V		AN316	350p	BA6304	120p	LA4120	270p
BC303	20p	BD897	50p	BU508A	70p	TIP35C	65p			EF183	75p	TIC246D	105p	AN360	100p	BA6305	140p	LA4140	60p
BC304	25p	BD899	50p	BU508AF	95p	TIP36C	65p	*RECTIFIER DIODES*		EF184	85p	16A/400V		AN362	140p	BA6410	220p	LA4160	100p
BC327	7p	BD977	50p	BU508D	90p	TIP41A	20p			EL500	100p	TIC253D	190p	AN366	150p	BA6411	250p	LA4182	180p
BC328	7p	BDX33	60p	BU508DF	115p	TIP41C	22p			EY86	70p	20A/400V		AN610	160p	BA6993	150p	LA4190	300p
BC337	7p	BDX65	80p	BU508V	110p	TIP42A	20p	BY127	8p	EY87	70p	TIC263D	205p	AN3312	350p	BA7001	150p	LA4192	140p
BC338	7p	BDW24	55p	BU508VF	100p	TIP42C	22p	BY133	8p	EY88	80p	25A/400V		AN3821K	600p	BA7004	200p	LA4200	130p
BC441	28p	BDW93	50p	BU526	75p	TIP47	40p	BY164	40p	PC97	100p			AN3822K	600p	BA7007	200p	LA4201	230p
BC446	8p	BDW94	50p	BU536	100p	TIP48	40p	BY179	35p	PCC85	60p	*THYRISTORS*		AN3990K	300p	BA7021	180p	LA4260	230p
BC477	18p	BDY92	100p	BU546	125p	TIP50	60p	BY184	32p	PCF80	100p	2N5061	20p	AN3991K	400p	BA7022	350p	LA4261	300p
BC516	22p	BF137	35p	BU608	120p	TIP51	80p	BY206	11p	PCF801	110p	0.8A/60V		AN5025	250p	BA7751LS	150p	LA4270	300p
BC537	25p	BF167	30p	BU626	120p	TIP52	80p	BY207	9p	PCF806	115p	TIC116C	59p	AN5033	400p	BA7752	250p	LA4420	140p
BC546	8p	BF181	18p	BU705	130p	TIP54	85p	BY227	19p	PCH200	100p	8A/300V		AN5132	250p	BA7755	150p	LA4422	130p
BC547	8p	BF183	20p	BU706DF	175p	TIP105	65p	BY228	28p	PCL81	65p	TIC116D	70p	AN5150	400p	BA7767AS	155p	LA4430	130p
BC548	8p	BF195	7p	BU706F	150p	TIP106	65p	BY298	15p	PCL82	80p	8A/400V		AN5151	600p	CA3011	110p	LA4440	200p
BC549	8p	BF199	8p	BU801	70p	TIP107	65p	BY299	18p	PCL84	60p	TIC126D	75p	AN5215	100p	CA3048	190p	LA4445	200p
BC550	8p	BF200	16p	BU806	70p	TIP110	40p	BY448	20p	PFL200	110p	12A/400V		AN5256	150p	CA3052	190p	LA4460	120p
BC556	8p	BF225	30p	BU807	60p	TIP111	40p	BYX10	15p	PL36	120p	TIC126M	90p	AN5262	175p	CA3054	95p	LA4461	120p
BC557	7p	BF240	16p	BU902	110p	TIP112	35p	BYX55/600	25p	PL83	60p	12A/600V		AN5265	80p	CA3085	135p	LA4500	200p
BC558	8p	BF245	25p	BU903	110p	TIP112H	50p	BYX70/500	32p	PL84	80p	C106D	28p	AN5352	600p	CA3088E	200p	LA4505	220p
BC559	8p	BF254	15p	BU920	100p	TIP115	30p	OA47	10p	PL95	180p	4A/400V		AN5411	450p	CA3089E	150p	LA4508	200p
BC560	8p	BF255	12p	BU922	110p	TIP116	30p	OA91	10p	PY81	100p	BR103	37p	AN5421	150p	CA3090Q	250p	LA4510	100p
BC637	20p	BF256	18p	BU930	130p	TIP117	30p	OA202	10p	PY500A	190p	BR303	85p	AN5429	420p	CA3130S	100p	LA4520	170p
BC639	20p	BF257	18p	BU2508A	130p	TIP120	37p	IN4001	3p			BT106	180p	AN5512	100p	CA3134E	280p	LA4550	200p
BC640	20p	BF259	18p	BU2508AF	130p	TIP121	35p	IN4002	3p	*LEDs*		BT119	100p	AN5515	160p	CA3140E	38p	LA4555	120p
BCY33	200p	BF262	25p	BU2508D	130p	TIP122	30p	IN4003	3p			17088	200p	AN5520	550p	CA3160	85p	LA4570	130p
BCY34	200p	BF270	18p	BU2508DF	150p	TIP125	30p	IN4004	3p	3mm		17089	200p	AN5521	100p	CA3189E	230p	LA5112	200p
BCY70	16p	BF273	15p	BU2520AF	225p	TIP126	40p	IN4005	3p	RED	5p	17127	200p	AN5612	200p	CA3193E	230p	LA5523	150p
BCY71	16p	BF311	21p	BU2520DF	225p	TIP127	35p	IN4006	3p	YELLOW	8p	17128	230p	AN5613	200p	CA3260E	170p	LA5527	150p
BCY72	16p	BF336	20p	BU2525AF	325p	TIP130	30p	IN4007	4p	GREEN	8p	15/80H	230p	AN5615	300p	CA3280E	150p	LA5700	300p
BD115	30p	BF337	20p	BUH515	200p	TIP131	30p	IN4148	2p	5mm		15/85R	230p	AN5620	250p	CX108	950p	LA7011	220p
BD124P	50p	BF338	20p	BUT11AF	55p	TIP132	30p	IN5400	9p	RED	5p	SG264	800p	AN5622	275p	CX136	600p	LA7033	400p
BD131	25p	BF362	30p	BUT12	80p	TIP141	65p	IN5401	8p	YELLOW	8p	SG613	1600p	AN5625	400p	CX139A	750p	LA7042	280p
BD132	25p	BF367	13p	BUT56A	100p	TIP142	75p	IN5402	8p	GREEN	8p			AN5712	180p	CX141	750p	LA7046	300p
BD133	50p	BF371	17p	BU18	80p	TIP145	50p	IN5403	8p			*COMPUTER ICs*		AN5722	140p	CX145	725p	LA7224	150p
BD135	20p	BF421	18p	BU18AF	80p	TIP146	70p	IN5404	8p	*RECTANGULAR LEDs*		Z80ACPU	100p	AN5730	160p	CX150B	325p	LA7505	250p
BD136	20p	BF422	21p	BUX10	150p	TIP147	80p	IN5405	11p			Z80ADMA	200p	AN5732	120p	CX175	325p	LA7507	250p
BD137	20p	BF423	25p	BUX11	200p	TIP150	90p	IN5406	12p	5mm × 2.5mm		Z80ACTC	140p	AN5753	130p	CX187	825p	LA7520	200p
BD138	20p	BF455	12p	BUX12	150p	TIP151	60p	IN5407	12p	RED	5p	Z80ASIO-1	210p	AN5763	450p	CX804A	775p	LA7620	500p
BD139	20p	BF458	19p	BUX20	350p	TIP2955	50p	IN5408	12p	YELLOW	8p	Z80ASIO-2	210p	AN5790	240p	CX867	575p	LA7800	90p
BD140	20p	BF462	50p	BUX21	450p	TIP3055	50p	RGP15	25p	GREEN	8p	75107	65p	AN5791	225p	CX868	525p	LA7801	100p
BD144	90p	BF471	28p	BUX22	450p	TIPL763A	200p	RGP30	16p			75110	75p	AN5836	450p	CX877	300p	LA7802	300p
BD157	38p	BF472	28p	BUX37	220p	TIPL791A	80p	SKE4F2/06	60p	*OPTO COUPLERS*		75113	100p	AN5900	130p	HA1125	120p	LA7806	260p
BD166	30p	BF479	30p	BUX40	210p	TIS61	15p	SKE4F2/08	80p			75122	110p	AN6135	120p	HA1197	130p	LA7808	250p
BD175	30p	BF494	16p	BUX41	200p	TIS90	15p	SKE4F2/10	100p			75154	100p	AN6247	200p	HA1199	130p	LA7820	100p
BD177	30p	BF495	16p	BUX42	200p	TIS93	20p	SR2M	60p	4N37	48p	75162	700p	AN6270	400p	HA1319	200p	LA7823	200p
BD179	32p	BF595	16p	BUX47A	220p	VK1010	88p			4N38	68p	75182	95p	AN6300	600p	HA1338	300p	LA7910	150p
BD181	45p	BF598	16p	BUX48A	150p	VN10KM	60p	*I.C. SOCKETS*		AN203	210p	75183	95p	AN6306	380p	HA1339A	350p	LA7940	200p
BD182	60p	BF615	30p	BUX80	180p	ZTX107	11p					75195	185p	AN6320	180p	HA1377	120p	LC7131	260p
BD184	60p	BF617	30p	BUX84	50p	ZTX108	11p	8 PIN	5p			2114	150p	AN6332	320p	HA1388	320p	LC7132	400p
BD187	30p	BF760	40p	BUX85	50p	ZTX109	12p	14PIN	6p	*BRIDGE RECTIFIERS*		2532	200p	AN6341	200p	HA1389	210p	LC7137	450p
BD201	33p	BF763	40p	BUX86	30p	ZTX212	20p	16PIN	7p			2716	100p	AN6344	440p	HA1392	120p	LF347	110p
BD202	38p	BF870	22p	BUX87	50p	ZTX300	10p	18PIN	10p	W005	16p	2732	200p	AN6350	610p	HA1394	170p	LF353	48p
BD203	42p	BF871	22p	BUX98A	350p	ZTX301	16p	20PIN	12p	1A/50V		2732A	220p	AN6359	500p	HA1397	200p	LF355	60p
BD204	42p	BF960	38p	BU69A	200p	ZTX302	10p	22PIN	13p	W01	18p	2764	150p	AN6360	320p	HA1398	240p	LF357	70p
BD222	31p	BF961	35p	BUY71	250p	ZTX303	20p	24PIN	14p	1A/100V		27C64	200p	AN6362	400p	HA11219	280p	LF398	300p
BD225	31p	BF964	38p	BUZ11	200p	ZTX304	10p	28PIN	16p	W02	19p	27128	150p	AN6371	350p	HA11221	180p	LM301	26p
BD232	31p	BFR90	85p	BUZ71	75p	ZTX320	20p	40PIN	18p	1A/200V		27256-25	150p	AN6387	480p	HA11225	130p	LM311	35p
BD233	30p	BFR91	99p	BUZ80	200p	ZTX501	13p			W04	21p	27512	300p	AN6884	200p	HA11235	120p	LM319	165p
BD234	32p	BFT43	30p	BY448	20p	ZTX502	10p	*ZENERS*		1A/400V		4116	40p	AN7105	170p	HA11251	190p	LM324	30p
BD235	28p	BFX29	20p	BYT11	25p	ZTX503	18p			W06	23p	4164-15	80p	AN7110	75p	HA11423	140p	LM335Z	120p
BD236	30p	BFX84	20p	C106D	28p	ZTX504	25p	400 mWatts		1A/600V		4164-12	90p	AN7114	120p	HA11724	650p	LM339	35p
BD237	21p	BFX85	20p	IRF630	150p	ZTX600	26p	2V7 to 39V	5p	W08	28p	41256-15	80p	AN7115	110p	HA12002	220p	LM348	50p
BD238	24p	BFX87	15p	J174	38p	2N697	22p	1.3 Watts		1A/800V		41256-12	100p	AN7116	90p	HA12003	250p	LM358	45p
BD239	30p	BFX88	15p	J300	50p	2N698	40p	2V7 to 39V	9p	BR81D	33p	41256-10	110p	AN7120	100p	HA12005	180p	LM380	80p
BD240	40p	BFX89	60p	MJ900	200p	2N78	22p			2A/100V		41464-12	150p	AN7130	75p	HA12017	100p	LM381	150p
BD241A	40p	BFY50	14p	MJ1000	200p	2N914	28p	*CRYSTALS*		BR82D	33p	6116	80p	AN7140	170p	HA13001	110p	LM382	130p
BD243A	50p	BFY51	14p	MJ1001	200p	2N930	18p			2A/200V		6264-10	210p	AN7145	195p	HA13002	200p	LM386	60p
BD244	50p	BFY52	14p	MJ10012	300p	2N1131	28p	Freq in MHz				62256-12	300p	AN7146	210p	HA13006	400p	LM387	100p
BD245	50p	BFY56	25p	MJ15003	250p	2N1132	28p	2.4576	180p					AN7154	180p	HA13007	400p	LM393	45p

LINEAR ICs / JAPANESE TRANSISTORS

Part	Price
LM431	50p
LM710	45p
LM723	40p
LM741DIL	18p
LM741MET	45p
LM747	55p
LM1889	300p
LM1894N	200p
LM3900	40p
LM3909	100p
LM3914	160p
LM3915	160p
LM3916	270p
L200	200p
M491BB1	500p
M494B1	700p
M50115P	320p
M50117P	500p
M50119P	525p
M50784	300p
M50786	500p
M50790	600p
M51161	300p
M51381P	200p
M51387P	800p
M51544	150p
M51848	150p
M54523P	200p
M54563P	200p
M58484	500p
M51516	260p
M51518	200p
MB3712	140p
MB3713	130p
MB3714	270p
MB3715	250p
MB3722	280p
MB3730	160p
MB3731	220p
MB3756	160p
MB3759	200p
MB8719	360p
MC1455	45p
MC1496	65p
MC3401	45p
NE555	20p
NE556	40p
NE556	80p
NE565	110p
NE567	115p
NE571	290p
NE592	85p
NE5532P	140p
SAA1006	300p
SAA1008	450p
SAA1010	400p
SAA1024	250p
SAA1025	250p
SAA1075	350p
SAA1124	200p
SAA1250	280p
SAA1251	380p
SAA1274	280p
SAA1293	550p
SAA3004	400p
SAA5000	200p
SAA5010	220p
SAA5012	400p
SAA5020	350p
SAA5030	440p
SAA5040A	280p
SAA5040B	400p
SAA5050	650p
SAA5231	300p
SAA5243PE	800p
SAB3013	200p
SAB3035	600p
STA301A	200p
STA401A	220p
STA403A	270p
STA405A	280p
STA431A	250p
STA432A	220p
STA434A	270p
STA435A	270p
STA441C	220p
STA456C	240p
STA471	210p
STA901M	280p
STK0025	420p
STK0029	360p
STK0039	600p
STK0040	520p
STK0049	510p
STK0050	440p
STK0059	620p
STK0060	820p
STK0070	1100p
STK0080	580p
STK011	330p
STK015	440p
STK016	760p
STK025	650p
STK050	1600p
STK077	520p
STK078	580p
STK080	550p
STK082	540p
STK084	600p
STK085	900p
STK086	800p
STK0100	900p
STK0100II	1200p
STK420	400p
STK430	500p
STK433	400p
STK435	375p
STK436	430p
STK437	460p
STK439	500p

Part	Price
STK441	680p
STK443	700p
STK457	470p
STK459	560p
STK460	660p
STK461	620p
STK463	950p
STK465	720p
STK501	550p
STK561	450p
STK563	415p
STK583	500p
STK760	600p
STK770	400p
STK772B	480p
STK780	575p
STK1039	460p
STK1040	640p
STK1049	700p
STK1050	650p
STK1060	700p
STK1070	850p
STK1080	940p
STK2025	620p
STK2028	500p
STK2029	480p
STK2038	700p
STK2048	950p
STK2110	550p
STK2125	580p
STK2129	750p
STK2139	675p
STK2155	900p
STK2230	470p
STK2240	740p
STK2250	650p
STK3041	370p
STK3042	375p
STK3044	500p
STK3062	500p
STK3082	550p
STK3102II	530p
STK3152II	900p
STK3156	500p
STK4017	400p
STK4019	480p
STK4021	380p
STK4024II	550p
STK4025	530p
STK4026	480p
STK4028	550p
STK4032II	510p
STK4036	470p
STK4038	680p
STK4040II	650p
STK4042II	800p
STK4044	800p
STK4046	950p
STK4048	1280p
STK4060	510p
STK4065	650p
STK4101	500p
STK4111	500p
STK4112	500p
STK4121	480p
STK4122	560p
STK4131	600p
STK4132II	600p
STK4141II	420p
STK4142	530p
STK4151	680p
STK4152	650p
STK4161	650p
STK4162	550p
STK4171	900p
STK4172II	680p
STK4181	680p
STK4182II	750p
STK4191	700p
STK4192	700p
STK4231II	700p
STK4241	1050p
STK4241V	1250p
STK4272	500p
STK4273	550p
STK4301	500p
STK4311	650p
STK4332	365p
STK4352	500p
STK4362	450p
STK4372	490p
STK4392	500p
STK4432	600p
STK4773	820p
STK4793	800p
STK4803	640p
STK4813	800p
STK4833	700p
STK4843	720p
STK4853	730p
STK4863	700p
STK4873	850p
STK4893	1000p
STK4913	900p
STK5314	475p
STK5315	500p
STK5322	500p
STK5324	450p
STK5325	370p
STK5331	300p
STK5332	180p
STK5333	1000p
STK5335	350p
STK5337	500p
STK5338	295p
STK5339	400p
STK5342	245p
STK5361	375p
STK5372	260p
STK5421	450p

Part	Price
STK5422	375p
STK5431	550p
STK5434	570p
STK5436	500p
STK5441	400p
STK5451	390p
STK5461	500p
STK5462	500p
STK5464	300p
STK5466	500p
STK5467	400p
STK5468	300p
STK5471	330p
STK5473	480p
STK5476	350p
STK5478	380p
STK5479	300p
STK5481	520p
STK5482	285p
STK5483	440p
STK5486	450p
STK5488	480p
STK5490	450p
STK5632	450p
STK5725	450p
STK5730	450p
STK6316	300p
STK6324B	500p
STK6431	850p
STK6722	725p
STK6732	1000p
STK6822	900p
STK6922	500p
STK6932	525p
STK6962	275p
STK6972	490p
STK6981B	600p
STK6982	600p
STK7216	420p
STK7217	400p
STK7225	500p
STK7226	600p
STK7251	500p
STK7308	350p
STK7309	400p
STK7310	470p
STK7348	400p
STK7356	425p
STK7358	440p
STK7402	560p
STK7404	400p
STK7406	650p
STK7408	675p
STK7410	900p
STK7554	600p
STK7561	650p
STK7562	1000p
STK7563	800p
STK8050	750p
STK8250	500p
STK8260	1200p
STK8280	1850p
STK73410	350p
STK73410II	500p
STK73605	375p
STR370	300p
STR371	400p
STR380	350p
STR381	390p
STR383	410p
STR384	350p
STR440	700p
STR450	520p
STR541	600p
STR452	600p
STR453	500p
STR454	400p
STR455	500p
STR456	470p
STR457	600p
STR470	400p
STR1096	275p
STR1195	350p
STR1229	325p
STR2005	400p
STR2012	400p
STR2013	300p
STR2015	550p
STR2105	600p
STR3113	225p
STR3115	400p
STR3123	400p
STR3125	480p
STR3135	250p
STR3212	275p
STR3214	275p
STR3215	275p
STR3315	275p
STR4090A	650p
STR4142	450p
STR4211	370p
STR4512	400p
STR5015	500p
STR5100	550p
STR5214	475p
STR5315	575p
STR5412	350p
STR6020	325p
STR9005	400p
STR9012	450p
STR10006	450p
STR11006	400p
STR12006	450p
STR13006	500p
STR15006	500p
STR16006	500p
STR20005	450p
STR20012	450p
STR20015	450p
STR30110	400p

Part	Price
STR30115	275p
STR30120	400p
STR30123	450p
STR30125	550p
STR30130	250p
STR40090	350p
STR41090	400p
STR44115	550p
STR45111	550p
STR50020	450p
STR50092	550p
STR50103A	260p
STR50113	500p
STR50115	500p
STR51041	500p
STR50213	500p
STR53041	500p
STR54041	350p
STR55041	500p
STR56041	550p
STR58041	325p
STR59041	475p
STR60001	525p
STR61001	550p
STR80145	550p
STR81145	600p
STRD1206	600p
STRD1406	600p
STRD1706	450p
STRD1806	400p
STRD1816	400p
STRD3035	300p
STRD4412	500p
STRD4512	400p
TA7054	190p
TA7061	115p
TA7066	120p
TA7089	300p
TA7119	150p
TA7120	55p
TA7137	60p
TA7140	100p
TA7157	100p
TA7193	320p
TA7200	200p
TA7205	110p
TA7207	150p
TA7208	125p
TA7214	220p
TA7217	145p
TA7220	220p
TA7222	90p
TA7223	210p
TA7225	300p
TA7226	290p
TA7227	170p
TA7230	100p
TA7232	95p
TA7233	120p
TA7237	300p
TA7238	400p
TA7240	160p
TA7241	165p
TA7242	190p
TA7243	320p
TA7245	225p
TA7267	220p
TA7269	260p
TA7270	170p
TA7271	220p
TA7272	260p
TA7273	300p
TA7274	210p
TA7280	190p
TA7281	200p
TA7282	160p
TA7283	200p
TA7288	220p
TA7299	200p
TA7310	100p
TA7312	120p
TA7313	70p
TA7314	175p
TA7315	200p
TA7317P	120p
TA7324	75p
TA7325	90p
TA7328	110p
TA7335	85p
TA7336	180p
TA7341	250p
TA7343	120p
TA7357	340p
TA7358	85p
TA7401	250p
TA7607	200p
TA7608	360p
TA7609	170p
TA7611	210p
TA7612	300p
TA7614	170p
TA7616	300p
TA7621	300p
TA7622	420p
TA7628	110p
TA7629	220p
TA7630	200p
TA7632	400p
TA7640	90p
TA7641	140p
TA7658	100p
TA7668	100p
TA7680AP	225p
TA7688	150p
TA7698	450p
TA7699	600p
TA7705	300p
TA7750	200p
TA7757	200p
TA7769	130p

Part	Price
TA7784	250p
TA8132AN	200p
TA8205	250p
TA8210	300p
TA8215	300p
TA8216H	375p
TA8227	250p
TA8691N	550p
TA8718N	550p
TAA550	25p
TBA120S	40p
TBA396	70p
TBA520	120p
TBA530	100p
TBA540	90p
TBA560	90p
TBA800	40p
TBA810AS	40p
TBA820	55p
TBA820M	35p
TBA920	100p
TBA950	100p
TBA990	60p
TC5020	200p
TC5081AP	80p
TC9106	500p
TC9125BP	410p
TC9134	750p
TC9142	320p
TC9143	300p
TC9145	150p
TC9148	200p
TC149	225p
TC9150	425p
TC9152	425p
TC9153	300p
TC9156	300p
TC9163	375p
TC9164	400p
TC9172P	300p
TCA9940	100p
TCEP100	100p
TD62308AP	200p
TD62382	200p
TD62506	200p
TD62705	250p
TD6304AP	300p
TD6306P	350p
TD6350P	200p
TD6359P	300p
TDA1001	200p
TDA1002	200p
TDA1003	150p
TDA1005A	175p
TDA1010A	80p
TDA1011	75p
TDA1012	120p
TDA1013A	110p
TDA1015	85p
TDA1016	140p
TDA1020	110p
TDA1022	330p
TDA1023	130p
TDA1024	150p
TDA1025	320p
TDA1028	175p
TDA1029	200p
TDA1035	160p
TDA1041E	250p
TDA1041P	180p
TDA1044	110p
TDA1047	200p
TDA1048	200p
TDA1053	300p
TDA1054	180p
TDA1059B	40p
TDA1060	140p
TDA1062	140p
TDA1072	150p
TDA1074	280p
TDA1077	250p
TDA1082	275p
TDA1083	95p
TDA1085	170p
TDA1087	60p
TDA1092	100p
TDA1097	475p
TDA1151	40p
TDA1154	50p
TDA1170	85p
TDA1180	120p
TDA1180A	190p
TDA1190	80p
TDA1200B	80p
TDA1220	75p
TDA1235	300p
TDA1236	240p
TDA1251	150p
TDA1270	150p
TDA1327	200p
TDA1410	220p
TDA1412	35p
TDA1510	170p
TDA1512	180p
TDA1514A	450p
TDA1515A	200p
TDA1516Q	350p
TDA1517	250p
TDA1519	200p
TDA1519A	200p
TDA1520	275p
TDA1521	250p
TDA1522	110p
TDA1524	200p
TDA1540	420p
TDA1541	750p
TDA1542	250p
TDA1543	300p
TDA1571	300p
TDA1572	175p

Part	Price
TDA1574	125p
TDA1576	170p
TDA1578A	210p
TDA1579	200p
TDA1596	200p
TDA1598	250p
TDA1600	275p
TDA1670A	230p
TDA1675	250p
TDA1701	300p
TDA1771	250p
TDA1870A	200p
TDA1872A	275p
TDA1904	80p
TDA1905	80p
TDA1908A	90p
TDA1910	225p
TDA1940	180p
TDA1941	300p
TDA1950	175p
TDA2002	50p
TDA2003	65p
TDA2004	150p
TDA2005	150p
TDA2006	70p
TDA2007	120p
TDA2008	100p
TDA2009	160p
TDA2010	150p
TDA2020	120p
TDA2030	80p
TDA2040	140p
TDA2048	600p
TDA2054M	110p
TDA2107	250p
TDA2148	350p
TDA2151	375p
TDA2170	260p
TDA2220	200p
TDA2270	250p
TDA2320	80p
TDA2501	400p
TDA2503	200p
TDA2504	200p
TDA2505	300p
TDA2506	500p
TDA2510	450p
TDA2514A	500p
TDA2515	450p
TDA2530	450p
TDA2532	120p
TDA2540	85p
TDA2541	120p
TDA2542	110p
TDA2543	210p
TDA2545	120p
TDA2546A	200p
TDA2549	300p
TDA2555	175p
TDA2556	230p
TDA2557	225p
TDA2558	500p
TDA2575A	100p
TDA2577A	200p
TDA2578A	200p
TDA2579A	250p
TDA2582	130p
TDA2590	170p
TDA2593	110p
TDA2594	300p
TDA2595	200p
TDA2600	250p
TDA2611A	100p
TDA2630	300p
TDA2640	220p
TDA2653A	225p
TDA2654	200p
TDA2670	150p
TDA2690	100p
TDA2730	200p
TDA2760	400p
TDA2780	600p
TDA2791	275p
TDA2795	200p
TDA2822M	60p
TDA2840	200p
TDA3047	100p
TDA3048	130p
TDA3082	200p
TDA3083	200p
TDA3190	100p
TDA3300B	480p
TDA3301B	280p
TDA3310	120p
TDA3330	500p
TDA3410	150p
TDA3420	200p
TDA3501	340p
TDA3502	450p
TDA3504	300p
TDA3505	275p
TDA3506	260p
TDA3507	450p
TDA3510	350p
TDA3520	650p
TDA3530	350p
TDA3540	200p
TDA3541	175p
TDA3560	260p
TDA3561	300p
TDA3561A	300p
TDA3562	260p
TDA3562TFK	300p
TDA3563	350p
TDA3564	325p
TDA3565	275p
TDA3566	280p
TDA3567	350p
TDA3570	375p
TDA3580	400p

Part	Price
TDA3586	750p
TDA3590	300p
TDA3591	360p
TDA3592A	350p
TDA3640	350p
TDA3651	200p
TDA3652	500p
TDA3652TX10	800p
TDA3653	150p
TDA3654	90p
TDA3710	300p
TDA3720	175p
TDA3724	500p
TDA3725	500p
TDA3730	400p
TDA3740	480p
TDA3750	400p
TDA3760	350p
TDA3771	460p
TDA3791	300p
TDA3800	350p
TDA3803A	500p
TDA3810	200p
TDA3825	225p
TDA3840	300p
TDA3843	200p
TDA3845	325p
TDA3856	400p
TDA3857	350p
TDA3950	225p
TDA4050	150p
TDA4092	350p
TDA4100	225p
TDA4180	145p
TDA4190	180p
TDA4200	360p
TDA4280	320p
TDA4282	360p
TDA4290	200p
TDA4400	175p
TDA4420	120p
TDA4421	300p
TDA4426	170p
TDA4427	200p
TDA4431	150p
TDA4437	300p
TDA4439	220p
TDA4440	180p
TDA4442	240p
TDA4443	250p
TDA4445	220p
TDA4450	225p
TDA4452	250p
TDA4453	275p
TDA4480	280p
TDA4482	350p
TDA4500	300p
TDA4501	400p
TDA4502	550p
TDA4503	300p
TDA4505	300p
TDA4510	270p
TDA4555	400p
TDA4556	370p
TDA4557	450p
TDA4560	270p
TDA4600	140p
TDA4600II	160p
TDA4601	120p
TDA4605	220p
TDA4610	370p
TDA4660	370p
TDA4800	350p
TDA4935	300p
TDA4940	325p
TDA4950	120p
TDA5330T	300p
TDA5600	450p
TDA5660P	250p
TDA5700	200p
TDA5708	400p
TDA5709	450p
TDA5800	600p
TDA5820	370p
TDA5850	175p
TDA6200	750p
TDA7000	170p
TDA7010T	120p
TDA7050	200p
TDA7052	120p
TDA7053	200p
TDA7056	200p
TDA7072	175p
TDA7077	175p
TDA7211	150p
TDA7220	100p
TDA7222	200p
TDA7230A	225p
TDA7233	150p
TDA7240	175p
TDA7241	250p
TDA7250	500p
TDA7255	500p
TDA7256	600p
TDA7272	170p
TDA7273	80p
TDA7274	60p
TDA7275	75p
TDA7284	100p
TDA7350	650p
TDA7359	300p
TDA7360	700p
TDA7770	225p
TDA8114	225p
TDA8115	200p
TDA8140	200p
TDA8143	160p
TDA8145	120p
TDA8153	250p
TDA8160	125p

Part	Price
TDA8170	170p
TDA8172	250p
TDA8173	280p
TDA8174	300p
TDA8175	300p
TDA8178	400p
TDA8185	300p
TDA8190	200p
TDA8191	425p
TDA8192	275p
TDA8196	150p
TDA8214B	225p
TDA8215B	300p
TDA8303	350p
TDA8304	600p
TDA8305	500p
TDA8340	200p
TDA8341	250p
TDA8380	200p
TDA8390A	650p
TDA8405	550p
TDA8415	650p
TDA8417	550p
TDA8421	500p
TDA8245	500p
TDA8432	550p
TDA8433	600p
TDA8440	300p
TDA8442	200p
TDA8443	350p
TDA8451	400p
TDA8452	200p
TDA8453	350p
TDA8490	350p
TDA8702	275p
TDA8703	500p
TDA8708	900p
TDA8732	400p
TDA9045	400p
TDA9080	550p
TDA9403	180p
TDA9503	150p
TDA9513	300p
TEA1002	650p
TEA1007	120p
TEA1009	100p
TEA1017	280p
TEA1019	130p
TEA1024	150p
TEA1045	300p
TEA1060	225p
TEA1067	150p
TEA1080P	170p
TEA1087	40p
TEA1101	425p
TEA1330	65p
TEA1511	150p
TEA2000	275p
TEA2014A	80p
TEA2018A	200p
TEA2114	200p
TEA2117	450p
TEA5114A	200p
TL431	45p
TL061	40p
TL064	80p
TL071	38p
TL074	80p
TL083	55p
TL084	70p
TMS1000-041	400p
TMS1000NIPM	200p
TMS100-233	400p
TMS1024	300p
TMS1025	350p
TMS3617NS	350p
TMS3701BN	300p
TMS3712	350p
TMS3891	550p
TPU2732	1200p
TPU2735	900p
U111B	250p
U211B	300p
U254B	150p
U318M	350p
U321M	450p
U329M	350p
U338M	300p
U420B	70p
U427B	70p
U664B	175p
U2401B	125p
U2829B	130p
U4606B	600p
UC3842N	125p
UC3844	100p
ULN2002	70p
ULN2003	69p
ULN2068	270p
ULN2804	170p
UPC20C	220p
UPC554	130p
UPC555	60p
UPC556H	80p
UPC571	220p
UPC574	60p
UPC575C2	90p
UPC577	64p
UPC592	95p
UPC595	190p
UPC596	190p
UPC1001	220p
UPC1018	170p
UPC1020	200p
UPC1023	60p
UPC1025	230p
UPC1026	95p
UPC1028	90p
UPC1031H	150p
UPC1032	60p

Part	Price
UPC1158H	70p
UPC1178H	250p
UPC1180C	200p
UPC1185H2	400p
UPC1186	80p
UPC1187	150p
UPC1188H	350p
UPC1197	140p
UPC1198H	200p
UPC1222	130p
UPC1225H	220p
UPC1230	200p
UPC1238	120p
UPC1270H	250p
UPC1274V	250p
UPC1277	240p
UPC1278	240p
UPC1288V	230p
UPC1298V	320p
UPC1318	300p
UPC1335V	320p
UPC1350	115p
UPC1363	190p
UPC1363C	300p
UPC1364C	350p
UPC1365	250p
UPC1370C	300p
UPC1373	85p
UPC1377C	200p
UPC1378	180p
UPC1382	110p
UPC1384	425p
UPC1387C	250p
UPC1394	120p
UPC1397	350p
UPC1403CA	650p
UPC1420CA	450p
UPC1421CA	650p
UPC1423CA	550p
UPC1470	200p
UPC1488H	150p
UPC1505C	400p
UPC1514CA	200p
UPC1515CA	250p
UPC1520CA	250p
UPC1536C	550p
ZN423	100p
ZN424	100p
ZN425	320p
ZN426	260p
ZN427	560p
ZN429	215p
ZN459	190p
ZN1040	640p
ZNA134H	2150p

JAPANESE TRANSISTORS

Part	Price
2SA473	29p
2SA490	45p
2SA496	30p
2SA505	120p
2SA509	35p
2SA537	170p
2SA544	650p
2SA550	150p
2SA562	30p
2SA571	650p
2SA603	100p
2SA606	200p
2SA608	15p
2SA614	150p
2SA634	50p
2SA636	50p
2SA640	60p
2SA642	50p
2SA673	15p
2SA677	35p
2SA678	26p
2SA683	25p
2SA684	25p
2SA699	100p
2SA708	240p
2SA711	280p
2SA715	50p
2SA719	50p
2SA720	20p
2SA725	80p
2SA726	20p
2SA733	15p
2SA747A	425p
2SA748	60p
2SA764	200p
2SA769	80p
2SA770	200p
2SA771	90p
2SA777	35p
2SA778	100p
2SA781	150p
2SA786	25p
2SA794	50p
2SA798	30p
2SA814	60p
2SA817	20p
2SA836	20p
2SA839	110p
2SA844	20p
2SA872	25p
2SA872A	50p
2SA886	45p
2SA899	40p
2SA907	650p
2SA909	500p
2SA913	100p
2SA916	30p
2SA921	40p
2SA933	30p
2SA934	30p
2SA935	40p

Part	Price
2SA937	20p
2SA939	140p
2SA940	50p
2SA942	60p
2SA949	70p
2SA950	18p
2SA952	50p
2SA953	60p
2SA954	75p
2SA958	60p
2SA963	120p
2SA965	40p
2SA966	35p
2SA968	55p
2SA970	25p
2SA979	35p
2SA984	25p
2SA985	60p
2SA988	25p
2SA992	30p
2SA993	50p
2SA999	30p
2SA1006	90p
2SA1008	125p
2SA1009	200p
2SA1010	225p
2SA1011	80p
2SA1012	85p
2SA1013	100p
2SA1015	15p
2SA1016	30p
2SA1018	100p
2SA1020	30p
2SA1021	35p
2SA1023	60p
2SA1026	90p
2SA1029	60p
2SA1036	60p
2SA1037	50p
2SA1038	40p
2SA1048	25p
2SA1051	300p
2SA1060	120p
2SA1069	150p
2SA1076	230p
2SA1077	300p
2SA1081	80p
2SA1082	80p
2SA1084	100p
2SA1085	75p
2SA1091	100p
2SA1094	190p
2SA1095	300p
2SA1096	80p
2SA1102	130p
2SA1103	130p
2SA1104	140p
2SA1105	250p
2SA1106	160p
2SA1111	90p
2SA1112	150p
2SA1115	30p
2SA1123	40p
2SA1124	60p
2SA1127	50p
2SA1133	120p
2SA1141	200p
2SA1142	100p
2SA1145	40p
2SA1152	150p
2SA1156	90p
2SA1162	30p
2SA1169	500p
2SA1170	500p
2SA1175	30p
2SA1184	120p
2SA1186	500p
2SA1198	40p
2SA1206	60p
2SA1208	70p
2SA1209	100p
2SA1210	120p
2SA1215	600p
2SA1216	550p
2SA1217	100p
2SA1220	75p
2SA1232	180p
2SA1242	80p
2SA1244	120p
2SA1246	80p
2SA1249	100p
2SA1261	150p
2SA1262	110p
2SA1263	280p
2SA1264	280p
2SA1265	200p
2SA1283	50p
2SA1284	60p
2SA1286	60p
2SA1290	150p
2SA1294	450p
2SA1295	500p
2SA1301	260p
2SA1302	300p
2SA1303	400p
2SA1304	110p
2SA1306	110p
2SA1307	100p
2SA1309	50p
2SA1315	100p
2SA1317	30p
2SA1318	20p
2SA1321	80p
2SA1329	200p
2SA1346	20p
2SA1352	100p
2SA1353	100p
2SA1356	100p
2SA1358	130p
2SA1370	100p

JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
2SA1371	100p	2SC1008	20p	2SC1730	10p	2SC2270	60p	2SC2750	300p	2SC3277	280p	2SC3893	225p	2SD836A	60p	2SD1279	600p	2SD1815	100p
2SA1380	75p	2SC1010	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC3895	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1012	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	400p	2SD838	300p	2SD1289	250p	2SD1843	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2767	300p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1291	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2769	400p	2SC3293	85p	2SC3927	250p	2SD844	200p	2SD1292	60p	2SD1849	325p
2SA1386	400p	2SC1030	150p	2SC1755	90p	2SC2290	1800p	2SC2773	700p	2SC3298	50p	2SC3950	120p	2SD845	250p	2SD1297	300p	2SD1850	325p
2SA1423	30p	2SC1047	20p	2SC1756	35p	2SC2291	40p	2SC2774	500p	2SC3299	120p	2SC3953	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC3973	210p	2SD856	48p	2SD1308	80p	2SD1877	250p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	250p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	130p	2SC3996	1200p	2SD863	23p	2SD1310	140p	2SD1879	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2791	500p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1313	1000p	2SD1884	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC4020	280p	2SD866	120p	2SD1326	200p	2SD1886	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4023	325p	2SD866A	140p	2SD1328	60p	2SD1887	450p
2SB546	45p	2SC1106	180p	2SC1815	10p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	25p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB566	90p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2825	900p	2SC3345	100p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB596	50p	2SC1162	30p	2SC1834	50p	2SC2334	80p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD892A	100p	2SD1384	50p	2SD1959	280p
2SB598	30p	2SC1164	600p	2SC1844	50p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	170p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB600	500p	2SC1165	750p	2SC1845	15p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD895	200p	2SD1391	250p	2SD1978	50p
2SB646	40p	2SC1166	100p	2SC1846	35p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	300p	2SD900	400p	2SD1395	150p	2SD2012	50p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2360	120p	2SC2839	40p	2SC3361	50p	2SD198	140p	2SD905	450p	2SD1396	120p	2SD2125	225p
2SB649	35p	2SC1173	40p	2SC1856	25p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	195p	2SD916	130p	2SD1397	120p	2SD2333	300p
2SB688	90p	2SC1195	210p	2SC1865	700p	2SC2362	50p	2SC2877	120p	2SC3377	50p	2SD200	180p	2SD917	300p	2SD1398	120p	2SJ48	425p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SJ49	425p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD257	195p	2SD923	360p	2SD1400	280p	2SJ50	425p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD313	25p	2SD946	120p	2SD1402	150p	2SJ56	700p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2373	210p	2SC2898	200p	2SC3393	80p	2SD315	75p	2SD947	100p	2SD1406	60p	2SJ74	60p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SD325	30p	2SD950	300p	2SD1407	60p	2SJ75	280p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD330	65p	2SD951	290p	2SD1408	125p	2SJ76	220p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD348	300p	2SD957A	520p	2SD1409	170p	2SJ77	350p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD357	40p	2SD958	60p	2SD1412	75p	2SJ79	225p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SD358	40p	2SD965	35p	2SD1413	60p	2SJ103	75p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD970	170p	2SD1415	190p	2SJ108	60p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD973	60p	2SD1417	125p	2SJ115	525p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD381	50p	2SD973A	70p	2SD1425	260p	2SJ117	550p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD985	120p	2SD1426	160p	2SJ119	700p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SJ161	650p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD1012	40p	2SD1428	220p	2SJ162	680p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD1020	40p	2SD1429	410p	2SK19	45p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD1021	120p	2SD1430	280p	2SK40	50p
2SB950	180p	2SC1328	15p	2SC1946	1500p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	55p	2SD1022	400p	2SD1431	400p	2SK49	50p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD1024	130p	2SD1432	400p	2SK55	100p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	150p	2SD1030	75p	2SD1433	750p	2SK68	100p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD1031	70p	2SD1438	140p	2SK73	75p
2SB1109	55p	2SC1358	270p	2SC1967	1300p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SD438	35p	2SD1046	200p	2SD1439	165p	2SK106	40p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD467	15p	2SD1047	180p	2SD1441	280p	2SK107	40p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD1051	130p	2SD1445	200p	2SK118	50p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD1060	130p	2SD1450	60p	2SK125	100p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD1062	150p	2SD1451	260p	2SK133	650p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD1063	200p	2SD1452	350p	2SK134	415p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD1064	250p	2SD1453	140p	2SK135	415p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD549	120p	2SD1065	160p	2SD1455	250p	2SK147	160p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD551	300p	2SD1069	150p	2SD1457	165p	2SK150	150p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD555	500p	2SD1071	450p	2SD1459	120p	2SK163	40p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD560	50p	2SD1073	350p	2SD1468	60p	2SK168	40p
2SC461	15p	2SC1407	50p	2SC2002	15p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD571	20p	2SD1088	150p	2SD1479	200p	2SK176	800p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD1094	520p	2SD1487	225p	2SK192	45p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2552	60p	2SC3042	300p	2SC3509	750p	2SD600	30p	2SD1110	225p	2SD1491	100p	2SK195	150p
2SC497	85p	2SC1429	50p	2SC2021	10p	2SC2553	200p	2SC3057	150p	2SC3518	120p	2SD601	40p	2SD1111	20p	2SD1494	300p	2SK197	140p
2SC515	100p	2SC1444	275p	2SC2022	110p	2SC2555	120p	2SC3058	2500p	2SC3519	250p	2SD602	60p	2SD1113	225p	2SD1496	350p	2SK214	170p
2SC535	30p	2SC1446	55p	2SC2023	180p	2SC2562	90p	2SC3068	60p	2SC3531	225p	2SD612	50p	2SD1128	200p	2SD1497	230p	2SK216	200p
2SC536	20p	2SC1447	70p	2SC2026	30p	2SC2563	200p	2SC3070	35p	2SC3549	200p	2SD613	70p	2SD1133	100p	2SD1497-02	350p	2SK218	400p
2SC558	275p	2SC1448	100p	2SC2027	200p	2SC2564	230p	2SC3074	200p	2SC3552	300p	2SD636	10p	2SD1135	75p	2SD1505	120p	2SK240	140p
2SC563	120p	2SC1449	120p	2SC2028	75p	2SC2565	260p	2SC3075	150p	2SC3568	200p	2SD637	15p	2SD1138	50p	2SD1507	60p	2SK312	750p
2SC605	100p	2SC1450	200p	2SC2029	120p	2SC2568	120p	2SC3077	120p	2SC3584	200p	2SD638	15p	2SD1140	40p	2SD1509	100p	2SK315	70p
2SC619	100p	2SC1454	250p	2SC2037	50p	2SC2570	30p	2SC3086	150p	2SC3595	220p	2SD639	20p	2SD1142	350p	2SD1511	100p	2SK320	120p
2SC641	80p	2SC1470	120p	2SC2053	120p	2SC2571	350p	2SC3089	130p	2SC3605	60p	2SD640	350p	2SD1148	175p	2SD1519	250p	2SK323	130p
2SC644	10p	2SC1472	40p	2SC2055	150p	2SC2577	110p	2SC3101	750p	2SC3606	100p	2SD655	18p	2SD1159	90p	2SD1521	70p	2SK386	600p
2SC647	300p	2SC1473	15p	2SC2058	20p	2SC2578	170p	2SC3112	35p	2SC3607	150p	2SD661	60p	2SD1160	150p	2SD1541	350p	2SK405	450p
2SC681	250p	2SC1474	45p	2SC2060	60p	2SC2579	110p	2SC3114	40p	2SC3636	280p	2SD666	25p	2SD1163A	220p	2SD1548	450p	2SK413	500p
2SC683	35p	2SC1475	60p	2SC2061	75p	2SC2580	175p	2SC3116	75p	2SC3657	400p	2SD667	20p	2SD1164	75p	2SD1554	170p	2SK415	500p
2SC708	100p	2SC1505	80p	2SC2068	60p	2SC2581	225p	2SC3117	120p	2SC3659	600p	2SD668	120p	2SD1168	270p	2SD1555	170p	2SK429	180p
2SC710	15p	2SC1507	45p	2SC2071	140p	2SC2588	600p	2SC3122	50p	2SC3668	120p	2SD669	35p	2SD1169	280p	2SD1556	400p	2SK511	450p
2SC711	15p	2SC1509	35p	2SC2073	40p	2SC2590	40p	2SC3148	185p	2SC3675	100p	2SD673	350p	2SD1173	350p	2SD1564	100p	2SK513	325p
2SC730	350p	2SC1514	35p	2SC2075	60p	2SC2591	50p	2SC3149	180p	2SC3678	280p	2SD676	250p	2SD1185	400p	2SD1565	75p	2SK531	350p
2SC732	40p	2SC1515	60p	2SC2078	95p	2SC2592	200p	2SC3150	125p	2SC3679	180p	2SD716	80p	2SD1186	400p	2SD1571	170p	2SK534	700p
2SC733	15p	2SC1520	45p	2SC2085	100p	2SC2603	10p	2SC3151	230p	2SC3680	380p	2SD717	180p	2SD1187	250p	2SD1572	100p	2SK537	900p
2SC735	40p	2SC1541	110p	2SC2086	60p	2SC2610	60p	2SC3152	130p	2SC3685	450p	2SD718	85p	2SD1189	55p	2SD1576	250p	2SK538	350p
2SC738	15p	2SC1545	120p	2SC2092	100p	2SC2611	30p	2SC3153	230p	2SC3687	600p	2SD722	240p	2SD1190	150p	2SD1577	250p	2SK539	1100p
2SC739	150p	2SC1567	40p	2SC2094	1200p	2SC2621	70p	2SC3156	350p	2SC3688	550p	2SD725	270p	2SD1191	120p	2SD1579	120p	2SK555	400p
2SC761	110p	2SC1568	35p	2SC2097	2300p	2SC2625	190p	2SC3157	200p	2SC3692	150p	2SD734	15p	2SD1192	90p	2SD1589	60p	2SK556	500p
2SC762	150p	2SC1569	55p	2SC2099	2500p	2SC2626	600p	2SC3158	260p	2SC3715	480p	2SD741	120p	2SD1196	150p	2SD1590	100p	2SK557	400p
2SC783	85p	2SC1570	40p	2SC2118	1100p	2SC2631	20p	2SC3159	200p	2SC3717	120p	2SD743	130p	2SD1197	150p	2SD1591	310p	2SK566	475p
2SC790	50p	2SC1571	50p	2SC2120	10p	2SC2634	10p	2SC3164	350p	2SC3729	450p	2SD756	100p	2SD1207	40p	2SD1593	125p	2SK695	550p
2SC792	380p	2SC1573	25p	2SC2131	550p	2SC2636	40p	2SC3169	150p	2SC3746	100p	2SD757	120p	2SD1210	280p	2SD1595	160p	2SK719	300p
2SC805	225p	2SC1580	600p	2SC2141	60p	2SC2637	120p	2SC3170	300p	2SC3747	120p	2SD758	140p	2SD1211	120p	2SD1608	210p	2SK724	600p
2SC828	20p	2SC1583	25p	2SC2153	40p	2SC2640	1800p	2SC3173	180p	2SC3752	250p	2SD762	100p	2SD1218	75p	2SD1609	70p	2SK725	600p
2SC829	15p	2SC1586	540p	2SC2166	80p	2SC2653	100p	2SC3175	150p	2SC3781	150p	2SD763	140p	2SD1223	75p	2SD1632	500p	2SK727	800p
2SC839	20p	2SC1617	340p	2SC2168	120p	2SC2654	180p	2SC3178	175p	2SC3783	300p	2SD768	180p	2SD1225	120p	2SD1637	50p	2SK735	600p
2SC870	100p	2SC1623	50p	2SC2188	70p	2SC2655	75p	2SC3179	70p	2SC3787	100p	2SD772	200p	2SD1227	40p	2SD1647	40p	2SK758	300p
2SC898	275p	2SC1624	60p	2SC2200	250p	2SC2656	550p	2SC3181	200p	2SC3789	75p	2SD773	20p	2SD1229	250p	2SD1649	260p	2SK787	900p
2SC930	15p	2SC1626	55p	2SC2221	650p	2SC2660	100p	2SC3182	120p	2SC3790	120p	2SD774	30p	2SD1237	300p	2SD1650	180p	2SK794	500p
2SC941	15p	2SC1627	15p	2SC2228A	60p	2SC2665	200p	2SC3199	40p	2SC3795	175p	2SD777	400p	2SD1246	20p	2SD1651	150p	2SK872	650p
2SC943	160p	2SC1628	75p	2SC2229	15p	2SC2668	10p	2SC3209	120p	2SC3798	220p	2SD784	650p	2SD1247	40p	2SD1663	450p	2SK903	500p
2SC944	140p	2SC1634	50p	2SC2230	80p	2SC2671	100p	2SC3210	550p	2SC3807	120p	2SD786	100p	2SD1248	270p	2SD1666	90p	2SK1057	600p
2SC945	10p	2SC1669	100p	2SC2233	100p	2SC2681	170p	2SC3211	220p	2SC3811	80p	2SD787	20p	2SD1251	180p	2SD1667	120p	2SK1058	800p
2SC950	40p	2SC1674	15p	2SC2235	60p	2SC2682	70p	2SC3212	260p	2SC3832	200p	2SD788	30p	2SD1263	90p	2SD1668	120p	2SK1117	250p
2SC959	225p	2SC1675	90p	2SC2236	20p	2SC2688	27p	2SC3225	50p	2SC3833	250p	2SD789	20p	2SD1264	55p	2SD1677	300p	2SK1118	225p
2SC980	40p	2SC1678	80p	2SC2237	540p	2SC2690	75p	2SC3244	45p	2SC3853	220p	2SD792	400p	2SD1265	75p	2SD1730	350p	3SK45	100p
2SC982	20p	2SC1683	100p	2SC2238	45p	2SC2705	50p	2SC3246	50p	2SC3854	250p	2SD794	33p	2SD1266	180p	2SD1732	400p	3SK51	100p
2SC983	120p	2SC1684	30p	2SC2240	15p	2SC2710	50p	2SC3259	350p	2SC3855	220p	2SD795A	140p	2SD1267	55p	2SD1739	275p	3SK59	100p
2SC1000	20p	2SC1685	30p	2SC2258	30p	2SC2712	20p	2SC3260	220p	2SC3857	500p	2SD811	450p	2SD1271	55p	2SD1740	125p	3SK74	50p
2SC1001	950p	2SC1729	900p	2SC2259	60p	2SC2716	50p	2SC3261	230p	2SC3858	550p	2SD819	200p	2SD1271A	225p	2SD1748	90p	3SK77	50p
						2SC2719	25p	2SC3262	280p	2SC3870	200p	2SD820	250p	2SD1272	200p	2SD1760	80p	3SK81	50p
						2SC2721	120p	2SC3263	280p	2SC3883	280p	2SD821	550p	2SD1273	50p	2SD1762	50p	3SK85	160p
						2SC2738	200p	2SC3264	390p	2SC3884A	300p	2SD822	290p	2SD1275	50p	2SD1773	160p	3SK88	70p
						2SC2740	450p	2SC3269	50p	2SC3886A	400p	2SD826	30p	2SD1276	60p	2SD1783	100p	3SK121	150p
						2SC2749	350p	2SC3270	50p	2SC3890	150p	2SD836	60p	2SD1277	190p	2SD1796	180p		

SEE OTHER PAGES FOR MORE GRANDATA BARGAINS

REPLACEMENT VIDEO HEADS

Model	Price
AIWA	
AV66/AV77	1200p
G700	1100p
G900	1500p
AKAI	
VS105, 112, 115, 116, 125, 126, 201, 202, 205, 220, 240, 244, 245, 247, 248, 250, 301, 303, 304, VSP8, VSP82	1200p
VP7100, VS9300, VS9500, VS9800	650p
VP77, VP88, VP7100, VP7200, VS9700, VS9800	1200p
VS1, VS2, VS3, VS4, VS5, VS10, VSP1	1350p
VS33, VS35, VS37, VS38, VS53, VS55, VS66, VS765, VS767, VS768	2100p
VS512, VS515, VS516	2800p
VS465	2300p
VS11, VS12	1200p
VS6, VS8, VS9	2400p
VSX9	2250p
VSF600, VSF650	3600p
VS155, VS165	2300p
VS20, 22, 24, 25, 26, 27, 422, 426, 427, VSF10, VSP9	1250p
VSR9	1300p
VS109, VS603, VS606, VS607	2500p
VS75	2500p
ALBA	
VCR4000, VCR5000, VCR6000	1650p
AMSTRAD	
VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	1000p
VCR6000, 6100, 6200, 8600, 8602, 8700, DD8900, 8904, TVR4	1100p
TVR2, TVR3, VCR4600, VCR4600 MKII, VCR4700	1100p
AUTHENTIC	
N850	800p
AWA	
ATVI	800p
BAIRD	
8900, 8901, 8902, 8903, 8906, 8922, 8928	650p
8904, 8923, 8924, 8925, 8929, 8935, 8943, 8944	650p
8909, 8912	800p
8930, 8931, 8933, 8940	800p
8942	2300p
8945	2000p
8947, 8948	1600p
8950	1700p
VC141L	3000p
VH582	7000p
BLAUPUNKT	
RTV100, 200, 202, 211, 214, 222, 224, RTX100, 200	800p
RTV301, RTX250, RTV333	800p
RTV306, 307, 309, 311, 315, 316, 520, 707	1650p
RTV310, 311A, 312, 317, 319, 320	1100p
RTV324, RTV325	1550p
RTV328	1850p
RTV424	3500p
RTV434, RTV444	3900p
RTX260, RTX720, RTV330	2300p
RTV454, RTV740	5000p
RTV478	3700p
RTV520, RTV530	1800p
RTV535, RTV560, RTV570	2000p
RTV635, RTV660, RTV670, RTV730	3000p
CR1000, CR1200, CR1500	4650p
CR1800	4100p
RTV321, RTV322	1700p
RTV338	2800p
RTV348	2700p
RTV404, RTV414	3000p
RTV640	3000p
RTV750, RTV800, RTV900	3500p
RTV810	4400p
RTV910	4500p
BOSCH BAUER	
VRH50	1000p
VRP20	1000p
VRP25	1000p
VRP30	3350p
CANON	
VR10	1000p
VR30A, VR30B, VR30E, VR40A	3350p
DAEWOOD	
912, VCR12, VCR30, VCR32, VCR50, VCR52	1800p
VCP11 RAF	1800p
DECCA	
8300	1000p
8400, 8500	650p
DUAL	
EVR101	2300p
VR70, VR71, VR74, VR81, VR90, VR91	650p
VR85, VR96	2300p
VR97	3300p
VR80, VR92	650p
VR93	2450p
EDISON	
VC2130, 2133, 2135, 2140, 2830, 2930, 2932, 2934, 3122	650p
VK2132, VK2512	2300p
VK2436, VK2340	650p
VK2530, VK2532, VK2631, VK2541	1600p
VK2632	1700p
VK2637	3050p
VKH2545	2450p
VKH2639, VKH2439	3300p
FUNAI	
E11, 1100, VIP1000, 1400, 3000, 5000, VCR4000, 4500, 4800, 5200, VCR5600, 6400, 6600, V1, V25	1100p
VCR4600, VCR5400, VCR5800	1200p
VCR5480, 5843, 8007, VIP2500A, 3000A, 6000, 150	2000p
VCR4530, VCR6000, VCR6100, VCR6800, VCR6803	1300p

Model	Price
VCR8103, VCR8107	2200p
VIP300A MKII	1900p
FISHER	
FVHP420, 510, 520, 530, 615, 618, 620, 622, 710, 711, 715, 720, 721, 722, 730, 830, 905, 906, 908, 910, 911, 915, 916, 918, 5000, 5001, 5005, 5050, 5075	1100p
VBS3500, 7100, 7500, 7600, 9900, VBR330	1800p
VBS7000, VBS7100, VBS9000	2000p
FVHP500, 711, 715, 721, 722, 730, 830, 5100, FVHD720	1100p
FVHP725, 830, 980	2500p
FVHP990	2700p
FVHP975	2400p
FVHD40, FVHD140, FVHP1, FVHP10, FVHP20	1150p
FIDELITY	
HQS200, VCR600, VCR6100, VR900, VR9100	1500p
VCR100	1100p
VTR1000	1100p
GOLDSTAR	
8000 3HSSDB	1900p
GVH51, GVH122, VCP4000, VCP4100, VCP4200	1100p
GHV1232, 1233, 1241, 1242, 1243, 1244, 1245, 1246, 1290, 1291, 1295, 1296, 1891, 8210, 8215, GVHP1240, 1241, 1247, 1248, VCP400, VCP4130, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4326	1100p
G.E.C.	
4000H, 4001H, 4002H	1200p
V4001H, V4004	1200p
V4005H	1500p
GRANADA	
CS1, DS2	1600p
VHSAH1	1100p
VHSAH3	2400p
VHSAN3	800p
VHSAY3	1200p
VHSBH1, VHSCH1	2100p
VHSBP1	850p
VHSBY3	2600p
VHSD52	1600p
VHSEH2	1600p
VHSEY1, VHSEY2	1400p
VHSFG2, VHSFG4	1300p
VHFS1, VHSFS2	1300p
VHSTJ1, VHSTJ2, VHSTJ3, VHSWJ3, VHSYJ2	700p
VHSVH4, VHSWH1, VHSXH1, VHSYH2	1600p
VHSWJ1, VHSXJ3	700p
GRAETZ	
4312, 4605, 4905, 4912, 4913, P4833, TR4605, TR4812, TR4905, TR4912, TR4913, TR4914, TR4943	650p
4935, 4943, 4963, 4985, 4993, TR4833, TR4935, TR4985, TR4993	650p
4920, 4927, 4930	1700p
4946, TR4906, TR4916	1600p
TR4994	2300p
TR4995	3300p
GRUNDIG	
VS410, 450, 460, 500, 505, 510, 520, 521, 530, 546	1600p
BARCELONA, MVS400, 440, 500, 600, SE5100, 6100, 6110, 9100, TVR4500, 4510, 5510, VS400, 440, 500, 505, 510, 518, 600, 610, 5180, VS6190, 700, 900	1400p
MADRID, SE5140, VS540, VS5480	3000p
MVS550, 620, VS550, 620, 630, 640, 790, 930, 940	2400p
VS120	2300p
VS680	4600p
VS160, VS740	4400p
VS170	4600p
MVS660, SE6160, VERONA, VS660, VS6690	3500p
MVS710, 720, 910, SE7120, 9120, VS710, 720, 800, 810, 910, 920	1700p
HINARI	
VXL2, 3, 4, 20, 35	1000p
VXL5, V20H	1050p
VXL6	1200p
VXL7	1300p
VXL8, 9, 10, 11, 90, VCR34H, VTV200	1100p
HITACHI	
VT11, 14, 15, 16, 30, 33, 34, 330, 340, 503, 640, 5030, VTP10, 30	1000p
VT7, VT17, VT18, VT19	2200p
VT35, VT38, VT39	2400p
VT100, 110, 111, 112, 113, 115, 118, 120, 125, 128, 220, 225, 400, 405, 410, 413, 414, 415, 418, 510, 518, 520, 525, 526, VTM625, 626, 725, 726, 728	1400p
VT3000	650p
VT4000, 4200, 5000, 5500, 5600	1100p
VT77, 680, 6500, 6700, 6800, 7000, 8000, 8030, 8040, 8100, 8300, 8500, 8700, 9000, 9300, 9500, 9700, 9900	1000p
VT8, 9, 56, 57, 570, 575, 576, 580, 585, 588	3200p
VT65	2400p
VT130, 135, 138, 145, 250, 255, 258, 420, 425, 426, 428, 430, 431, 435, 438, 535, 536, VTL30, 301, VTM630, 635, 636	1900p
VT52, VT60, VT61E, VT62E, VT63, VT64, VT640	1200p
VT168, VT150, VT260, VT498 (4 HEAD)	2300p
VT530	2050p
VT522, VTM620, VTM622, VTM720, VTM722, VTM822	1650p
VT660E	2600p
H.M.V.	
HV1000, HV2000, HV3000	650p
HV4000, HV7000, HV8000p	
I.T.T.	
VR3605, 3905, 3935, 3943, 3954, 3958, 3985, 3993, 4993	650p

Model	Price
VR3833, 3912, 3913, 3914, 3963, 3975, 4913, VRP3833	650p
VR3986	2000p
VP3826, 3906, 3916, 3926, 3946, 3948	1550p
VR3927	1400p
VR3976	2300p
VR3977	2700p
VR3984, VR3994	2300p
VR3995, 3997	1800p
VR3917	1400p
VR3730, VR3731, VR3749	2500p
VR3918, VR3919, VR3938	1500p
VR3520, 3701, 3719, 3720, 3721, 3759, 9720	2000p
VR3907, VR3908	1600p
VR3968	700p
J.V.C. & FERGUSON	
HR2200, 3300, 3320, 3330, 3350, 3360, 3660, 3750, 3860, 4100, 3292, 8900, 8901, 8902, 8903, 8906, 8922, 8928, 3V01, 3V06, 3V22	600p
HR3660, 7600, 7610, 7650, 7700, HRD110, 111, 120, 121, 220, 225, HRS100, 8904, 8923, 8924, 8925, 8929, 8935, 8941, 8943, 8944, 3V16, 3V23, 3V24, 3V31, 3V35, 3V36, 3V38, 3V39, 3V49	625p
BR1600, HRD140, 141, 142, 143, 150, 152, 156, 157, 158, 160, 5101, HRS10, 8947, 8948, 3V42, 3V44, 3V45, 3V46, 3V47, 3V52, 3V54, 3V55, 3V56, 3V57	1150p
HRD154, 170, 171, 210, 211, 217, 320, 321, 350, 521, 522, 525, 526, 527, 550, 8950, 8951, 3V64, 3V65, FV10, FV11, FV20, FV21, FV26	1300p
HRD565, HRD566, 3V48	2200p
HRD725, HRD755, 3V43, 3V53	2950p
8930, 8931, 8933, 8940, 3V29, 3V30	700p
8945	2400p
3V00, 8902, 8903, 8909, 8912, 8922	1000p
FV31	1500p
FV37, FV43H, HRD860	3500p
BR7000E, BR7000S	2600p
HR7200, 7300, 7350, 2650, BR6200	700p
HRD455	2000p
HRD520	1400p
HRD300, 400, 580, 600, 620, 650	2300p
HR4100	1000p
HRD750, HRD830	3300p
HRD250, HRD257	2500p
3V32, 8942, HR7655	2200p
HRD180, 190, 230, 610, 3V59, FV12L, FV20B, 26, 30, 32, 33, VC141L	2250p
HRD370, HRD430, HRD470, 3V58, FV13H	2300p
HRD530, HRD700, FV14T	3100p
GRC1, GRC2, 3V41	2800p
HRD330, 337, 440, 637, 641, 660, HRFC100, FV44L	2100p
KENWOOD	
KV901, KV903, KV905	650p
KV917	2450p
LOGIK	
VR960	1500p
VR950	1400p
LOEWE	
OC410, OC420, OC440	2400p
OC50, OC55, OC60, OC65	1500p
LUXOR	
9225, 9256	1800p
9245, 9251, 9254	1225p
9270, 9271, 9273	1800p
9272, 928217	2700p
9252	2500p
928017, 928077, 928097, 929107, 928117	1700p
9253	2500p
9281	2700p
9284, 9295, VR3701, VR3721, VR3731, VR3761	2100p
MATSUI	
VX500E, 800A, 810A, 820, 80A, 770B, 773B	1200p
VCRL3, VX730, VX750	1450p
VX735, VX755, VX990	1500p
VX735A, VX765, VX850	1750p
VX600	1100p
MITSUBISHI	
HS303, HS304, HS320, HS700	1500p
HS306, HS318, HS710	1500p
HS307	2300p
HS319	2300p
HS330	2400p
HS400	2250p
HS349, HSE31, HSE32, HSB31	2250p
HS411	2900p
HSE30, HSB30	2100p
HS338	2200p
HSE10, HSE11, HSE20, HSE21, HSE41, HSB10, HSB20	2100p
HS300, HS301, HS302, HS310, HS273	1450p
HS200	650p
HS337, HS347	1400p
HSE12, HSE22, MX1	2100p
HS411EZ, HS411GZ	2900p
HSB11, HSB21	2100p
HSE50	3300p
NATIONAL PANASONIC	
NV300, 322, 333, 390, 2000, 2010, 3000, 7000, 7500, 7800, 7850, 8170, 8200, 8400, 8600, 8610, 8620	625p
NV777, NV330	1500p
NV8050, NV8051	2800p
AG1000, AG1050, NV260, NV280, NV460, NV470, NV480	1600p
AG6010, AG6015	2500p
AG6840	2400p
NV100, NV200, NV370, NV380, NV630	725p
NVD80, NVH65	3400p
NVF65, NVH75	3200p
NVF51	4200p
NVG19	2300p
NVJ30, NVHJ33, NVL20, NVL21, NVG30, 31, 40, 130	1600p
NVJ35, NVG46	2100p

Model	Price
NVM1, NVM3, NVM5	4200p
AG2100, AG2200	700p
NV430	1000p
NV730, NV770 4 HEAD	1550p
NV366	1850p
NV180, NVD48	2300p
NV788	2600p
NV810, NV830	2400p
NV850, NV950	2750p
NV870, NV890, NV970	3600p
NVG33, NVG46, NVL23, NVL25, NVL28	1800p
NVG10, 11, 12, 14, 16, 120, NV250, 280, 450, 465	1500p
NVG18	1800p
NVG20, 21, 22, 25, 28, 200, NVD48	1800p
NVG50, NVG300	2650p
NVG45	1800p
NVH70	3600p
NV688	2400p
NV600	1600p
AG6800, AH6810	2600p
AG6100, AG6200, AG6300	2600p
NVG7, NVG9, NV230	1050p
NV780	2400p
NVG15, NVG400	2600p
NVM7, NVMC20	3800p
NVF70	5200p
N.E.C.	
N9011, 9012, 9013E, 9014E, 9014G, 9015, 9016, 901A, 902A, 9033, 9034, 9040, 9053, 9054, 9055, 9063, 9065, 9066, 906, DX1000, 1600	1200p
N911A, 914C, 915A, 916A, 917, 9110, 9120	2400p
PVC600, 740, 744, 754, 763E, 764, PV2300, 2400, 760, 794, 770, 774	1650p
N380, N381, N830, N831, N832, N833, N834, N835, N836	700p
8261, AH1 (for model DX3000), DX4000, N9610	3000p
N895	3150p
N9052, N9530, DX2000	3400p
VCP1	1700p
PVC2300, 2400, 740, 744, 760, 764	1400p
DS6000	3500p
NORDMENDE	
460, 9460, V100, 140, 200, 250, 304, 341, 450, 550	700p
V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 2305	1250p
V110, V333	2000p
V101, 102, 103, 112, 141, 142, 200, 300, 301, 302, 350, 500, 3005	700p
V1205, V1215, V1235, V1245	1400p
V1305	2450p
V380	2300p
V502, V503, V5005	3150p
ORION	
VH3, VH555, VH600, VH700, VH844, VH900, VH1000 (ALL MODELS)	1100p
VH1, VH2A	700p
PHILIPS	
VR6460, VR6520, 64VR60, VR6420	725p
VR6711 4 HEAD	1800p
6920, VR6440	2500p
VR6441, VR6540, VR6541, VR6640, VR6642	1300p
RANK	
BV6900AS	1800p
N830EA, RV300, RV310, RV320, RV330, RV340, RV350, RV380	700p
REDSON	
MR100	1700p
SABA	
2A10, 2A70, 2B20	1400p
4A10, 4B20	2450p
6A10, 6A70	2300p
8A10, VR6038	3150p
CVR6083, VR600, 66007, 6008, 6009, 7006, 7007	1250p
PVR6068, 6070, 8070, VR2000, 6000, 6010, 6012, 7000, 9010	600p
VHR7000, VR5005	1500p
VR6004, 6005, 6011, 6013, 6014, 6020, 6022, 6023, 6024, 7004, 7011, 7014, 7720, 7730, 8011, 8014	700p
VR6018, VR7018	2450p
VR6028	2300p
VR7016	2000p
SAISHO	
VR100, 605, 705, 805, 905, 1000, 1100, 1200, 1600	1200p
VR3300X, VR3600X, VR3650, VR3800	1400p
VR3200, VR3500	1400p
VR2000, VR3300, VR3600	1400p
SALORA	
6500, 6600	1600p
SV7300, SV8200, SV8300, SV9200	1500p
SV7400, 8400	1600p
SV8100	1200p
SAMSUNG	
SVX301, VB900, 910, VVT510, VT320, 5600, VX510, 511, 520, 616, 625, 627, 717, 614, 619, 629, 710, 712, 720, 730, 970, 971, 972, SV716, 717, SVX303, 305, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 710, 971, V1520, 616, 621, 626, 900, 910	1200p
VB770, V1730, V1770, VK8220, VX750, VK770, VK8225	1900p
VM1560, VN1561	2200p
SANYO	
VTC5000, 5400, 6000, 6500, VFR5000, VTC1500, VTCM10, 11, 20, 21, 25, VTC2000, 5100, 5150, 5300, 5400, 5350, 5370, VTCNX10, VTCNX15, 20, 30, VPR5800	1800p
VTC5500, 5550, 9100, 9300, 9350, 9355, 9455, 9500	1900p
VHR1110, VHR1150, VHR1300, VHR1700, VHR2300	1200p
VHR3200, 3270, 3100, 3150, 3300, 3400, 3310, VHRD500	1500p

Model	Price
VHR1100, VHR1200	1500p
VHR1500, VHR2500	2100p
VHR2700	2450p
VHR7900	3000p
SHARP	
VC390, VC393, VC496	2750p
VC488	4200p
VC779	1800p
VC789, VC790	2900p
VC200, 220, 300, 381, 383, 384, 385, 386, 387, 388, 471, 477, 481, 482, 483, 486, 3300, 8381, 9100, 9300, 9400, 9500, 9600, 9700	1100p
VC582, 583, 651, 681, 750, 780, 781, 683, 684, 402, 500, 571, 573, 580, 584, 600, 682, 693, 700, 772, 7810, 782, 7822, 783, 8481	1100p
VC6000, 6200, 6300, 7300, 7700, 7750, 8000, 8300	1800p
VC793	3000p
VC473, 785, 786	2200p
VC699, VCA501, VCA602	2800p
VC585, VC685	2000p
VC90ET	3900p
VFH815	2800p
SIEMENS	
FM350, FM352, FM355, FM361, FM362, FM363	1300p
FM364	1350p
FM391, FM392, FM461	1800p
FM394, FM464	2800p
FM462, FM561	1600p
FM468	2450p
FM484, FM485, FM602, FM604, FM622, FM624	1800p
FM585	1425p
FM600	1900p
SONY	
DSR-19R (FOR SL-T 9ME)	3100p
DSR-21R (FOR SLC 8-C9)	2600p
DSR-35R (FOR C20, C30, C40, SLF1UB, SLF1E) 2 PIN SLC24PS, SLC33E, SLC44PS, SLF30PF, SLF60PS, SLK85, SLT20ME, SLT30ME	1500p
DSR-43R (FOR SLC7 RANGE, SL5000, SL5100, SL3000) 1 PIN SLC6E, SL36ES, SL37E	1300p
SL3000, 8000, 8080, SLC5E, SLT7ME	1600p
SLV201, 202	2000p
SLK95, SLT50ME	2900p
SLV373VB	2600p
TOSHIBA	
V63	1500p
V9680	3400p
V8600, V8700	3000p
V21, V31, V33, V50, V51, V53, V9600	1450p
V55, V57	700p
V71, V73, V74, V75, V77, V80, V81, V82, V83, V84, V85, V86, V87	1200p
V80, V93	1450p
V5470, V5480	1300p
V600	2350p
V880MS	2600p
V700G	3700p
V500G, V509G	2500p
V9680	2900p
V300G, V301, V305, V309G	2550p
V61, V63	1700p
V110, V120, V130, V140, V210, V220	1500p
TRIUMPH	
VR9500, VR9501, VR9525	1100p
TELEFUNKEN	
A890	2700p
A920, VR1970, 2920, 2925, 2930, 410, 7921, 7926, 7931, 7970, 970	1250p
VR400, 410, 450, 510, 519, 520, 529, 540, 610, 620, 640, 920, 1920	700p
A930, 932, 935, VR2931, 2935, 2941, 3935, 4935, 4940, 4942, 4945, 5935, 7932	1400p
A935, VR3945, VR3950, VR7959	2450p
A940, VR1925, 1930, 1940, 1950, 2960, 440, 449, 530, 535, 539, 549, 550, 630, 650, 925, 930, 940, 950	700p
VR1980, VR7980, VR980	3150p
VR2915	1100p
VR2970, VR7971, VR975	2450p
VR7979	2300p
THOMSON	
TX8000, V309, 316, 320, 321, 323, 326, 4100, 4200, 4300, VX305T, 306T, 309BL, 3301, 312T, 410T, 411T	650p
TX8500, V318, 342, 343, 351, 352, 353, 4210, 4230, 4260	1250p
V333	1100p
V340	1100p
V357, VK309LP	2300p
V360, V5500	2450p
V364, V4400	2000p
V368, V6000, V8540	3150p
V410, 510, 610, 630, 715, 4240	1400p
V430, 530, 4340	2450p
V450	2300p
VK300T, VK301T, VK302T, VK303T, VK308P	650p
VM10, VM20	2700p

PINCH ROLLERS / VCR BELT KITS

Model Price

AKAI
VS10, VS9300, VS9500, VS9700, VS9800, VP7100, VP77 165p
VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9 165p
VS105, 112, 115, 116, 126, 205, 220, 240, 244, 245, 247, 248, 250, 512, 515, 516, VSX9 165p
VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP58-P82 165p
VS125, VS155, VS165, VS220, VS240, VS250, VS512 165p
VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422, 425, 426, 427, 462, 465, 467, 485, 965, 967, VSA77 165p
VSF260, 261, 262, 265, 270, 274, 280, 290, 410, 440, 400, 455, 480, 490, 497, 560, 599 165p

AMSTRAD
VCR4000, 4600, 4700, 5200, 6000, 6100, 8600, 8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD8904, TVR1, 2, 3, 4 165p
VCR7000 165p

AIWA
AV66, AV77 165p
G700, G900 165p

ALBA
VCR3000X, VCR4000 165p
VCR5000, VCR6000 165p

AUTHENTIC
N850 165p

BLAUPUNKT
RVT100, 200, 202, 222, 224, 301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 328, 404, 414, 434, 444, 478, 707, RTX100 165p
RTV211, 214, 321, 322, 348, RTX250, 260 165p
RTV324, 325 165p
RTV330, 454, 520, 530, 535, 560, 660, 670, 720, 730, 740, 800, 810, 900, 910, 920 165p

DAEWOOD
VCR12, VCR32, VCR52 165p
VCR30, VCR500 165p

DECCA
VR8300 165p
VRH8495DK (Pressure Roller Assembly) PS403-40205 350p

FERGUSON
3V00, 3V01, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929 165p
3V29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942 165p
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948 165p
3V52 165p
8950, 8951, FV10B, 11R, 13H, 14T, 20B, 21R, 26D, 31R, 32L, 41R, FV42L, 50B, 51R, 52L, VC141L 165p
FV44L, FV46T, FV43H 165p

FISHER
FVHP420, 520, 530 165p
FVHP615, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730, 830, 840 165p
FVHP905, 906, 908, 910, 911, 915, 916, 918, 970, 975, 980, 990, 5000, 5005, 5050, 5075, 5100 165p
VBR330, VBS3500, 7000, 7500, 7600, 9000, 9900 165p
FVHD250, 270, 370, 2000D, FVHP3, 210, 250, 300, 310, FVSD2095 165p

FIDELITY
HQS200, VCR100, 600, 6100 165p
VTR100 165p

FUJITSU
HS760, VX715, VX720D 165p

FUNAI
V1, V2, VCR4000, 4000, 4530, 4540, 4600, 4800, 5200, 5400, 5600, 5800, 5840, 5843, 6000, 6400, 6600, 6800, 6803, 8007, 8103, VIP150, 3000, 5000, 6000 165p
VIP1000, VIP1400 165p

G.E.C.
V4004 165p

GRANADA
VHSAH1, 3, VHSVH4, VHSWH1, VHSXH1, VHSYH2 165p
VHSAN3, VHSBP1, VHSVN1, VHSVN2 165p
VHSAY3, VHSX42 165p
VHSBH1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3 165p
VHSBY3, VHSCC1 165p
VHSDS2, VHSXN2 165p
VHSDP1, VHSFP2 (Pressure Roller Assembly) PS403-40205 350p
VHSEY1, VHSEY2, VHSFY2 165p
VHSFG2, VHSFG3, VHSFG4, VHSFH6 165p
VHSFJ2, VHSFJ4 165p
VHSF63, VBXAS1 165p

SEE OTHER PAGES FOR MORE GRANDATA BARGAINS

Model Price

VHSTJ1, VHSTJ2, VHSTJ3 165p
VHSWJ1, VHSWJ3, VHSXJ3 165p
VBXYB3 165p
VHSEH3, VHSES2 165p
VHSF34 165p
VHSFP2 165p

GRUNDIG
BARCELONA, MADRID, MVS500, 510, 600, 620, 660, 710, 720, 910, 9105, SE5110, 5140, 6100, 6110, 7120, 9100, 9120, TVR4000, 4510, 5510, VERONA, VS500, 505, 510, 520, 530, 540, 550, 600, 610, 620, 630, 640, VS650, 660, 680, 700, 710, 720, 740, 790, 800, 810, 900, 910, 920, 930, VS940, 5180, 5480, 6190, 6690 165p
MVS400, 440, 400, 410, 440, 441, 400, 456, 460 165p
VS120 165p
VS150 165p
VS180, 200, 220, 226, 262, 265, 267, 300, 310, 315, 320, 326, 345, 380 165p

GOLDSTAR
GHV51, 1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 8000, 8200, 8210, 8215, GHVP1240, 1241, 1247, 1248, 1290, 1291, 1295, 1296, VCP4000, 4100, 4130, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326 180p

HINARI
V20H, VXL5, VXL6, VXL7, VXL8, VXL9, VXL10, VXL11, VXL19 165p
VXL2, VXL3 165p
VXL4, VXL20, VXL35 165p

HITACHI
VT7, 11, 14, 16, 17, 19, 33, 34, 35, 38, 39, 88, 330, 680, 6500, 6800, 5000, 5500, 7000, 8000, 8300, 8500, 9300, 9500, 9700, 9900 165p
VT8, 52, 57, 61, 62, 63, 64, 65, 85, 86, 88, 100, 110, 111, 113, 115, 118, 120, 122, 125, 130, 135, 138, 145, 150, 168, 175, 220, 225, 250, 255, 258, 260, 400, 405, 410, 413, 414, 415, 418, 420, 425, 426, 428, 430, 431, 435, 438, 400, 498, 510, 518, 520, 525, 526, 576, 580, 585, 588, 640, VTD660, 665, VTF770, 775, VTL30, VTLC50, VTM620V, TM625, 626, 630, 635, 636, 640, 645, 646, 720, 722, 725, 726, 728, VTM730, 731, 735, 736, 740, 745, 746, VTS80, 85 165p
VT3000 165p

I.T.T.
VR3605, 3826, 3905, 3906, 3916, 3926, 3935, 3946, 3948, 3976, 3985, 3986, 3995, 3997, 6348 180p
VR3913, 3914, 3943, 3954, 3984, 3993, 3994 165p
VR3907 165p
VR3908 165p
VR3912, VR3963, VRP3833 165p
VR3917, VR3833 165p
VR3927, 3929, 3968 (PRESSURE ROLLER ASSEMBLY) PS403-40205 400p
SVR3799, VR3520, 3701, 3719, 3720, 3721, 3730, 3731, 3749, 3759, VR3761, 3781 165p
VR3918, 3919, 3958, 3998 165p
VR670, VR680, VR681 165p
VR3927, VR3977 165p
VR482, VR580, VR581, VR582 165p
VR9720 165p

J.V.C.
HR2200, 3300, 3330, 3360, 3660, 4100, 7700 165p
HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655 165p
HRD110, 111, 120, 121, 140, 150, 157, 158, 160, 225, 257, 455, 565, 566, 725, 755, HRP50 165p
HRD520, 540, 550, 580, 600, 620, 637, 641, 650, 660, 830, 860, 960, HRS5800 165p
HRD170, 180, 210, 230, 300, 320, 321, 330, 337, 350, 370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000 165p
HRS10 165p

LOGIK
VR955 180p

LUXOR
9245, 9251 165p
8252, 8253, 8256, 8285 165p
9254 165p
9255 165p
9270, 9271, 9273, 9274 165p
9272, 928017, 928077, 928097, 928217, 929017, 929117, 929317 165p
9281, 9283, 9284, 9292, 9295, VR3701, 3721, 3731, 3761, 3781 165p

MATSUI
VX850 165p

MITSUBISHI
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS700 165p
HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS710, HSB10, 20, 30, HSE10, 20, 30, 70 165p
HSE11, HSE12, HSE21, HSE22, HSE31, HSE32, HSE41, HSE51, HSE52 165p

NATIONAL PANASONIC
NV100, 180, 300, 332, 333, 340, 366, 600, 688, 777, 788, 3321, AG6010, 6015, 6100, 6200, 6400, 6800 180p
NV230, 250, 260, 280, 370, 380, 430, 431, 433, 400, 460, 465, 470, 480, 630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000, 2010, 3000, 7000, 7200, 7800, 8050, 8150, 8200, 8300, 8400, 8600, 8610, 8620, NVG14, NVG7, 10, 12, 15, 18, 30, 130, 400, AG1000, 1050, 1200, 1500, 2100, 2200, 6810, NVH70 165p
NVG9, NVG120 165p
AG6840, NVH65, 75, NVJ30, NVL20, 23, 25, 28, NVG300, NVF65, NVF70, NVFS1, NVFS100, NVG19, 20, 25, 33, 40, 50 165p
NVD48, NVD80, NVG21, NVG45 165p

Model Price

N.E.C.
N830, 831, 832, 833, 895 165p
PVC2300, 2400, 740, 744, 746, 760, 764, 766 165p
DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, N9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610 165p

ORION
VH1, VH2 165p
VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312, VHF2A, VP2948 165p
COMBI15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML, TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 600, 630, 635, 640, 666, 730, 735, 744, 774, 790, 800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050, 1060, 1070, 1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004, 2151, 2308, 2204, 2400, 2500, 2600, 2700, 2960, 2970, 3050, 3060, 4000, 4008, 4010, 4012, 4015, 4020, 4300, 5020, VP10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2957, 2966, 2979, 2980, VTV300, VXL20, 25, 30 165p

PHILIPS
VR6460, VR6920 165p
VR2020, VR2021, VR2022, VR2023, VR2024 165p
VR6711 165p
VR6540 165p
DV856, 586, VR702, 703, 6485, 6589, 6785, 6880, 6948 165p
VR445, VR6442, VR6542, VR6843, VR6943 165p
DV464, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, 2480, VR2485, 2486, 2489, 2490, 2498, 2840, 6462, 6463, 6464, 6560, 6660, 6860, 6861, 6862, 6863 165p
N-1700, VR2870 165p
VR2025, VR6580 165p
VR6548, VR6648 165p
PRESSURE ROLLER ASSEMBLY PS403-40205, DV186, 190, 286, 291, 292, 486, 471, 562, 582, 571, 761, VR201, 202, 203, 302, 303, 305, 6180, 6182, 6185, 6285, 6290, 6291, 6293, 6362, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, 6761, 6762, 6870, 6970, 6975, 86B1, 63SB7, 68SB4, 71SB4, 72SB8, 92SB31 350p

SANYO
VHR1100, 1150, 1200, 1300, 1500, 2100, 2300, 2500, 2700 165p
VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6500, 9100, 9300, VTCM10, 20, 11, 21, 31, 50, VPR5800 165p
VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 700 165p
VTC3000 165p
VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4000, 4600, 4610, 4710, 4890, 6700, VHRS700 165p
VCR100 165p

SHARP
VC200, 381, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, 6200, 7300, 7700, 7750, 8300, 9100, 9300, 9500 180p
VC300, 387, 402, 471, 473, 477, 481, 482, 483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 585, B481, VC5F3, VC5W20E, VCA1031 165p
VC600, 651, 681, 682, 684, 685, 693, 699, 700, 772, 750, 779, 780, 781, 782, VC782MK2, 783, 785, 786, 787, 793, 800, 7810, 7822, VCT72, VC6F3, VC6V3, VCA100, 102, 104, 131, 140, 170, 202, 203, 211, 234, VCA303, 501, 602, 5011, VCDB01, 802, 851, 852, 881, 882, VCM73, VCT73 165p
VC220 165p
VCA10, 30G, 60, 103, 105, 106, 211, 244, 505, 605, 615, 1031, VCD806, 810, 815, VCH80, 865, 910, VCS1000, VCT310, 410, 610, VCT1314, 5313 165p

SAISHO
VHL3, VR1000, VR2000, VR2500, VR3800 165p

SALORA
SV6500, SC6600 165p
SV7300, SV8200, SV8300, SV9200, SC9300 165p
SV7400, 8400, 8420, 8500, 8520, 8550, 8600, 8620, 8700, 8710, 8720, 8800, 8830, 9500, 9600, 9810 165p
SV8000, SV8100 165p
SV601, SV800, SV900, SV901, SV6910, SV9800, SV9900 165p
SV6700, SV8710, SV8750, SV9700 165p
SV6800, 6900, 8820, 8850, 8870, 8910, 8920, 8970 165p

SAMSUNG
SV716, 717, VB510, 520, 610, 616, 617, 619, 620, 626, 627, 629, 900, SV910, VI510, 520, 611, 616, 621, 626, 900, 910, VX510, 520, 616, 617, 619, 626, 627, 629 165p
SVX301, 303, 305, 307, 319, 322, VB710, 770, 971, 8220, 8225, V1730, 1790, 18220, 18225, VX710, 712, 720, 730, 750, 770, 790, 825, 970, 971, 972, 8220 165p

SANSUI
SVR5030 165p
SVR7010 165p

SIEMEN
FM350, FM352, FM355 165p
FM361, FM362, FM363, FM364 165p
FM391, FM392, FM394, FM461, FM462, FM464, FM468, FM561 165p
FM484, FM485 165p
FM585, FM602, FM604, FM622, FM624, FM627 165p
FM600 165p
FM204, 303, 304, 314, 325, 328, 374, 375, 376, 384, 386, 388, 404, 424, 428, 429, 488, 489 165p

Model Price

FM556, FM558, FM560, FM562, FM564, FM574, FM578 165p
FM601, 603, 605, 607, 608, 617, 619, 620, 621, 623, 625, 626, 628, 630, 632, 634, 636, 638, 639 165p

SOLAVOX
NCVR1000, NCVR5000 165p

SONY
SLC5, 6, 7, SL3000, 8000, 8080, 8200, SLJ10, SLT6ME, SLT7ME 165p
SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 60, 100, 200, SLF60PS, SLF90E, SLHF150, 850, SLK88, 95, SLT20ME, SLT30ME, SLT50ME 165p
BMC100, BMC200, BMC500 165p
SLV201, 202, 301, 302, 401, 402, 801, 802 165p
SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715, SLV757, 777 165p
SLV255 165p

TELEFUNKEN
A920, 930, 932, 935, 940, 960, 980, 990, 1200, VR925, 930, 940, 950, 971, 975, 980, 1920, 1925, 1930, 1940, 1950, 2920, 2925, 2930, 2931, 2935, 2941, 2960, 2970, 2671, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 4970, 6000, 7921, 7926, 7929, 7931, 7932, 7970, 7971, 7979, 7980 165p
VR1935, VR2915 165p
VR1970, VR1980 165p
VR400, 410, 440, 449, 400, 510, 519, 540, 549, 610, 640 165p
VR520, 529, 530, 535, 539, 550, 620, 630, 650, 920 165p

THOMSON
SV1000, TX8500, V320, 321, 323, 326, 342, 343, 351, 352, 353, 360, 364, 368, 410, 430, 400, 510, 520, 530, 540, 620, 630, 640, 4200, 4210, 4230, 4240, 4260, 4300, 4340, 4400, 5500, 5540, 6000, 8540 165p
TX8000, V309, 316, 357, 309, 410, 411, 3801, 4100 165p
V333, V340 165p
VX300, 301, 302, 305, 306, 312, 3301 165p

TOSHIBA
DV55, 57, 61, 63, 65, 66, 67, 71, 73, 74, 75, 77, 81, 83, 85, 86, 93, 94, 80, 90, 96, 97, 200, 202, 205, 207, 300, 309, 500, 509, 700 165p
V5470, V5480 165p
V108, V109, V199, V209, V609 165p
PRESSURE ROLLER ASSEMBLY – PS403-40205, V91, V95 350p

VCR BELT KITS

AKAI
VP7100, VS9300, VS9500, V9700, VS9800 120p
VS1, VS2, VS4, VS5 100p
VS10 65p
VSX9, VS105, 112, 115, 116, 205, 220, 24, 244, 245, 247, 248, VS250, 512, 515, 516 300p
VS22, VS23, VS25, VS35, VS37, VS38, VS53, VS55, VS66 80p
VS4, VS6 120p
VSA77 140p

AIWA
AV66 125p
AV77 140p
G700 160p
G900 180p

ALBA
VCR40000 130p
VCR5000, VCR6000 105p

AMSTRAD
TVR123, VCR4600, VCR4700, VCR5200 120p
VCR7000 80p
VCR6000, 6100, 8600, 8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD8900, DD8904, TVR4 120p

AUTHENTIC
N850 120p

BLAUPUNKT
RTV100 200p
RTV200, RTV222, RTV224 90p
RTV202, RTX200 150p
RTV322, RTV248 100p
RTV306, 307, 309, 310, 311, 312, 328, 414, 434, 444, 707 135p
RTV211, RTV214 140p
RTV324, RTV325 65p
RTV315, RTV316, RTV319, RTV320, RTV317 50p
RTV301, RTV333, RTV338, RTV404, RTV424 85p

BONDSTEC
BT100 110p
BT300, BT310 170p
BT350 140p
BT50 150p

BOSCH-BAUER
VRH50 100p
VRH60 140p
VRP20 180p

DAEWOOD
VCR12, VCR32, VCR52 110p
VCR30DAP 150p
VCR30DBD, VCR500BD, VCR50DFD, VCR50DFP 170p

DECCA
VR8300 90p
VRH8945DK 80p

DUAL
VR4430 90p
VR91, VR93, VR97 75p
VR70, VR71, VR74, VR81, VR90 85p
VR80 90p
VR96 85p

Model Price

FERGUSON
3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901, 8904, 8906 120p
3V23, 8923, 8924, 8929 65p
3V29, 3V30, 8930, 8931, 8933, 8940 75p
3V31, 3V32, 8941, 8942 75p
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 75p
3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948 60p
3V43, 3V44, 3V58, 3V65, 8950, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, CV141L 65p
FV31R 110p

FIDELITY
HQS200, VCR600, VCR6100 180p
VCR100 160p
VTR1000 100p

FINLUX
VR2005, VR2010, VR2020, VR2025, VR2040 105p
VR2008 160p
VR3009 140p

FISHER
VBS7000 245p
VBS9000 120p
FVHP520, FVHP530, FVHP420 60p
FVHP615, 618, 620, 622, 710, 711, 720, 721, 722, 725, 730, 840 80p
FVHP905, 906, 908, 910, 911, 915, 916, 918 80p
VBR330, VBS7500, VBS7600, VBS9900 100p
VBS3500 75p

FUJITSU
HS760, HS750, VGX715, VGX720D 160p

FUNAI
V1, V25, VCR4600, 4800, 5200, 5400, 5600, 6400, 6600, VIP3000, VIP5000 160p
VCR4530, 5840, 5843, 6800, 6803, 8007, 8103, VIP150, 6000 160p

G.E.C.
4005 100p
V4004 100p

GOLDSTAR
GHV1221, 1232, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 8210, 8215, VCP4100, VCP4130 80p
GHV1290, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4320, 4321, 4325, 4326 120p

GRANADA
VHSAH1, VHSAH3 100p
VHSVH4, VHSWH1, VHSXH1 60p
VHSYH2 50p
VHSBH1, VHSCH1 150p
VHSBP1 135p
VHSAN3 110p
VHSDS2 125p
VHSAY3 125p
VHSBY3 100p
VHSEY1, VHSEY2 70p
VHSCC1 100p
VHSDP1, VHSFV2 80p
VHFTJ1, VHSTJ2 150p
VHSTJ3 65p
VHSWJ1, VHSWJ2 120p
VHSXJ3 85p
VHSFJ2 140p
VHSFS1, VHSFS2 130p
VHSFG1, VHSFG4, VHSF63 180p

GRUNDIG
MVS400, MVS440, VS400, 410, 440, 441, 400, 456, 460 55p
VS180, 200, 220, 226, 262, 265, 267, 2X40800, 0850, 0880, 1600, 2000, 2080, 2200, 2280, MVS200RC 90p
VS150 160p
VS310, VS315, VS320, VS326, VS340, VS345, VS380 85p

HINARI
VXL2 80p
VXL7, VXL8, VXL9, VXL10 180p
VXL4, VXL35 70p
VXL5, VXL6 160p
VXL3, VXL20 90p

HITACHI
VT11, 14, 17, 19, 33, 34, 35, 38, 39, 88, 165, 330 90p
VT5000, VT5500 120p
VT7000, VT8000, VT8300, VT8500 60p
VT680, VT6500, VT6800, VT9300, VT9500, VT9700, VT9900 75p
VT52, VT57, VT61, VT62, VT63, VT64, VT65, VT85, VT86, VT640 105p
VT3000 120p
VT100, 110, 111, 113, 115, 118, 120, 125, 128, 130, 135, 138, 145, 150, 168, 175, 220, 225, 250, 255, 258, 260, VTL30 110p

I.T.T.
VR3605, VR3905, VR3935, VR3954, VR3985 90p
VR3913, VR3914 70p
VP3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3986, VR3995, VR3997, VR6948 65p
VR3927, VR3977 65p
VR3993, VR3994 75p
VR3963 65p
VR3912 130p
VR3917 150p
VR3929, VR3968 85p
VR3907 100p
SVR3799, VR3520, 3701, 3719, 3720, 3721, 3730, 3731, 3749, 3759, 3761, 3781 90p
VR3908 180p
VR3918, VR3919, VR3958, VR3998 115p

J.V.C.
HR3300, HR3330 HR3360, HR3660, HR4100 130p
HR7200, HR7300 70p
HR7350, HR7600, HR7610, HR7650, HR7655 75p
HR7700 75p
HRD110, HRD111, HRD120, HRD121, HRD225 90p
HRD140, 150, 157, 158, 160, 250, 257, 455, 565, 566, 725, 755, HRP50 65p
HRD170, 180, 210, 230, 300, 320, 321, 330, 337, 350, 370, 400, 430, 440, 441, 530, 700, 750, 950, HRS5000, 5500, 9000 60p

The Broadcasting Bill

Because of technological developments, great changes in broadcasting have become possible and are already taking place. In particular satellites whose transmissions are not amenable to control by national governments are now vying worldwide with terrestrial transmissions that are amenable to such control. When there were few satellites capable of providing quality signals for domestic viewers, and these signals were in analogue form, the situation was perhaps something that governments could choose to ignore. With the increasing population of satellites aiming their wares at the domestic viewer, and the imminent arrival of digital transmissions that will vastly multiply the signals available, the situation is becoming one that governments are likely to feel they should address. It is in this context that we have to consider the government's Broadcasting Bill.

There are several fundamental approaches, all logical, that can be adopted on the control of broadcasting. You may feel that there should be no control at all. Let broadcasters get on with it: if they can't find a market for their wares, they will simply go out of business. Fair enough. At the other extreme there is the view that broadcasting makes use of a public asset, spectrum space, and is therefore answerable to the public through its elected representatives, i.e. the government. Equally logical. In practice of course the situation is rather more complex than that assumed by these simplistic views. Because of this, most people probably feel that some policy between no control at all and tight government control (if this remains possible) is the correct approach to adopt. This leads to such tricky questions as what sort of and how much control, who by, who should appoint the controllers, who they should be answerable to, etc.

The great problem is to ensure that good use is made of spectrum space for the public benefit. It is this concern that is the basis of the elaborate arrangements inherited by the ITC from its predecessors. The aim is to use supervision to ensure that varied, quality broadcasting remains available. Complete freedom of the skies, as found in some parts of the world, has hardly been a success – in some countries the choice is rubbish, rubbish or rubbish.

The difficulty is that quality costs money. Rather a lot of it. So frequency franchising becomes essential – to provide companies and broadcasting organisations with adequate motivation to invest in the programming and services they provide.

The Broadcasting Bill is to some extent a tidying up operation, to give a legal basis to the forthcoming terrestrial digital TV services. In this respect there is little to quibble about. The Bill could become law this summer, taking effect from the start of 1997. What one can complain about is its relaxation of the law relating to the ownership of ITV companies. The effect here would be to allow greater concentration of ownership of the network. To allay fears that this might give excessive power to a small number of broadcasters, the ITC is to be given greater powers to ensure that regional TV requirements are adequate, and will be given the task of deciding on whether or not changes in broadcasting company ownership are in the public interest. The government has decided to abolish the rule that no company can own more than two franchises. Instead, no ITV company may broadcast to more than fifteen per cent of the total audience. "Market share is", according to national heritage secretary Virginia Bottomley, "a more reliable measure of influence." Up to a point, yes. But audience ratings can vary substantially over quite short periods – and is success to be penalised? This proposal does not appear to have been well thought out.

Some of the larger UK broadcasters have been maintaining that their long-term future depends on their ability to compete with vast international broadcasting operations, and that they must therefore grow. This doesn't really follow. Smaller operations should be able to survive – it depends on their ability to produce and sell to other broadcasters quality programming. On the whole this aspect of the Bill appears to be a way of accommodating the wishes of a few larger broadcasters, a dubious exercise.

The Bill also tackles the subject of the change from analogue to entirely digital transmission. Instead of setting a final date for "switching off analogue", the government says it will review the situation when fifty per cent of households can receive digital TV, or five years after the start of the first digital licence, whichever occurs first. That is to put off the decision, which in the present uncertain circumstances is as well.

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Reed Business Publishing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Editorial correspondence should be addressed to "Television", Editorial Department, Reed Business Publishing, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

INDEXES AND BINDERS
Indexes for Vols. 38 to 45 are available at £3.50 each from SoftCopy Ltd., who can also supply an eight-year consolidated index on computer disc. For further details see page 285. Binders that hold twelve issues of *Television* are available for £5.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

SUBSCRIPTIONS
Annual subscription rates (inclusive of postage) are as follows: UK £26.00; overseas £30.00 (airfreight); Europe £37.00 (airmail); rest of the world £48.00 (airmail). Send orders with payment (make cheques payable to Television) to Television, Subscriptions Dept., PO Box 302, Haywards Heath, West Sussex RH16 3YY (UK). Telephone 01444 445 566.

Subscription hotline for 24-hour ordering with Credit Card telephone 01622 778 000 quoting INJ.

NEWSAGENT DISTRIBUTION
Enquiries 0181 652 8171, fax 0181 652 8997.
Distributed by Marketforce (UK) Ltd., 247 Tottenham Court Road, London W1P 0AU. 0171 261 5555.

BACK NUMBERS
Some back issues are available at £2.75 each. For further details see box on page 271.

ISSN **0032-647X**

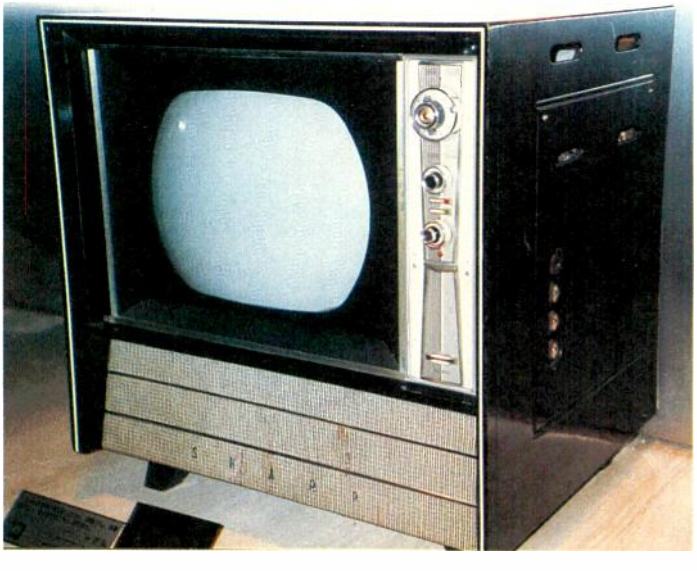
REED BUSINESS

A visit to SHARP

George Cole takes a look at the latest developments in LCD technology

Sharp's name has become synonymous with liquid-crystal display (LCD) technology. The company is the world's largest manufacturer of LCD panels, accounting for around 44 per cent of a worldwide market that's forecast to be worth about £4 billion this year. Hundreds of millions of pounds have been invested by Sharp in LCD production plants, which supply many other electronics companies.

During a recent visit to Japan I got to see and hear about Sharp's current LCD plans, which include new types that will be larger, stronger and even better than today's displays.



Sharp's first 21in. TV receiver, Model CV2101, launched in 1960.

At the company's museum Sharp has a display of some of its older technology. This includes its first 21in. TV receiver, Model CV2101, which was launched in 1960. At the time it cost 500,000 Yen, which is around £2,900 at today's rate. The average monthly wage in Japan was then just £63!

Also on show is the VC6000, the first front-loading VCR, which was launched in 1979. Its features include a tape remaining counter, a 12-channel tuner and index search, which works by recording an electronic pulse between each recording.

With the current interest in computers that incorporate TV facilities (PCTVs), it's noteworthy that Sharp was offering the C2-8000 TV and computer back in 1982.

LCD Background

Before looking at what Sharp is doing in the LCD field, we'll take a brief look at how the technology works. Liquid crystals were discovered in the nineteenth century. Most are organic compounds with long, rod-like molecular shapes. They get their name from the fact that they can behave like both a liquid and a crystalline structure. There are over 10,000 types of liquid crystals.

LCDs are made by blending different combinations of liquid crystals to achieve the best results. The blending process is a mixture of science and black art.

Researchers at RCA discovered in 1963 that the application of a voltage across an LCD cell changed the way in which light passed through it, by altering the alignment of the molecules. Five years later, RCA made the first LCD device.

The basic structure of an LCD cell consists of a pair of glass plates, which have to be 2,000 times smoother than ordinary glass, with the liquid crystal material sandwiched in between. The liquid crystals are arranged in grooves, light passing through in the direction of molecular alignment. In most LCDs the molecules are aligned in a twisted state. Thus light is twisted as it passes through. If a voltage is applied, the crystals take up a vertical alignment and light passes straight through. The passage of light can be blocked or allowed through by adding polarising filters (ordinary light is non-polarised, the filter allowing through only light with the relevant polarisation). These work in conjunction with voltage con-

trol of the LCD cells.

Thus varying the voltage controls the passage of light. The principle is shown in Fig. 1.

Colour can be introduced by putting an RGB filter over the display. With a TV or video display, each liquid crystal cell represents one pixel, the pixels being arranged in rows that correspond with the phosphor arrangement on a TV or monitor screen.

In the so-called passive display (also known as a duty-drive LCD) each row is switched on sequentially. The disadvantage is the blurring that can occur when a fast-moving object is being displayed, because of the time taken to switch on each pixel. With an active-matrix display, each pixel has its own control transistor to switch it on. The result is much better image quality. There are two types of active LCD, the thin-film transistor (TFT) type and the two-terminal element type such as the metal-insulator-metal (MIM) structure. Unlike a c.r.t., which produces light, an LCD controls the passage of light. It therefore requires a backlight or a mirror to reflect ambient light.

Types of LCD

There are many types of LC display. The first, released in 1973, used the dynamic scattering mode (DSM). They were used in calculators. A mirror provided the backlight, and the display had a curious milk-like appearance. DSM displays were replaced by the twisted nematic (TN) type in 1975. This has the molecules arranged, in the rest state, with a 90° twist. Image quality is improved, but the snag is that the contrast decreases as the display is made larger.

A number of displays were subsequently developed, including the super twisted nematic (STN), the double super twisted nematic (DSTN) – and the triple super twisted nematic (TSTN)! Simple TN displays are generally used for calculators and electronic organisers. TV and monitor screens and projectors use TFT and MIM arrangements.

Developments

Sharp is working on various new types of LCD. One is the ferroelectric LCD (FLCD) which doesn't, like an active-matrix display, require expensive switching elements and has the curious ability to retain the last screen display when the power is switched off.

Low-temperature polysilicon TFT LCDs will make it possible to incorporate drivers, memory, CPU and other elements within the display, heralding a new generation of ultra-thin computers. Low-temperature relates to the substrate processing.

Other developments include plastic LCDs that can be rolled up, and more robust displays that can withstand mechanical shocks (dropping an LCD camcorder or computer can be an expensive accident!).

There are moves to reduce LCD power consumption. A current 10·4in. display consumes around 2·4W, but 11·3in. displays that consume just 1·5W are expected to be announced this spring.

A new type of LCD, the Double Metal Guest Host (DMGH), blends a dye into an LCD. When no voltage is applied the dye absorbs the light, giving a black display. When a voltage is applied the liquid crystals realign and the light passes through, being reflected by an aluminium electrode – see Fig. 2. The process enables easy-to-read displays to be produced without the need for a backlight. Power consumption is much less at around 60mW, while the viewing angle is 100°. Production of the DMGH LCD is scheduled to begin this April.

Another development is the reflective NH (New Hysteresis) STN LCD, which uses a system known as electrically-controlled birefringence (ECB). This enables a single pixel to display white, black, red, blue and green light successively without the need for a backlight and colour filters. ECB works by voltage control, modifying the angle of the molecules in the liqui-crystal layer. The birefringence change in the crystal layer is detected by two polarisers (see Fig. 3). Production of NH STN LCDs is due to start in March. The new display will be aimed at cellular phone, electronic organiser and multimedia ter-

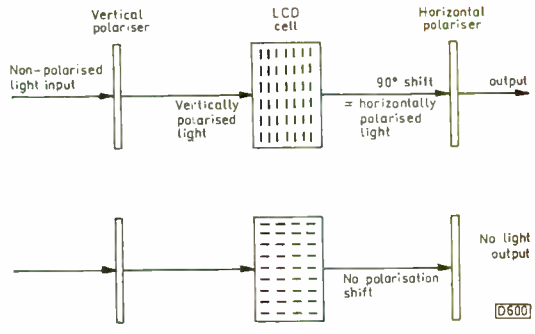


Fig. 1: Basic principle of using polarising filters and a voltage-controlled LCD cell to control the transmission of light.

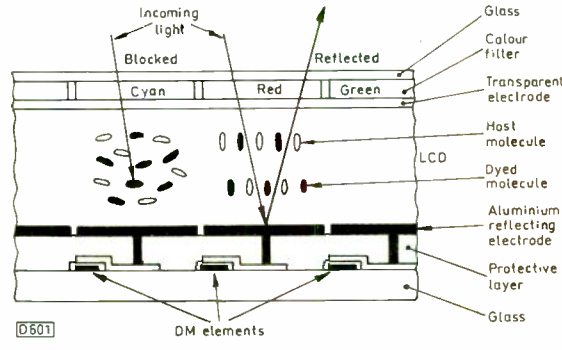


Fig. 2: Diagrammatic representation of a section through a reflective DMGH colour LCD.

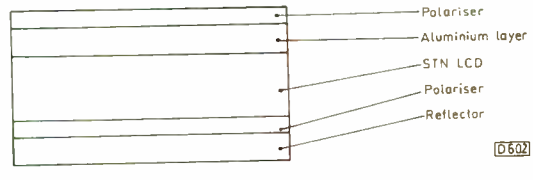


Fig. 3: Component layers of a colour ECB reflective STN LCD.

The World's largest direct-viewing TFT LCD display at 28 inches.

The stylish "Window Series" range of 8·4in. and 10·4in personal LCD TVs from Sharp.

minal applications.

LCDs are already used in a wide range of devices, including watches, calculators, test equipment, VCR displays and camcorder monitors. But Sharp's largest market (around 66 per cent) is the computer one. Other possible markets include car navigation systems, entertainment machines and hand-held information devices. Sharp's biggest goal however is to replace the c.r.t. as the major display device in TV sets and monitors. This will be no easy task.

LCD Production

Sharp began work on LCDs over twenty years ago and holds over 1,225 patents in Japan and over 500 worldwide. It has three LCD production plants in Japan: the largest and newest, Mie, began mass production last October, producing around 250,000 LCD panels a month (150,000 TFT and 100,000 passive display types). Production is expected to increase to 320,000 units a month from April. The first phase of the Mie plant, which covers 344,000 square metres and employs some 650 people, represents an investment of around £353 million by Sharp.

The Nara plant produces 160,000 passive display a month. I visited the third plant, Tenri, which produces 140,000 8·4in. and 160,000 10·4in. TFT panels a month. The first production line was built four years ago: the latest line, just opened, uses up to the minute computer-controlled systems. Sharp also produces LCDs in China, the USA and Taiwan.

Production and Yield

The production process for a TFT LCD is complex, involving seven separate film-deposition steps. The electrodes are formed during the same process. To start off, a glass substrate is covered with a photo-sensitive resist and then exposed to light, using a photolithographic process. Any excess material is washed away, then the process is repeated for each layer.

Care is required to prevent dust contamination: at Tenri, TFT production takes place in a Class 10 clean room, which means that there are fewer than ten dust particles, each no larger than 0·3 microns, per cubic foot of air. In comparison normal air has one million dust particles per cubic foot. Workers have to wear special suits to trap any flaking skin particles. Even so, faulty panels are produced and have to be junked. The yield rate is a closely guarded secret: Sharp simply says that it is "much better than 50 per cent".

Comparisons

The high cost of LCD production puts a question mark over the possibility that LCDs will replace the c.r.t. in large-screen TV sets and monitors. Although LCD costs are understood to be falling by fifteen per cent a year, they are still much higher than c.r.t. production costs.

Sharp markets a 14in. LCD TV set in Japan, but the price is around £4,000. Most LCD TV sets have 8·4 or 10·4in. displays and cost about £640 and £870 respectively. That's why other electronics companies are looking at different flat-screen technologies. Sony for example has opted for its Plasma Addressed Liquid Crystal (PALC) technology, which uses a plasma discharge instead of a transistor to switch on each pixel. Sony claims that PALC displays are cheaper and easier to produce than conventional TFT LCDs.

Other companies are developing gas-plasma displays, arguing that the production of large LCD panels is difficult. Sharp has developed a 28in. LCD panel however, made by joining together two 21in. panels. The junction between the two panels is just 440 microns, or half the pixel pitch, so the join is not visible. The panel has 921,600 pixels, 24-bit colour and a consumption of about 100W. Contrast ratio is more than 100:1 and the weight 18kg. A 42in. version is being developed by Sharp, based on four 21in. panels.

Despite all this effort, flat-panel display manufacturers will find it hard to overhaul the c.r.t., which continues to provide the best colour, brightness, contrast, resolution, viewing angle and cost. The signs are that LCDs will continue to eat into areas previously dominated by the c.r.t. however, and if companies such as Sharp can continue to drive LCD costs down the large, flat-screen TV may reach our living rooms sooner rather than later.

Acknowledgement

My special thanks to Mr Isamu Washizuka, senior executive of Sharp's liquid-crystal display business, for his help in the preparation of this article. ■

The first front-loading VCR, Model VC6000, was released by Sharp in 1979.

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model	Price
HRD520, 600, 620, 637, 641, 650, 830	95p
HRD540, 550, 580, 660, 860, 960, HRS5800	130p
KENWOOD	
KV901	70p
KV903	90p
LOEWE	
OC11, OC40	95p
OC410, OC420, OC440, OC460	130p
OC50, OC55, OC60, OC65, OC70, OC75	120p
LOGIK	
VR955	180p
LUXOR	
9245, 9251	130p
9252	140p
9253	140p
9254	100p
9255	130p
9256	130p
9270, 9271, 9273, 9274	115p
9272, 9280	140p
9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781	95p
MATSUI	
VX850	75p
MITSUBISHI	
HS200	200p
HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70	150p
HS303, HS304, HS306, HS307, HS330, HS400, HS700	150p
HS318, HS319, HS410	130p
N.E.C.	
N830, N831, N832, N833	100p
N895	80p
PVC2300, PVC2400	180p
DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610	95p
NATIONAL PANASONIC	
NV300, NV332, NV333, NV340, NV366	125p
NV777, NV788	100p
NV2000, NV2010, NV3000	130p
NV7000, NV7200, NV7800	95p
NV8600, NV8610, NV8620	145p
NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050	125p
NV370, NV380, NV480, NV630, NV780, NV830, NV850	100p
NV600, NV688, AG6010, AG6015	110p
NVG7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70	70p
NORDMENDE	
V100, V140	70p
V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905	65p
V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503	80p
V101, V102, V103, V112, V141, V142, V301, V302	90p
V110, V333	110p
V1500T, V2000B, V2000P, V400H	95p
V250, V460, V9460, V20035542, V20035543	130p
V300, V303, V380	75p
V500	75p
ORION	
COMBI15000, 16000, NEVHM, TVP230RC, 900MVH1012, VH1030, 1040, 1060, 1070, 1100, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2960, 300, 358, 360, 362, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 640, 730, 735, VP220, 225, 245, VR1032, 2966, 2980, 821, 925, VXL25	30p
NEVHL, VCP, VH1204, 2004, 2204, 3050, 3060, 4008, 400, 4012, 412, 512, 600, 666, 744, 774, 7905, 800, 820, 900, 974, VP200, VR2949, 2956, 2957, VXL20	90p
VC150, 180, VH1000, 200, 201, 205, 212, 250, 254, 288, 300, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 780, 844, 900, VHF2, VH3	80p
VH1, VH2A	150p
PHILIPS	
VR6460, VR6920	170p
VR6540	100
DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RW7, 25BO1, 25BO2, 302, 303, 305, VR30DV2, 35BO2, 35BO3, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6185, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR68SB4, 86SB1, 92SB3	85p
VR6442, VR6542	70p
VR2025, VR2580	100p
VR445B9, BR445B920, VR445B922, BR6843	100p
VR6548, VR6648, VR49SB620, VR644869S	110p
SABA	
VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2A10, 70, 2B20, 3B20, 4A10, 4B20, 6A10, 6A70, 6B20, 8B20	65p
VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN	90p
VR2000, VR6000, VR6012, VR7000, VR7720, PVR6068	130p
VR5005, VHR7000	135p
VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006	65p
VR6010, VR9010	70p
VR6020, VR6022, VR6023, VR6028, VR7730	75p
VR6024	75p
VR6520, VR6540, VR6560	90p
VR6710, VR6720, VR6735, VR8720	130p
VR6720, VR6730, VR6760, VR6775, VR6780	160p
SAISHO	
VR2000, VHL3	90p
VR3800	75p
SALORA	
SV6500	100p
SV6600	150p
SV8000	120p
SV8100	60p
SV8500, SV8520, SV9500	150p
SV7400, SV8400, SV8420, SV8550	120p
SV6700, SV8710, SV8750, SV9700	120p
SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970	95p
SV8600, 8620, 8700, 8720, 8830, 9600, 9810	130p
SAMSUNG	
SV716, 717, V1616, V1621, V1626, VX616, VX617, VX619, VX626, VX627, VX629	85p
VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, VI510, 520, 611, 616, 621, 626, VX510, 520	100
VB900, VB910, V1900, V1910	110
PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, VB770, 8220, 8225, V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX790, 8220, 8225	135p
SVX301, 303, 305, SX7301, VB710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972	230p
VX9880	110p
SANYO	
VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50	75p
VTC5300, VTC5350, VTC5400, VPR5800	100p
VTC5500	95p
VTC9100, VTC9300	220p
VTC1100, 1300, 1500, 1100, 1150, 1200, 1300, 1500	90p
VHR2100, VHR2300, VHR2500, VHR2700	150p
VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 700	110p
VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700	90p
SHARP	
VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700	100p
VC7300, VC7700, VC7750, VC7800, VC8000	150p
VC8300	150p
VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481	80p
VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3	80p
VC600, 651, 682, 684, 685, 693, 783, VC6F3, VC6V3	70
VC772, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 815, VCH80, 865, 910, VC51000, VCT310, 410, VCT1314, VCTS312	115p
SIEMENS	
FM350, FM352, FM355	60p
FM484, FM485	55p
FM391, FM392, FM394, FM462	100p
FM461, FM464, FM468, FM561	150p
FM361, FM362, FM363, FM364	120p
SONY	
SLC6, SLJ10, SLT6ME	140p
SLC5, SLC7, SLJ7, SLJ9	140p
SLC9, SL8000, SL8080, SLT50	165p
SL8000E, SL8080E, SL8200, SL8600	175p
SLV255	95p
TELEFUNKEN	
VR400, VR410, VR440, VR449	130p
VR450, VR540, VR549, VR640	70p
VR520, VR529, VR620, VR920	70p
VR530, VR535, VR539, VR550, VR630, VR650	75p
A940, VR1925, 1930, 1940, 1950, 2960, 925, 930, 940, 950	90p
A920, VR1970, 1980, 2920, 2925, 2930, 2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980	65p
A1200, 930, 932, 935, 960, 980, 990, VR2931, 2935, 2941, 2971, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 496, SVR4970, 6000, 7932, 7959, 7979	65p
VR1935	100p
VR2915	90p
THOMSON	
SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540	65p
TX8000, V309, V357, VK411	75p
TX8500, V342, 343, 351, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, 5500, 6000, 8564	90p
V320, V321, V323, V326, V4200, V4300	90p
V333	100p
V340	90p
V4100, VK308, VK309, VK410	120p
VK300, VK301, VK302, VK303, VK305, VK3301	135p
VK312	65p
TOSHIBA	
V55, V57	85p
V33, V31, V51, V53, V9600, V9680	85p
V61, V63, V65, V66, V67	150p
DV80B, DV80D, V71, 73, 74, 75, 81, 83, 85, 86	120p
V108, V109, V199, V209, V609	120p
V91G, V95G	115p

Models & Description	Order Code	Price
UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	VL01	25p
PANASONIC VIDEO LAMPS	VL02	35p
SHARP VIDEO LAMPS	VL02	35p
HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p
AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA	VL05	150p
AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)	VL01	25p
BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)	VL02	40p
AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p
AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL07	40p
GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	60p

PANASONIC MODE SWITCHES

NV2000, 2010, 7000, 7200, 7800 (VSS0048)	£3.50
NV230, 260, 430, 810, 870, 2300, 4300 (VSS0110)	£2.25
NV830 (VSS0091)	£2.10
NV300, 333, 340, 366, 688, 777, 778 (VSS0060)	£3.75
NVG21, 25, NVH65, NVD80 (VSS0175A)	£2.00

ON/OFF MAIN SWITCHES

GRUNDIG
PART NO: 29703, 29102
USED ON: C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M68-190, M68-190/99, M70-195, P40-345, ST66-1602, T55-340, V7722
PRICE: £2.25

ITT
PART NO: 13/1074
USED ON: CP0200, 0211F, 0323, 0323/1, 0341/14, 0345F, 0351/1, 0361, 0361/1, 9350, CT0500, 0500/1/T, 0500T
PRICE: £3.00
PART NO: LFC 005
USED ON: CVC40
PRICE: £2.00

MATSUI/SAISHO
USED ON: MATSUI-2190, SAISHO-PST2130TX
PRICE: £2.00

PHILIPS
USED ON: K30, K35, K40, KT3, KT4
PRICE: £0.95

SONY
PART NO: (POWER SWITCH + REMOTE SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1
PRICE: £2.75
PART NO: (POWER SWITCH + REMOTE SWITCH)
USED ON: KV2022, KV2024
PRICE: £3.00
PART NO: (POWER SWITCH)
USED ON: KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1
PRICE: £8.00
PART NO: (POWER SWITCH 26mm)
USED ON: KV1400, KV1440, KV2040, KV2060
PRICE: £2.00
PART NO: (POWER SWITCH 21mm + REMOTE SWITCH)
USED ON: KV2020
PRICE: £2.00
PART NO: 2 PIN (FUNCTION SWITCH)
USED ON: KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV275PE3, KV2756PE3
PRICE: £0.40
PART NO: (4 PIN FUNCTION SWITCH)
USED ON: VARIOUS
PRICE: £0.50

REPLACEMENT IDLER TYRES

AKAI	M132773	IT01
	MZ366960J2	IT02
GOLDSTAR	VXP0521	IT17
HITACHI	6861471	IT03
	6861482	IT04
	6886971	IT05
JVC	PU 48967B	IT06
FERGUSON	PU 51380	IT07
	PU 51402A	IT08
	PU 55373	IT09
	PU 55374	IT10
NATIONAL PANASONIC	VXP 0329	IT11
	VXP 0343	IT12
	VXP 0344	IT13
	VXP 0401	IT14
	VXP 0433	IT15
	VXP 0463	IT16
	VXP 0521	IT17
	VXP 0581	IT18
SANYO	1430662T15620	IT19
SHARP	NIDL005GEZZ	IT20
	NIDL0006GEZZ	IT21
	NPLY0107GEZZ	IT22

PRICE
20p EACH
16p EACH FOR A PACK OF 5 FOR EACH MODEL
13p EACH FOR A PACK OF 10 FOR EACH MODEL

VIDEO SERVICE KITS

AMSTRAD

VCR700
Contents
BELT SET. PINCH ROLLER. REEL IDLER. VIDEO LAMP
Order Code: SK41 **£5.50**

FERGUSON & JVC

3V42/43
HRD455/HRD725

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND		BELT SET. PINCH ROLLER. SUPPLY CLUTCH. TAKE UP CLUTCH	
Order Code: SK37	**£16.00**	**Order Code: SK38**	**£9.00**

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
Contents
BELT SET. PINCH ROLLER. IDELR ARM. TENSION BAND
Order Code: SK44 **£7.00**

3V29/3V30
HR7200/7300/7350
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK05 **£5.00**

3V35/36.38/39/49
HRD110/111/120/225
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK04 **£5.00**

3V31/3V42
HR7600/7610/7650/7655

Contents		*Economy Kit Contents*	
BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDERL. T/U CLUTCH. T/U IDLER TENSION BAND. VIDEO LAMP		BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDERL TYRE. T/U CLUTCH	
Order Code: SK33	**£11.00**	**Order Code: SK34**	**£5.00**

3V35/36/38/39/49
HRD110/111/120/121/225

Contents		*Economy Kit Contents*	
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND		BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER TYRE. REEL IDLER TYRE	
Order Code: SK35	**£10.00**	**Order Code: SK36**	**£5.50**

3V29/3V30
HR7200/7300/7350

Contents		*Economy Kit Contents*	
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP		BELT SET. T/U REEL IDLER TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLE TYRE. T/U IDLER TYRE. T/U CLUTCH	
Order Code: SK31	**£10.00**	**Order Code: SK32**	**£5.00**

3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND		BELT SET. PINCH ROLLER	
Order Code: SK39	**£15.00**	**Order Code: SK40**	**£9.50**

FISHER

FVHP905/906/907/908/910/911/916/918

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER GEAR IDLER UNIT. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE	
Order Code: SK57	**£13.00**	**Order Code: SK58**	**£5.00**

FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER GEAR IDLER UNIT. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE	
Order Code: SK68	**£11.00**	**Order Code: SK69**	**£3.00**

HITACHI

VT11/VT33
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK08 **£5.00**

UNIVERSAL TRIPLER
Price: £4.00 each

AMSTRAD MODE KIT
Price: £2.75 each

SEE OTHER PAGES FOR MORE GRANDATA BARGAINS

VIDEO SERVICE KITS *(Cont.)*

VT11/VT33

Contents		*Economy Kit Contents*	
BELT SET. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. FF/REW IDLER. CLUTCH PLATE. TENSION BAND		BELT SET. PINCH ROLLER. FF/REW IDLER TYRE. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE	
Order Code: SK45	**£13.00**	**Order Code: SK46**	**£3.75**

VT52/61/62/63/64/65/85/86/640

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND		BELT SET. PINCH ROLLER. FF/REW IDLER	
Order Code: SK49	**£14.00**	**Order Code: SK50**	**£3.00**

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
Contents
TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND
Order Code: SK52 **£9.75**

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30
Contents
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND
Order Code: SK51 **£14.00**

PANASONIC

NV2000/NV2010

Contents		NV7000/NV7200/NV7800 *Contents*	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES		BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	
Order Code: SK03	**£5.00**	**Order Code: SK02**	**£5.00**

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
Order Code: SK01 **£5.00**

NV2000/NV2010

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP		BELT SET. PINCH ROLLER IDLER TYRE. PULLEY TYRE	
Order Code: SK13	**£6.00**	**Order Code: SK14**	**£3.50**

NV7000/NV7200/NV7800

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER TENSION BAND		BELT SET. PINCH ROLLER IDLER TYRE. CLUTCH TYRE	
Order Code: SK11	**£8.50**	**Order Code: SK12**	**£3.25**

NV300/NV330/NV333/NV340/NV366

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE. PLAY IDLER TYRE	
Order Code: SK15	**£7.00**	**Order Code: SK16**	**£3.25**

NVG7/NVG9/VNG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)

Contents		*Economy Kit Contents*	
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TENSION BAND		LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TYRE	
Order Code: SK27	**£6.00**	**Order Code: SK28**	**£3.00**

NV332

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER TENSION BAND. FF/REW TYRE		BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE	
Order Code: SK29	**£12.00**	**Order Code: SK30**	**£5.10**

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE	
Order Code: SK23	**£6.00**	**Order Code: SK24**	**£3.25**

NV600/NV688

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER TENSION BAND		BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE	
Order Code: SK25	**£12.00**	**Order Code: SK26**	**£6.00**

NV730/NV770

Contents		*Economy Kit Contents*	
SLOT IN BELT. LOADING BELT PINCH ROLLER. IDLER UNIT. TENSION BAND		SLOT IN BELT. LOADING BELT PINCH ROLLER. IDLER TYRE	
Order Code: SK19	**£5.00**	**Order Code: SK20**	**£3.00**

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE	
Order Code: SK21	**£5.00**	**Order Code: SK22**	**£2.75**

NV777/NV788

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. IDLER UNIT. TENSION BAND		BELT SET. PINCH ROLLER. IDLER TYRE	
Order Code: SK17	**£6.00**	**Order Code: SK18**	**£4.00**

VIDEO SERVICE KITS *(Cont.)*

SHARP

VC381

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP		BELT SET. PINCH ROLLER. REEL IDLER TYRE	
Order Code: SK47	**£8.00**	**Order Code: SK48**	**£3.25**

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND		BELT SET. PINCH ROLLER. REEL IDLER	
Order Code: SK60	**£9.50**	**Order Code: SK61**	**£5.00**

VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND		BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE	
Order Code: SK64	**£13.50**	**Order Code: SK65**	**£3.75**

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700

Contents		*Economy Kit Contents*	
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND		BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE	
Order Code: SK62	**£13.50**	**Order Code: SK63**	**£5.00**

FOR MORE DETAILS OF OVER 500 TYPES OF SERVICE KITS...
PLEASE RING US!

BACKUP BATTERIES

REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES

Replaces Ferguson Part No:
00E6-067-001, used on TX10, L2V — 150P
Replaces Philips Part No's:
138-10138, 138-10313. 1.2V – 90mAh — 100p
Replaces Philips Part No's:
138-10229. 2.4V – 90mAh — 180p

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES

Replaces Ferguson Part Nos:
00E6-066-001, 2.4V
Used on: 3V35, 3V56, 3V58, 3V65 — 200p

REPLACEMENT LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500p	LOT01
ORION 3714002	1500p	LOT02
FIDELITY ZX300	1500p	LOT03
FE TX100 90 DEG	1500p	LOT04
SABA 490007182	1500p	LOT05
FE TX90 WHITE	1650p	LOT06
ITT D307/37 EQ	1600p	LOT07
BLAUPUNKT 210	1600p	LOT08
GRUNDIG 2922010	1600p	LOT09
ITT CVC800/1/3	1500p	LOT10
ITTD218/37 EQ	1600p	LOT11
NORMENDE 5255	1600p	LOT12
SABA 81000 200	1600p	LOT13
SALORA T236 EQ	1650p	LOT14
SABA 811-50-24	1600p	LOT15
SABA 770223500	1600p	LOT16
TELEFUNKEN AT1	1450p	LOT17
TELEFUNKEN EQ	1400p	LOT18
SALORA FM0218B	1600p	LOT19
NORMENDE 5255	1600p	LOT20
ITT CVC 1150/1	1500p	LOT21
ITT COMPACT 80	1500p	LOT22
FE TX100 GREEN	1450p	LOT23
HINARI CT4/5 5113	1500p	LOT24
SELECO 6320410	1600p	LOT25
BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT B1	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D066/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3700 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002 Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3	1650p	LOT38
PANASONIC TLF14567F Used On: TC2043, TC2243, TX300	1850p	LOT39
PANASONIC TLF14568F Used On: TX2231, TX2244	1850p	LOT40
PANASONIC TLF14584F Used On: TC2210, TC2160, TX1752, TX2112 TX2112, TX2162, TXC22	2350p	LOT41
PANASONIC TLF14586F TC1651, TC2051, TC2061, TC2253, TC2263, TX5500	2350p	LOT42
HINARI Used On: CT15	1600p	LOT43
HITCHI 2434274 CPT2174, CPT2176, CPT2178, 2434274	1250p	LOT44

We stock line output transformers for over 100 different models. Please ring 0181-900 2329 for more information.

IDLERS & PULLEYS REPLACEMENT

AKAI

VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p
VS3, 6, 12, 56, 58, 59			
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	500p
VS3, 6, 12, 59, 59			
V9700	IDLER	BV321979	600p
VS125, 126, 155,	IDLER ASSY	MZ366866J2	900p
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516			
VS22, 38, 105, 112, 115, 116, 205, 220			
VP7100, VS9300	T-UP IDLER	PU47752	£4.50
VS9500, VS9800			
VP7100, VS9300	UNLOADING	PU46381	£4.00
VS9500, VS9800	IDLER		
VP7100, VS9300	REW IDLER	PU46380	500p
VS9500, VS9800			
VP88	IDLER	BV336067	£5.00
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p
VS15, 58			
VS23, 35, 37, 53, 55	CLUTCH	ML373043	1100p
VS66, 75, VSA77			
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	W321762	£4.25

AMSTRAD

VCR7000	IDLER	150280	£1.50
TVR1, VCR4500	CLUTCH	150873	£3.75
VCR4600, VC5200, VCR9000			
TVR1, VCR4500	GEAR HOLDER	151284	£3.50
VCR4600, VCR5200, VCR9000			
TVR1, VCR4600	REF CLUTCH		£3.50
VCR5200			
VCR6000, VCR6100	CLUTCH	153202	£3.80
VCR4500, VCR9000	CLUTCH		£4.00
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p
VCR4700			
MOD KIT TAPE CREASING FOR AMSTRAD			
VCR4500, 4600, 4700			£3.00

FERGUSON

3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50
3V22, 3292, 8900, 8901, 8904, 9806			
3V16, 3V22	T-UP IDLER	PU49280	£5.50
8903, 8909, 8912, 8922			
3V23, 3V29 3V30,	REEL IDLER	PU48967	175p
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942			
3V23, 3V31	ROLLER ASSY	PU49042A	350p
3V29, 3V30, 3V31	T-UP IDLER	51402	100p
3V32, 3V35, 3V36, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942			
3V29, 3V30, 3V31	T-UP CLUTCH	PU51380	200p
3V32, 8930, 8931, 8940, 8941, 8942			
3V35, 3V36, 3V38	REEL IDLER	PU55374	200p
3V39, 3V49, 8943, 8944			
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	150p
3V39, 3V49, 8943, 8944			
3V58, 3V59, 3V64	IDLER ARM	PU58645	£2.25
3V65, FV10, FV11, FV12 FV13, FV14, FV20, FV21, FV22, FV26			
FV30, FV32, FV33, 8950, VC141L			
3V42, 3V43	CLUTCH ASSY	PU55822	1200p
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948			
3V42, 3V43, 3V44	T-UP CLUTCH	PU56043-1-4	240p
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1-5	160p
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948			
3V00, 3V01, 3V16	LOADING IDLER	PU43681	£4.00
3V22, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909			
8912, 8922			
3V00, 3V01, 3V16	REW IDLER	PU46380	500p
3292, 8900, 8901, 8904, 8906			
3V16, 3V22, 8902	IDLER	PU49281	£1.70
8909, 8912, 8922			

FISHER

FVHP420, 520, 530	FF REW PULLEY	HI638531	80p
FVHP615, 618, 620	COMP. IDLER ASSY	FI1430420400300	£220p
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830			
FVHP840,905, 906, FVHP908, 910, 911, FVHP915, 916, 918			
FVHP615, 618, 620	GEAR IDLER ASSY	FI1430490400900	380p
FVHP622, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP615, 618, 620	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP662, 710, 711, FVHP720, 721, 722			
FVHP725, 730, 830, FVHP840			
FVHP905, 906, 908,	GEAR IDLER ASSY	FI1430490402400	275p
FVHP910, 911, 915, FVHP916, 918			
FVHP975, 980, 990,	IDLER	FI1430420400700	300p
FVHP999, 5000, 5005			
FVHP5050, 5075, 5100			
FVHD40, 55, 140	REEL DRIVE ROLLER		£6.00
FVHP1, 10, 20			
FVHP975, 980, 990	CLUTCH	F12430510404200	£9.50
FVHP420, 520, 530	IDLER		£2.80
FVHP420, 520, 530	TAKE UP IDLER		290p
FVHP990	LOADING GEAR		90p
VBS3500	REEL DRIVE PULLEY		£3.20
VBS3500	IDLER		250p
VBS7000	REW IDLER		95p

GOLDSTAR

GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			
GHV1221, 1232, 1240	IDLER		110p
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000,			
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130			

HINARI

VXL3, VXL20	REEL IDLER	40000009	110p
VXL2	IDLER		110p
VXL4, VXL35	IDLER		£2.75
VXL4, VXL35	CLUTCH		£6.50
VXL4, VXL12, VXL25	LIMITER POST		£1.30
VXL30, VXL35, VTV300			
VXL5, VXL6	CLUTCH		£3.75
VXL5, VXL6	GEAR HOLDER		£3.50
VXL7, VXL8, VXL9	CLUTCH		£3.80

HITACHI

VT11-33, VT63-64	CLUTCH ASSY	6879515	£7.50
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61			
62, 65, 85, 330, 640, VT16S			
VT120-220, 100, 110	CLUTCH ASSY	6886824	£7.50
111, 113, 115, 118, 200		6886972	
125, 128, 130, 135, 138, 145, 150, 175, 225, 250,			
255, 258, 260, VTL30			
VT8000-8300, 7000	FF REW IDLER	6413663	£2.80
VT8500-8700			
VT8000-8300, 7000	PLAY IDLER	6414221	290p
VT8500-8700			
VT8000-8300, 7000	FF REW PULLEY	6383531	80p
VT8500-8700			
VT9300-9500, 6500	FF REW IDLER	8681471	250p
VT680, 6800, 9700, 9900			
VT9300-9500, 6500	PLAY IDLER	6861482	230p
VT680, 6800, 9700		6861481	
VT 9900			
VT9300-9500, 9700	IDLER	681505	230p
VT9900, 6500, 680, 6800	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	125p
VT14, 16S, 17, 19, 34, VT35, 38, 39, 52, 61, 62			
VT65, 85, 86, 88, 330, 640			
VT1000, 110, 111, 113	FF-REW ARM	6886792	240p
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150			
VT175, 220, 225, 250, 255, 258, 260, VTL30			
VT400, 405, 410, 413	FF-REW ARM	6897094	£1.30
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT400, 405, 410, 413	CLUTCH BASE	6896951	£3.25
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435			
VT438, 450, 498, 510, 518, 520, 525, 526, 530, 535			
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585			
VT588, VTM625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85			
VT3000	T-UP IDLER (LARGE)		£4.50
VT3000	REW IDLER		£6.00
VT680, 6500, 6800	FS-BRAKE	6861505	230p
VT9700, 9900			

HITACHI TV

OUTPUT MUDULE HM 6251	£5.50
OUTPUT MODULE HM 6232	£8

JVC

HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p
HR7655, 7300, 7350, 7610			
HR7200, 7300, 7350	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655, 7700			
HR7600, 7610, 7650	ROLLER ASSY	PU49042A	350p
HR7655, 7700			
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p
HR7655, HRD110, HRD111, HR7300, 7350, 7610, HRD120-121, 225			
HRD110, HRD120-121,	T-UP CLUTCH	PU55373	150p
HRD225, HRD111			
HRD110, HRD120-121,	IDLER ARM	PU55374-3-8	200p
HRD225, HRD111			
HRD170, 180, 210, 230	IDLER ARM	PU58465	£2.25
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000			
HRS5000, HRS5500			
HRD455, HRD725	CLUTCH MECH	PU558822	1200p
HRD140, 150, 157, 158	CLUTCH MECH	PU57658	1050p
HRD160, 250, 257, 565, 566, 755, HRP50			
HR3300, HR3330	REW IDLER	PU46380	500p
HR3660, HR4100			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56043-1-4	240p
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50			
HRD140, 150, 157, 158	TAKE UP CLUTCH	PU56044-1-5	160p
HRD160, 250, 257, 455, 565, 566, 725, 755, HPR50			

MATSUI

VX730, 735, 750, 755,	CLUTCH	850A00005	420p
VX810, 820, 850, 880, 990			
VX730, 735, 750, 755	LIMITED POST LEVER		£1.30
VX770, 800, 810, 880	ASSY		
VX990			
VX800A, VX900	IDLER REEL		£1.50
VX800A, VX820	REEL UNIT CLUTCH		280p

MITSUBISHI

HS306, 307, 318, 319,	GEAR ASSY	522B00201	£6.25
HS400, 410, 710			
HS337, 338, 347, 349	IDLER	552B01701	325p
HS411, 412, 421, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30,			
HSE70			
HS306, 307, 318, 319	IDLER	641C34301	£2.00
HS400, 410, 710			
HS347, 349, 412	IDLER	522902002	£3.00
HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70			
HS337, 338, 411, 421	IDLER	552B01801	320p
HS200	TAKE UP IDLER (LARGE)		£4.50
HS200	UNLOADING IDLER		£4.00
HS200	REWIND IDLER		£6.00
HS306, 307, 318, 319	SUPPLY REEL	522A00101	£3.20
HS400, 410, 710	DISK		
HS306, 307, 318, 319	TAKE UP REEL	522A00102	£3.20
HS400, 410, 710	DISK		
HS320	REEL DISK	522C06301	£3.00
HS337, 338, 411, 421	REEL DISK	522P00601	£5.00
HS300, 301, 302, 310	PULLEY	522C05201	£2.25
HS306, 307, 318, 319	GEAR WHEEL	641D71101	£1.50
HS400, 410, 710			
HS306, 307, 318, 319	GEAR WHEEL	641D71001	£1.50
HS400, 410, 710			

NEC

N830, N831, N832, N833	TAKE UP CLUTCH	150p
N830, N831, N832, N833	TAKE UP IDLER	100p
N830, N831, N832, N833	REEL IDLER	200p
N895	TAKE UP IDLER SMALL	550p
N911, N915, N916, N917	REEL DRIVE PULLEY	350p
N9012, 9013, 9014, 9016, 9033, 9034, 9054, 9055, 9066, 9110		
N9510, 9520, 9530, 9610		

NATIONAL

NV322, NV600, NV688	IDLER UNIT	VXP0463	£2.75
NV777, NV788, NV332, AG6100, 6200, 6800, 6810			
NV300, NV333, NV340	IDLER ARM	VXL0997	£3.60
NV366			
NV300, NV330, NV333	IDLER UNIT	VXP0401	60p
NV340, NV366			
NV300, NV330, NV333	PLAY IDLER	VXP0433	£2.75
NV340, NV366, NV8620			
NV300, NV332, NV333	ACTION GEAR	VDG0016	£0.60
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV333, NV688, NV2000	LOADING GEAR	VXP0325	£2.00
NV3000, NV7800			
NV300, NV332, NV333	INTERMEDIATE GEAR	VXG0017	£0.65
NV340, NV366, NV600, NV777, NV788, NV2000, NV2010, 3000, 7000			
AG6010, AG6015			
NV330, NV333, NV340	CAM GEAR	VXG0158	£1.00
NV366, NV777, NV788			
NV230, NV250, NV260	IDLER ARM	VXP0521	110p
NV280, NV370, NV380, NV430, NV450, NV460, NV465, NV470, NV480			
NV630, NV650, NV730, NV780, NV810, NV830, NV850, NV870			
NVG7, NVG9, NVG10, NVG11, NVG12, NVG 14, NVG15, NVG16, VG18			
NVG30, NVG400, AG1000, AG1200, 1500, 1810, 2100,			
AG2200, NVH65, NVH70			
NV370, NV430, NV870,	CAM GEAR	VDG0200	£1.20
NV730, NV830, NV850, NVG10, NVG12, NVG18			
NV730, NV770	IDLER UNIT	VXP0581	£2.50
NV2000, 2010 3000	IDLER UNIT	VXP0331	80p
NV2000, 2010, 3000	IDLER UNIT	VXP0329	80p
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV7000, 7200, 7800	IDLER UNIT	VXP0344	75p
NV7000, 7200, 7800	CLUTCH	VXP0343	300p
NV8150, 8200, 8300,	IDLER UNIT	VXP0245	80p
NV8400, 8620, 8610, 8620			
NV8200, 8400, 8600	PLAY IDLER	VXP0243	80p
NV8610, 8620			
NV8620	CLUTCH	VXP0343	250p
NV332, NV600, NV688	IDLER	VXPO488	300p
NVG20, NVG21, NGV25	PULLEY UNIT	VXP0767	400p
NVG40, NVG45			
NV230, NV250, NV280	WORM WHEEL	VXP0604	160p
NV430, NV450, NV460, NV465, NV650, NV730, NV770, NV810			
NV870, NV890, AG1000			
NV370, NV380, NV630	IDLER	VXP0523	300p
NV780, NV830			
NV370	CLUTCH GEAR	VXP0595	£1.00
NVG7, NVG11, NVG12	WORM WHEEL	VXP0691	£1.50
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70			
NV2000, 2010, 3000	LOADING GEAR	VDG0035	£0.60
NV7000, 7200, 7800, 8050			
NV230, NV250, NV370	LOADING GEAR	VXP0520	£1.50
NV430, NV450, NV460, NV630, NV730, NV770, NV780, NV810			
NV830, NV890, NVG7, NVG10, NVG12, NVG15, NVG30, NVG120			
NGV130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	CLUTCH GEAR		£2.50
NV280, NV430, NV450, NV730, NV770, NV810, NV870, NV890			
NVG7, NVG10, NVG11, NVG12, MVG14, NVG15, NVG18, NVG30			
NCG120, NVG130, NVG400, NVH70, AG1000			
NV230, NV250, NV260	LIMITER ROLLER		£1.50
NV280, NV300, NV333, NV340, NV366, NV370, NV430, NV450, NV460			
NV465, NV630, NV650, NV777, NV780, NV788, NV810, NV830, NV850,			
NV870, NV890, NV2000, NV2010, 7200, 7800, NVG7, NVG10, NVG12,			
NVG14, NVG15, NVG18, NVG30, NVG120, NVG130, NVG400, NVH70,			
AG1000			

SAISHO

VR605, VR800, VR900	CLUTCH	850A20000	420p
VR1100, 1200, 1600, 2500, 3200, 3300			
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 2500, 3200, 3300, 3500, 3600, 3700			
VR605, VR800, VR900	IDLER		280p
VR2500, 3200, 3300, 3500, 3600, 3800			
VR705, VR805, VR905	IDLER		110p

SANYO

VHR1110, 1150, 1200	IDLER	143-0-662T-14730	£5.00
VHR1300, 1500			
VTC5000, 5150, 6000	FF-REW IDLER	143-0 741T-20001	250p
VTC6500, VTCM10, M11, M20, M21, M30, M31, M50			
VTC9100, VTC9300	IDLER	143-0-551T-01400	95p
VTC9300	FF ROLLER ASSY	143-0-547T-00200	200p
VTCM10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
VTCM30, M31, M50			
VHR2100, 2300, 2500	IDLER	6130374899	300p
VHR2700			
VTC5000, 5150, 6000	PULLEY	143-0-662T-01201	£5.20
VTC6500			
VTCM10, M11, M20, M21	PULLEY	143-0-662T-10350	£5.50
VTCM30, M31, M50			
VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	350p
VHR3400, 3700, 3800	ROLLER		
VHRD500, VHRD700			
VPR5800, VTC5300	LOADING ROLLER	143-0-661T-03800	80p
VTC5400			
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		750p

SHARP

	IDLER ASSY	NIDL0005GEZZ	110p
	IDLER	NIDL0006GEZZ	110p
VC600, 651, 681, 682	IDLER ASSY	NPLYV0107GEZZ	£8.15
VC684, 685, 693, 698, 700, 783, VC6FR, VC6V3			
VC7300, VC7700, 7750	PLAY IDLER KIT	NPLYV0041 + NDA1V1007	£7.50

JUST ARRIVED!!! NEW ITEMS

Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	650p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585 VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000	4600p
	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25 NVG25, NVG28, NVG200, NVD48 PART NO: VEH 0343	3000p
	NVG33, NVG45, NVG46, NVL23 NVL25, NVL28 PART NO: VEH 0417	2900p
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130 PART NO: VEH 0416	2700p

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX, SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625p

8 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxilliary Options!!
* Replaces up to 8 remotes with one * Simple 4 digit setup routine
* Controls 1000s of models * Teletext functions with Fastext
* Clear (large key) layout * Code Search Facility
* Stylish and easy to operate * Replace broken or lost remotes
* Original Remote not required

Order Code: 8 WAY Price 1450p + VAT

Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2600p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316,4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2600p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2600p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2600p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2600p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2600p
	N895	CH02	2600p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2600p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2600p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2600p
TOSHIBA	V55, V57	CH01	2600p
	V65, V66	CH02	2600p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	220p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	200p
AERO DUSTER	150ML	SP08	220p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	200p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	—	SP26	2100p

All the above items are manufactured by Servisol

If you purchase more than one Servisol Product, postage & package will be charged as follows:
300p for 5 cans **450p** for more than 5 cans

CD Pick Ups

SONY OPTICAL PICK UP
PART NO: KSS210A SONY CDPC 301M, CDPC 305M 2200p
Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

PART NO: KSS210B
USED ON MODELS:
CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 2200p

Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	90p
STEREO-HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	70p
SOLDER MOP 1.2mm x 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

REMOTE CONTROLS

Description	Order Code	Price
GRUNDIG		
TP160E	RC 107	900p
TP200, TP300	RC 380	800p
TP400	RC 401	675p
TP590-600	RC 600	850p
TP390,TP610	RC 610	850p
TP621	RC 621	850p
TP630, TP650	RC 650	850p
TP660	RC 660	850p
TP661	RC 661	850p
HITACHI		
CLE800-CLE830	RC 140M	700p
A617402/655602	RC 192	875p
A512120/230	RC 900	800p
A514790	RC 901	800p
A5088470	RC 902	800p
A518612	RC903	900p
SCL002	RC904	850p
C2096	RC 905	850p
A511940	RC 906	750p
655602H	RC 907	800p
ITT		
IFB13, 14, 15	RC 143	875p
FS4	RC 148	850p
RG305	RC 305	675p
RG306	RC 306	825p
FS9/1-10/1	RC 307	850p
VS5 RUK	RC 308	825p
VS4-1	RC 310	850p
MULTICONTROL (17C20)	RC 311	800p
KORTING		
18279, 18396, 18460, 18521 SE	RC 108	850p
40540 VTS	RC 108	900p
LOEWE		
DC11	RC 146	850p
MATSUI		
010270601	RC 889	850p
VX770	RC 892	850p
METZ		
JAVA COLOR (6890)	RC 166	850p
COLOR (7156)	RC 183	850p
JAVA (7180)	RC 184	850p
MITSUBISHI		
939P/03607, 939P/03609	RC 140M	850p
NOKIA		
SATELLITE	RC 550	850p
NORDMENDE		
TC2336	RC 351N	850p
CMC1, TC3519	RC 356	875p
OCEANIC		
390C9500	RC 339	900p
ORION		
RC53	RC 892	850p
PANASONIC		
EUR51200	RC 200	800p
TC2200	RC 201	850p
VSQ0357/NV730	RC 202	875p
TNQ1621	RC 203	900p
PHILCO		
CARVEL, CONCORDE, MERCURY, TELESTAR	RC 108	850p
TC10	RC 152	900p
PHILIPS		
RC5002,5154	RC 134	850p
KT3 NON TEXT	RC 135	825p
69117032	RC 178	875p
69117194	RC 180	875p
RC5991-UNIV	RC 300	580p

Description	Order Code	Price
PHILIPS (continued)		
RC38	RC 301	750p
KT3 TEXT	RC 5301	750p
RC5352	RC 5352	800p
RC5375	RC 5375	850p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	700p
SABA		
T6772	RC 149	900p
TC319-320	RC 328	875p
TC356	RC 356	875p
TC358	RC 358	850p
TC360	RC 360	800p
TC365	RC 365	800p
SALORA		
SERIES L	RC 190	875p
86173	RC 882	850p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	700p
JXGE	RC 878	850p
JXDE	RC 884	850p
VHR2300	RC 890	850p
RC628	RC 865	900p
SHARP		
G0121CESA, 123CESA, 204, 251	RC 140M	850p
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	850p
FC742	RC 164	900p
SONY		
RM604, RM605, RM606	RC 140	700p
32 CHANNEL	RC 140M	700p
RM613	RC 141	750p
RM632, RM636	RC 160	675p
TATUNG		
FXA	RC 877	850p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	850p
TELEFUNKEN		
FB632	RC 632 ST	850p
FB639	RC 639 ST	850p
THORN/FERGUSON		
3V35-42	RC 342	650p
3V31-32	RC 344	800p
3V57-58	RC 628	800p
TX10 TEXT	RC 732	575p
TX10 STEREO TEXT	RC 738	575p
TX9-90-100	RC 740	675p
3V55, FV11	RC 783	800p
TX100 FASTTEXT	RC 785	650p
TX100 STEREO FASTTEXT	RC 789	650p
PROFESSIONAL	RC 790	650p
TOSHIBA		
CT937	RC 950	850p
CT9117	RC 951	800p
201R4B	RC 952	800p

UNIVERSAL PROGRAMMABLE REMOTE CONTROL
Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)
Order code: IR100R Price: 1950p

We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.

VCR ALIGNMENT KIT

CONTAINS:

SET OF 7 HEAD & TAPE PATH ALIGNERS
- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

SET OF 8 ALLEN KEYS
- 0.77mm
- 0.90mm
- 1.27mm
- 1.50mm
- 1.60mm
- 2.00mm
- 2.40mm
- 3.00mm

3 Reversible Screwdrivers
Circlip Pliers
Spring Hook
Micro Screwdriver
VCR Head Extractor

Order Code: TOOL10 Price: 2900p

FUSES

	TIME LAG (20mm)		QUICK BLOW (20mm)	
Value	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
4A	FUSE14	55P	FUSE30	50P
5A	FUSE15	60P	FUSE31	50P
6.3A	FUSE16	60P	FUSE32	50P

FUSES

CURRENT RATING	ORDER CODE	PRICE
CERAMIC PLUG TOP		
3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P
20MM CERAMIC TIME LAG		
3.15A	FUSE41	100P
4A	FUSE42	100P
5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
32MM CERAMIC SLOW BLOW		
8A	FUSE44	210P
10A	FUSE45	210P
15A	FUSE46	210P
20A	FUSE47	210P
38MM CERAMIC SLOW BLOW		
10A	FUSE48	875P

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

I.C. PROTECTOR

ICPF10	ICPF38	ICPN10	ICPN38
ICPF15	ICPF50	ICPN15	ICPN50
ICPF20	ICPF75	ICPN20	ICPN75
ICPF25	ICPN5	ICPN25	

Price: Only 30p each

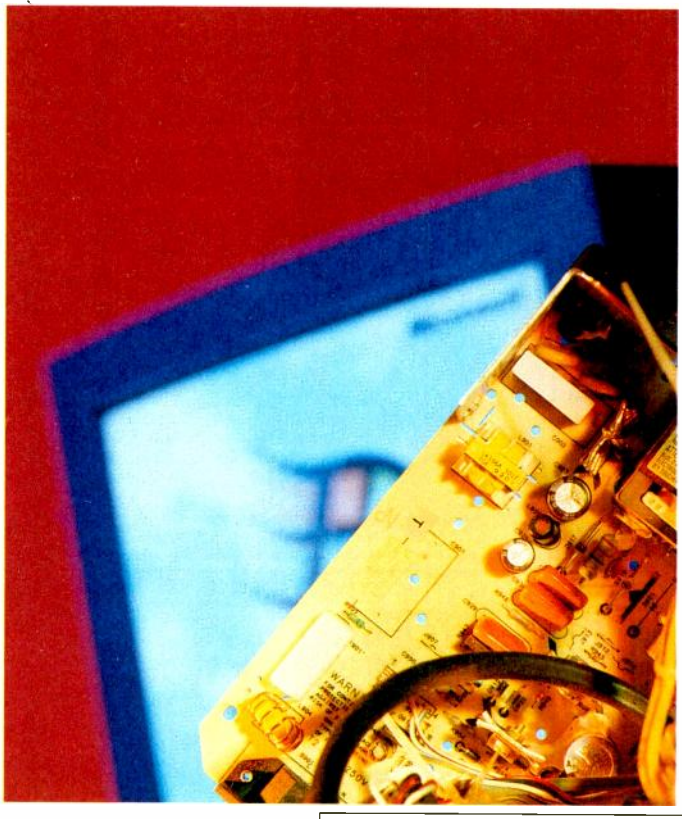
AUDIO CONTROL HEAD
Amstrad Original No: 150751
Used on Amstrad TVR1.2.3, VCR4600, 4600MII, 4700 Funai V2S, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada, Ultravox
Order Code: AH01 Price: £13.50

Amstrad Original No: 153154
Used on Amstrad 008900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244
Also fits: Antitech, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguant, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Universum
Order Code: AH02 Price: £14.50

GRANDATA LTD
K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE, SOUTHWAY, WEMBLEY, MIDDLESEX, ENGLAND HA9 0HB
Telephone: 0181-900 2329 Fax: 0181-903 6126
OPEN Monday to Saturday. Times: Mon-Fri 9.00-5.30 Sat 9.00-2.00

Servicing PC Monitors

The first obstacle one meets when servicing monitors is getting the back off! Peter Shoreland has hopefully started the ball rolling with his findings on this and other aspects of monitor servicing. We follow up with a number of fault reports sent in by readers. Further reports and information will be welcome



The first time someone asks you to repair a computer monitor will start as a day of trepidation and end with you wondering what all the fuss was about. You are likely to be asked to do the job because large companies charge a hundred pounds or so just to look at a monitor while other large companies, which have no one to do repair work, willingly pay up. Here's where you come in. If the big boys charge two hundred pounds or more to replace a tube, and a new monitor costs much the same. you can establish a nice little repair service. Monitors you can't repair will provide you with a supply of spare parts – the big boys simply put old monitors in the crusher!

I attend liquidation sales where computer equipment is sold off by business consultants who double as insolvency practitioners. The auctioneer is usually happy to get a bid and give you an option on the lot!

Problems

So what are the problems with monitors? As with a well-known Japanese manufacturer's large-screen TV sets, getting the back off is a major one. Fig. 1 shows a typical arrangement. The first thing to do is to take off the base pedestal – this applies to virtually every monitor, no matter who made it!

The PC installation consists basically of one box (the PC) with a mains input and one monitor sitting on top, again with a mains input. Both have delicate switch-mode power supplies. As a TV service engineer you know about these already, so you are on familiar ground. The pin connections for a typical cable that joins the PC box to the monitor are shown in Fig. 2. This will enable you to make up a test box. Better still, buy a PC at an auction and load up Euras on the 3·5in. floppy disc. This will give you a permanent test box. The pin connections shown are actually for the Olivetti 250/290/500/750 range. But these sockets are very much of a muchness whatever the make of equipment.

Fig. 3 shows the switch-mode power supply circuit used in Amstrad 1600 range monitors. These will be by far the most common source of work for you, since they were budget machines though generally quite reliable and are often still going at third or fourth hand.

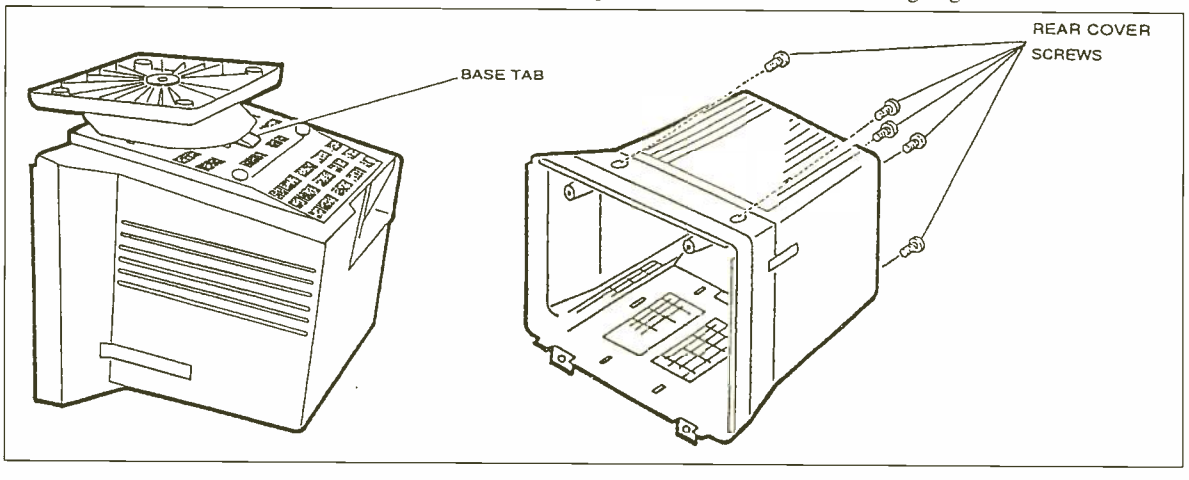


Fig. 1: Gaining access: remove the swivel base then the rear cover.

Actually the mains bridge rectifier feeds two separate switch-mode power supplies in this range, one for the monitor itself and the other for the PC, linked via a 15-pin plug. We've shown the monitor power supply, which follows conventional lines.

The active devices are contained within the STK7356 chopper chip IC501. Q5 is the chopper transistor, which is connected as a blocking oscillator with feedback to its base via C512. Q3 sets the d.c. conditions at its base, which is biased via R505-7. It is preceded by Q2, whose base voltage is set by the error detector transistor Q1. The latter's collector voltage depends on the difference between its base and emitter voltages. Zener diode D1 provides a fixed emitter bias. Rectifier D3 with C508 produces a voltage that's dependent on the mains input and circuit loading, being fed from a close-coupled secondary winding on the chopper transformer T501. A second rectifier, D2 with C507 as its reservoir. provides an emitter supply for Q3.

Q4 provides excess current and voltage protection. The chopper transistor's emitter current flows via R502, the voltage developed across this resistor being sensed at Q4's base. In the event of excessive chopper transistor conduction, the voltage across R502 will switch Q4 on, shorting out the drive to Q5's base. Under excess voltage conditions zener diode D508 will conduct, with the same result.

Willow Vale can supply most of the components you will need for monitor repairs, including line output transformers. There are many other suppliers, as the advertisements in *Television* show. Handy if you don't have a Willow Vale account or live down the road from them as I do.

A study of the average monitor circuit will show that protection devices abound. Most are three-pin devices with a triangular presentation. They also come as silver fusible devices rated at one or two amps. If the mouse or keyboard is dead, go to the motherboard in the PC: you'll find these fuse devices where the keyboard and mouse connectors link up.

Line timebase circuits generally follow conventional practice. A study of the field timebase will also make you feel at home. In the Compaq range of monitors for example you'll find a TDA1170 chip, though with a much larger copper heatsink. If you don't have the circuit diagram, take a note of the values of the small resistors in this area when a good monitor comes your way. Next time you may well find that they have turned to charcoal. This is a common fault brought about by the relevant winding on the line output transformer taking an away day. Sadly, everything else goes with it!

1	Red video
2	Green video
3	Blue video
4	NC
5	Self-test
6	Red earth
7	Green earth
8	Blue earth
9	NC
10	Logic earth
11	Mon ID bit 0
12	Mon ID bit 1
13	Line sync
14	Field sync
15	NC

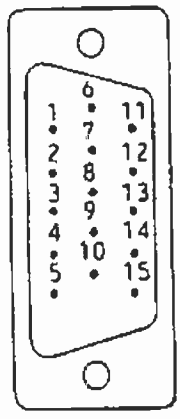


Fig. 2: Typical 15-pin PC/colour monitor plug connections.

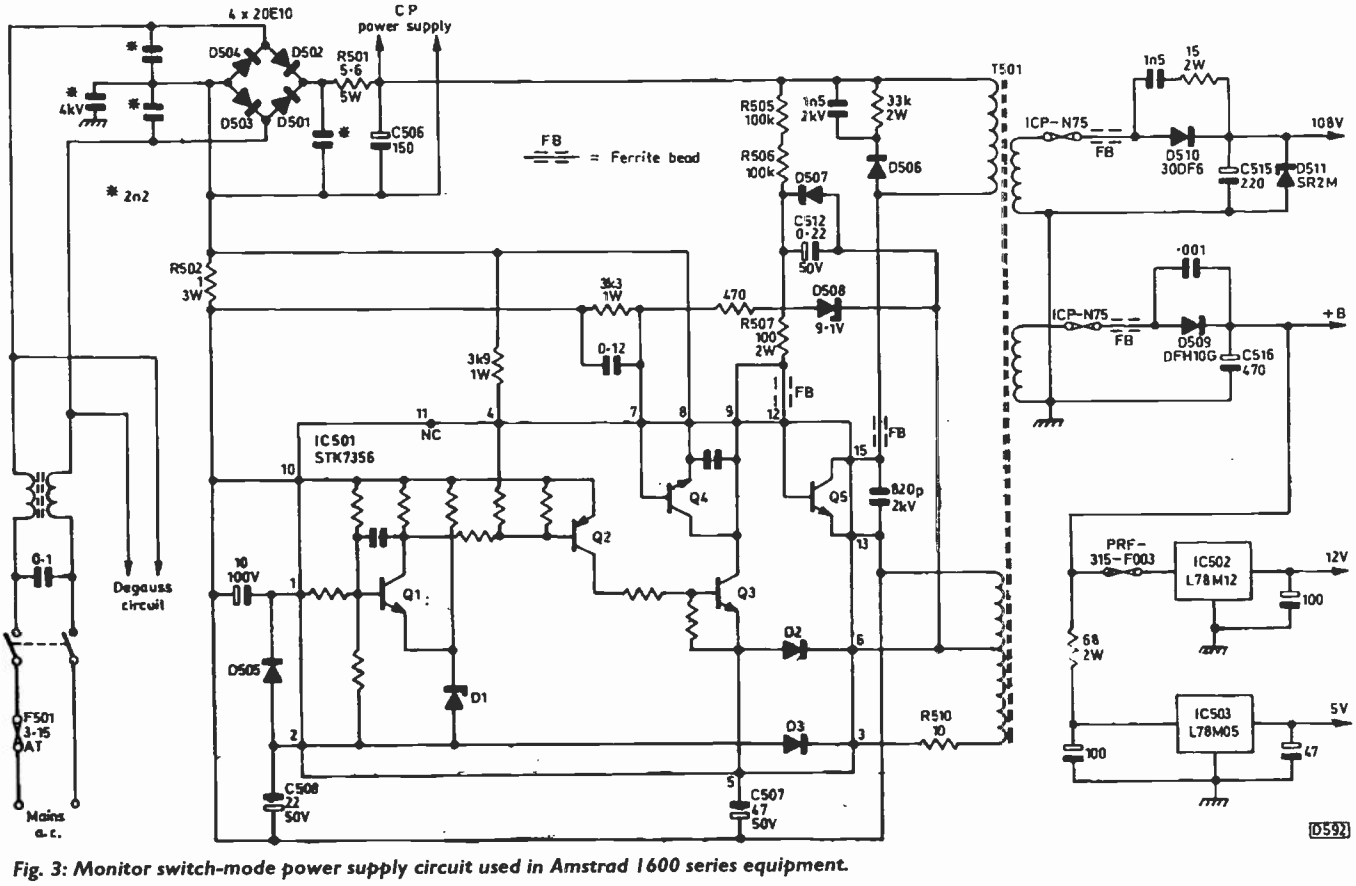


Fig. 3: Monitor switch-mode power supply circuit used in Amstrad 1600 series equipment.

The Tube

It's wise to drill a hole in the cabinet so that you can reach the focus control on the line output transformer. The focusing tends to drift off over a period of time and, as I have already mentioned, getting the back off can be something of a problem.

Tube life can be short. The outfit I work for give their monitors a hard life, some being on for eighteen to twenty hours a day, so a screen-save program can be useful to prevent phosphor burn. If you have to change the tube, it's easy. Off with the lid, unscrew the four screws on the metal surround and the tube with the plastic surround will come away. But the quote you have to give for doing the job is often more than the customer will bear – a new monitor may be cheaper. Invariably you end up with the monitor for spare parts. If you don't attend the auctions, this will be your best way of getting spares.

Keep your degaussing baton handy. Weird colours on the screen is a common complaint in offices: the cleaner has just been through with the vacuum, or the screen has been swivelled so that everyone can see the latest share prices!

Well that's enough for a starter. Let's see what others can come up with.

Readers' Monitor Fault Reports

Reports from
Dave Lawrence
Philip Blundell
Chris Watton
Nick Beer
Chris Avis
David Mawtus
Chris Hawkins

Tulip Colour VGA Monitor

This monitor is a derivative of the Philips 9CM082. A common problem we get is that there is no colour, just a monochrome display. It happens only when the monitor is connected to a Tulip computer. Connect a pattern generator and the monitor works perfectly: connect a different monitor to the PC and this also works correctly.

It seems that when the PC is switched on it decides to produce a colour display only if the d.c. impedance of the three RGB lines to their respective earth lines (pins 1 and 6, 2 and 7, 3 and 8 respectively of the 15-pin sub-D connector) is in the range 65-85Ω. Correct operation can be restored by cleaning the pins of the connector for the interface cable on the monitor's motherboard. In practice slightly increasing the size of the pins by tinning them seems to provide a permanent cure.

If one colour is prominent or the raster is at full brightness, check for dry-joint at the tube base connector.

The tubes used in these monitors seem to lose emission or develop poor focusing sooner than those in other makes, requiring regeneration – in fact we've never to date had to use our rejuvenator on any other VGA or Super VGA monitor. Conversely my Philips colour TV set is still going strong after fifteen years, the only repairs in all this time being to the remote control unit! **D.L.**

GoldStar 1470SSI

This SVGA monitor produced a dim picture. There was a fracture on the main board near the front centre. **D.L.**

Digital VT320

A faulty line output transformer is often the cause of the no picture symptom. **D.L.**

IBM PC Monitors

If you have ever tried to remove the back from certain IBM monitors you will have realised that a special tool is required to release the internal latch. Jensen Tools (01604 787 060) has a monitor opening kit for IBM PS/2 monitors. It contains five different tools, including the latch opener. Order code number is IB991. **P.B.**

Enta CK1420

For a dead monitor check whether R531 (560kΩ) is open-circuit. **P.B.**

Taxan MV870

A dark picture with a bend in the top third of the display suggested a problem in the power supply. We didn't have a circuit diagram, but fortunately the output voltages are shown on the component side of the board. The main h.t., shown as 138V, was found to be low at only 105V. Replacing C927 (100µF, 160V, 105°C) brought the voltage up to 117V, but attempts to set up the h.t. by means of the control made no difference.

As the monitor, and the workshop, warmed up the h.t. rose to 129V and the picture and its crispness improved. So we decided to try freezing some likely components. Q903 (2SD763) seemed to be very sensitive to this treatment, but a replacement made no difference. Applying some Tellyman's wisdom, we replaced the small electrolytics C919 (10µF, 50V) and C920 (47µF, 50V). The result, perfect regulation and a bright picture.

Note that most monitors are made to a higher standard than most TV sets. All electrolytics should be 105°C rated types. **C.W.**

Amstrad CTM644

This monitor had previously operated intermittently: it was now dead. The cause of the fault was loss of the h.t. feed to the line output stage as ICP-N20 had failed. It had undoubtedly done so because of a huge dry-joint at the collector of the line output transistor. **N.B.**

Amstrad PCW9256

This wordprocessor was dead. We didn't have the service manual, but who needs one when you know these classic, basic power supply circuits? The 180kΩ start-up resistor R506 was open-circuit. **N.B.**

Hitachi CM2187ME (C77M Chassis)

This is a 21in. luxury monitor. There were faint vertical striations on the left-hand side of the screen, with north-south distortion for about the first four inches of the scan, producing about one and a half cycles of sinewave-shaped vertical displacement of the raster. Armed with the service manual and strong coffee, we waded patiently through the elaborate scan and correction circuitry without success. Then a little preset was spotted amongst a group of components on a PCB fitted astride the scan coils: one touch with an adjusting tool and the fault cleared.

To be on the safe side we decided to replace this 470Ω preset. It proved to be a difficult task, with all the scan coil leads having to be unsoldered before we could lift the PCB. It is typical of the perverse irony of this trade that the board, with its offending preset, is not shown anywhere in the service manual! **C.A.**

Wyse WY50

The most common fault is simply a defective on/off switch. Other common faults are as follows:

(1) Terminal is completely dead. Replacing transistors Q101 (2N2222) and Q102 (2SC3150) will usually put this right. It is wise to check zener diode D106 (TL431C) and optocoupler U103 (4N35 or CNX35) as well since if either of these is faulty Q101/2 will again blow.

If replacing these items fails to bring the terminal to life, check the following (in the order given): R101 (1·2Ω, 3W), BR101 (KBPS06), R105 (750kΩ, 0·5W), U102 (7812 regulator) and the 5·1V zener diode C17, which is on the logic board.

(2) Slow start – the image appears several minutes after switch on, the screen remaining blank initially. The cause has always been C120 (4,700µF, 10V) which becomes leaky.

(3) Unstable image. I've quite often had terminals which produce an image that 'wobbles' about on the screen. Replacing C112 (220µF, 35V) usually cures the fault. If not, the cause is either C117 (100µF, 25V), U101 (L200 regulator) or U102 (7812 regulator).

(4) Only the status line appears on the screen. Nothing else comes up, even in the 'block' mode. Changing EPROM 7B (ER1400) usually cures this. Note that this chip is in position 5J in the less common gate-array version of the terminal. If changing the EPROM fails, the cause of the fault is the 27C64 row buffer 5C. **D.M.**

Tatung TM340T

Breaks in the fine PCB tracks are a common cause of trouble with these monitors. For missing colours, check around the c.r.t. base pins. If the power supply is tripping and there are no obvious shorts, check for breaks at connector SK202 on the main PCB and connector PL202 on the tube base panel. **C.H.**

ADC/RDI MM211D

If the e.h.t. rises from 16kV to 20kV, with arcing around the tube base, check C301 (220µF, 63V) which may be shorted or leaky. **C.H.**

Ultrasys/Chuntex DM14350

If there's no e.h.t. though the power supply is o.k., check whether diode D411 (DD75) is short-circuit. A BY228 can be used as a replacement. Note that L451 normally goes open-circuit at the same time, and that the line output stage tuning capacitor is also suspect. **C.H.**

Mitsubishi HF1200E

This tip applies to most monitors that use STK7402/7406/7408/7410 series switching regulators. Before condemning the regulator, a quick check on the condition of the internal chopper transistor can be carried out by measuring the resistance between pin 16 (collector) and pin 14 (emitter). If there is no short-circuit, check for continuity between the mains bridge rectifier's reservoir capacitor and pins 16 and 14 (chassis return).

Common faults are failure of the start-up resistor (generally 3·3kΩ) connected to pin 1, or the oscillator supply resistor (2-3MΩ) connected to pin 6: they tend to go high in value.

Finally, it's best to replace the 220µF, 16V capacitors connected to pins 8 and 11. **C.H.**

Amstrad PC CM

The cause of intermittent operation of these weighty monitors can often be traced to dry-joints around the STK7356 and STK7358 chopper chips. **C.H.**

Kaizo EM1428

If the monitor is dead with the 2A fuse F501 open-circuit, check whether R501 (2·2Ω, 7W) is open-circuit and bridge rectifier BD501, its reservoir capacitor C509 (50µF, 400V) and the 2SK790 FET chopper transistor Q501 for shorts.

For repeated failure of the line output transistor, check the 6·8nF, 2kV flyback tuning capacitor C619. **C.H.**

Hyundai HMM413

When there's no e.h.t. it's advisable to replace both IC7 (MC1391/LM1391) and the IRF740/IRF840 MOSFET line output transistor. **C.H.**

Arche 217AXL

This monitor's power supply had failed during an electrical storm. We had to replace the following items: C102 and C103 (both 22nF, 400V), R102 (1·5Ω), Q101 (2SK955), D105 (15V, 1·3W) and the UC3842AN chopper driver chip. **C.H.**

Commodore 1084S

This monitor's power supply was tripping. We found that D207 was short-circuit. It had in turn damaged L207. **C.H.**

Hyundai HCM1420

The power supply in this monitor is based on the STK7309 chopper chip. For no or low output, or a high-pitched whistling, it's best to replace C709 (47µF, 25V), C710 (22µF, 63V), C711 (1µF, 63V), C716 (47µF, 63V) and C724 (220µF, 63V). Use 105°C series capacitors.

It's common to find that R711 and R712 (both 18kΩ, 0·5W) have increased in value. Also check the two 3·6V, 1·3W zener diodes D703 and D704 which tend to short.

For field collapse check the TDA1675 chip U401 and/or diode D401 (BA159). **C.H.**

Amstrad PCW8256/8512

For intermittent changes in picture size, check the 2SD1666 12V regulator transistor Q5003. A BUT11AF works in this position.

For slow disc functions or disc errors, check the condition of the disc drive belt. **C.H.** ■

David Botto

It is with deep regret that we report the untimely death, from cancer, of David Botto, who had been a regular contributor to *Television* for many years. David's involvement with the radio/TV trade started in the early Forties, when he entered as a trainee. He was keenly interested in new equipment, technologies and developments, and was anxious to share his findings with others. He also wrote for *Electronics Australia* and other publications. During a long life in the trade he spent some time in Germany, where he was involved with technical publications and translation.

David was a helpful and warm personality. He will be greatly missed by his friends and associates. **J.A.R.**

Camcorner

Reports from David C. Woodnott

Sony EVS550

The complaint was no mechanical operation. In fact loading was partially o.k., but the take-up coaster assembly was detached from its linkage. After dismantling the unit to reach the assembly we refitted the coaster, using Loctite to replace the linkage pin which had fallen out. **D.C.W.**

Sony CCDF500

This F series unit had no mechanical functions and there was no EVF picture. The E-E pictures were o.k. The cause of these problems was a chafed EVF connecting cable, which had shorted the supply rail to the earthed metal bracket. As a result PS990 (1·6A) on the power supply PCB (PA-24P) had failed.

Unfortunately the EVF connecting lead is only available with a new EVF PCB (VS41). Rather a high price to pay for a damaged lead! It was not possible to repair the lead as this had been done before. We got round the problem by fitting a lead from a scrap EVF. The customer was happy to accept the lower cost! **D.C.W.**

JVC GRAX2

The symptoms were confusing to say the least. When a battery was connected the PWR ON LED lit, as usual, but then stayed on despite operation of the on/off button. Everything appeared to be o.k. in the playback mode, but when the machine was switched to the camera mode a picture with noise lines that moved around in the background was displayed. If the record trigger was pressed, the noise lines would disappear and recording would continue normally. But playback of the recording would be marred by incorrect drum speed (no servo lock). The main d.c.-d.c. converter was the cause of these diverse symptoms. It provides several outputs, inluding switched 8V and 5V supplies. The latter was permanently on and not regulated (it would read about 5V with a 6V battery connected, rising to 8V or so when the camcorder was run from an adaptor or power supply). A replacement converter restored normal operation. We've since had another GRAX2 with a similar d.c.-d.c. converter problem. **D.C.W.**

Sanyo VMD6P

This camcorder would power up then do nothing. On inspection we found that another party had had a go and had fitted connector CN312 on the SYSCON 2 PCB incorrectly. CN312 is a two-pin plug that connects the trigger switch to the syscon circuit's key-scan matrix. By reversing the plug CN312's live pin was effectively earthed, thus locking up the micro-controller chip. Remember the effect – it might happen to you! **D.C.W.**

Panasonic NVR50B

No mechanical functions and shut down was the problem with this machine. The cause was a detached pinch roller assembly. The roller arm is, on earlier models, made of plastic and can break off. A replacement restored normal operation. **D.C.W.**

Sharp VLC6400E

This camcorder produced distorted pictures, with the white areas of the picture crushed and loss of sync. There was also pulling of the highlights and rolling, in both the E-E and playback modes. As the chroma signal seemed to be o.k. we investigated the luminance signal path. As usual, the signal processing circuitry is largely common to both record and playback operation, IC201 being at the heart of things.

Various capacitors that we felt might be suspect were replaced, to no avail. After a lot more checking we decided that IC201 itself was probably the cause of the trouble. So a replacement was ordered. When it arrived we found that instead of a single i.c. there was a kit of parts: it consisted of a replacement i.c. (not the original type, which is no longer available) and about twenty chip components that had to be fitted to enable the new i.c. to function. Who estimated for this one?! To be fair to Sharp the kit was well marked, with each component individually bagged and a circuit diagram showing the modifications required. Unfortunately there was no PCB layout.

Thoughts about the likely time required to fit this little lot led us to make some further checks in case the chip wasn't the cause of the trouble. In the event we didn't have to replace the i.c. The cause of the fault was C211 (8,200pF) which was open-circuit. It acts as a reservoir capacitor in the composite sync separator stage, being connected to pin 4 of IC201. **D.C.W.**

Sony CCDTR50

The electronic viewfinder display consisted of a blank white raster, all other functions being o.k. The cause of the trouble was on board VF41, where C965 (2·2µF, 35V) was open-circuit. **D.C.W.**

JVC GRAX7

No pictures were being recorded, though the E-E pictures and playback of prerecorded tapes were fine. The sound was also o.k. We found that the REC 8V supply was not being switched by Q524 because R599 (1·5kΩ) was open-circuit. **D.C.W.**

Canon E640E

There was no viewfinder picture. We found that C2931 (47µF) and C2933 (100µF) had failed. They are both 16V can type electrolytics. **D.C.W.**

Sony CCDTR805

There was a rather worrying symptom in the E-E mode: the screen was covered with white spots (CCD failure?). Over the course of a minute or so however the spots would gradually disappear, leaving a normal picture. Playback and all other functions were o.k. If the machine was switched off then on again, the spots would reappear.

When a bench power supply was used instead of a battery the symptom was slightly different: any adjustment of the supply voltage around 6V either increased or decreased the picture's 'spottiness' and the length of time the spots remained. This led us to the power supply PCB, where the MC4600FU switch-mode drive chip IC231 was failing to regulate its output and produced severe hash on the camera supplies – hence the variable white spots. A replacement chip and power supply set up cured the trouble. **D.C.W.**

WILLOW VALE
ELECTRONICS LIMITED

'The Better Choice'

gives you more...

- More new products and spares
- More commitment to higher stock levels
- More technical know-how
- More choice
- More product support
- More dedication to customer care

Willow Vale supplies parts for all these household names, with over 290,000 different spares available by letter, phone, fax or C.O.P.S. ('viewdata' based order/enquiry system).

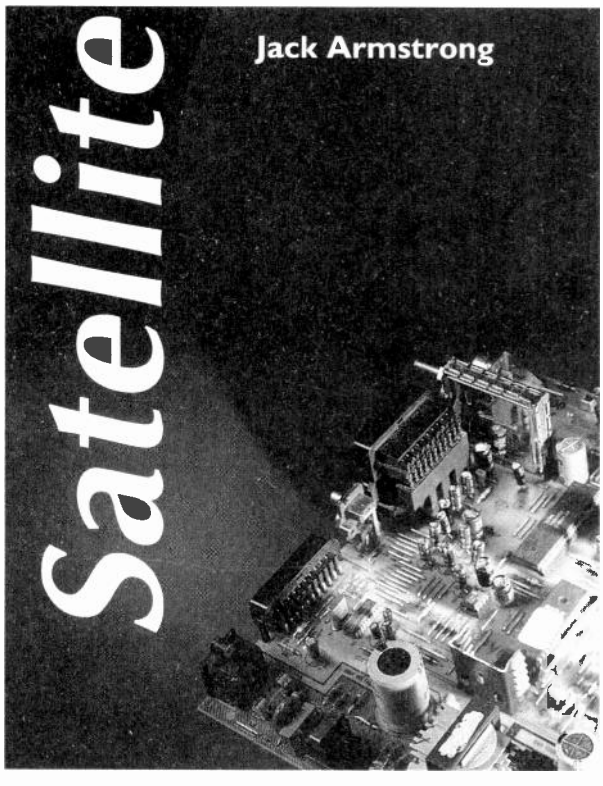
Should you require any technical help, advice is available on our 'TECHLINE' **0891 615915**
(*all calls charged at premium rate).

Being **Willow Vale**, we don't just guarantee the quality of our spares. We also pride ourselves on our prices...and our genuinely friendly and knowledgable staff.

Reading: (01734) 876444 Manchester: (0161) 682 1415

Satellite WORKSHOP

Jack Armstrong



Though I don't do them myself, I'm often called to sort out installation problems. In a recent case the customer had had his 60cm dish changed for an 80cm Lenson Heath dish with two LNBs on a bracket. The problem was very sparkly pictures on some Astra channels, also picture and sound interference on UK Gold.

The 'expert' installer had aligned the dish for the Eutelsat Hot Bird at 13°E. This meant that the Astra signals were probably 6dB down. In addition sidelobe pickup was producing interference, increasing the sparklies by swamping the tuner with unwanted signals from other satellites.

Solutions

As a better compromise I realigned the dish for Eutelsat II F3 at 16°E, using just one LNB mounted on the standard bracket. Then I fitted the Lenson Multi-LNB brackets – one at each side of the arm – and screwed the LNBs in place (a fiddly task that requires ultra-thin fingers!). Aligning the dish in this way can reduce Astra and Hot Bird losses to just 1·5dB.

Pictures of a sort were produced when each LNB was moved along its bracket. Final alignment called for the use of a spectrum analyser to obtain the best compromise between maximum signal input and a minimum noise floor. Most 'experts' use an ordinary signal-strength meter, which for this purpose is about as useful as a piece of wet string. If you align the dish for the maximum reading, you are certain to get maximum noise as well – the meter can't tell the difference!

The LNBs had to be twisted slightly off vertical to match each satellite's skew, and I had to bend the brackets for best readings on the analyser and minimum co-satellite interference from the side lobes – this was clearly visible on the spectrum display. Once this had been done there were nearly perfect pictures from Astra and Hot Bird, though I had to warn the customer that he would see sparklies in bad weather – there was no need for a Link Budget calculation to predict that an 80cm dish was a compromise up here in Yorkshire!

A Mimtec Premiere

A dead Mimtec Premiere was brought in recently. Since there are about fourteen components that can fail in the power supply, it saves time to order from Davenham Satellite Systems (1 Firths Fields, Davenham, Northwich, Cheshire CW9 8JB – 0160 649 085) the power supply repair kit for this model and follow the instructions.

Unfortunately the customer had failed to bring along the remote control unit. As a result I was unable to test the receiver, though it now lit up. I sent it back, knowing full well that it would soon return. Sure enough I received a call the following week to say that there were no horizontally polarised channels. Back came the receiver, this time with the remote control unit.

It took only a few minutes to trace the cause of the problem to TR4 (BC547), which was leaky. It's in the LNB supply circuit. I don't know whether this is a common fault, but it's always worth checking out all functions after a power supply failure. The last Mimtex receiver I repaired needed a new power supply and had killed off TR16 and TR17 on the decoder interface board. The Sorensen power supply used in these receivers really does go with a bang! The latest replacement power supply is made by Nokia and appears to be more reliable. Unfortunately satellite receiver owners simply don't want to pay, so we end up repairing the old ones.

An Estimate

The customer who brought in this dead Pace MSS1000 receiver wanted an estimate. At first I thought the only problem was that the front panel display didn't light up, but a quick voltage check confirmed that the receiver was indeed dead. A replacement STP5N90 MOSFET chopper transistor appeared to be all that was required, but at switch on the power supply just ticked, with pulses appearing on the secondary side.

This symptom is often caused by a shorted amplifier chip on the audio board, but disconnecting the supply had no effect. My diagnosis was not far out however, since the cause of the fault was the relevant rectifier diode D54. When it was removed the receiver worked nicely – without the speaker function of course. I couldn't tell whether the audio output chips were damaged, so I simply quoted for a replacement diode. Fully expecting the estimate to be accepted, I ordered a replacement.

On his return the customer complained that my price was far too high for a receiver that had cost only three hundred in the first place, and insisted on taking it away! I charged him my standard estimate fee and he marched off with the receiver under his arm. I'd taken the precaution of putting the faulty diode back and removing the mains fuse.

I do a lot of repair work for local TV shops. A week later an MSS1000 came in. Sure enough it was the same one. This time my estimate was accepted. All that was required was to replace D54, the audio board having survived intact. I still don't know what the owner paid in the end, but I bet he wished he'd accepted the original estimate!

A Glued up SRD510

The Amstrad SRD510 has a download facility that enables you to connect it to another one, via a scart

lead, to transfer the contents of the memory. Transfer is initiated by holding the standby button whilst applying mains power. The red and green LEDs will then begin to flash alternately.

When it was plugged into the mains supply one of these receivers did just that – but I didn't need to press the standby button. A quick inspection revealed that someone had already had a go – they'd been looking for a microcontroller chip fault.

It occurred to me that one of the two standby buttons might be damaged. So I removed the front panel and took a look. The buttons operated freely, but measured less than 1kΩ when open! A lot of glue, which had become completely black with the heat, was spread across the little PCB. Scraping off this carbonised glue cured the fault.

The receiver had another fault however – don't they always! The picture was fine, but the screen remained blank for four seconds after each channel change. In addition the menu graphics were superimposed on a grey background instead of the picture.

I checked for a line sync pulse input at pin 5 of the microcontroller chip, but there was nothing. In this model the microcontroller chip 'knows' that a good picture is present when it receives good, clean sync pulses at pin 5. The sync separator circuit is simple. It consists of discrete components, with an input from a TEA2029C chip. The cause of the fault was traced to TR16 – but I've known TR13 and TR14 cause the same symptom.

Pace Apollo

This model had been part of a Sky promotion. I can see satellite receivers going the way of mobile phones: subscribe and get one free! Unfortunately people think that because a receiver is low priced it will cost pennies to repair, but no one is subsidising the poor repairman.

The one that was brought to me came because the customer was't prepared to wait even three days for the Pace warranty repair! His loss was to be my gain. He described the fault as "horizontal streaks on the picture with all satellite channels". Just to make it a little more interesting, the fault was intermittent. I was able to instigate the fault by tapping the unit gently. It affected only the picture from the u.h.f. modulator – the scart outputs were fine. By poking and prodding with a plastic knitting needle I discovered that the track to C51 in the modulator was broken. I carried out a neat repair and the customer got his unit back in slightly less than three days at a very reasonable price.

Sticky Problem

I wonder how many times I've seen "goes off when hot" on a fault report? Often it's the picture or sound that goes off, not the receiver itself. This time it really was the receiver, though it went to standby rather than off. This was another case of carbonised glue forming a short-circuit across the standby switch in the Amstrad SRD510. The receiver switched to standby after about four hours' operation. You'll find the glue across the standby button solder joints.

??? Query Service ???

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. You can reach him via the Internet at his CompuServe address:

INTERNET:100613.2105@compuserve.com

No letters or phone calls please: he can cope with e-mail requests only.

Test Case 398

Cathode Ray's heart sank when he read the job card attached to the old Sharp VC787 that sat on the waiting-repair rack. He was all too familiar with the machine, having repaired it last month when, at great trouble and expense, he had fitted a new lower drum assembly. The original problem had been intermittent shut down in the cue and review modes because of excessive friction between the tape and the surface of the lower drum. The only cure for this (once cleaning and a go with Duraglit metal-polish wadding had failed!) is to replace the lower drum. The owner had sanctioned the work on this rather old machine for the sake of its excellent still-frame and frame-advance performance – better than that of many later models.

Here it was back, boldly labelled "recent repair, bounce, no charge". A scribbled and rather rude note from the customer indicated that the symptom was "wobbly sound". Wearily, Ray carried the machine to his bench and removed its top cover. How a new lower drum could upset the sound while curing the previous fault was beyond him – but doubtless he would soon find out. . .

Tests started using a workshop tape with a 1kHz test tone. When the Sharp machine, which does not feature hi-fi sound, played this back it produced a clear, steady tone. The same thing happened when the machine played back its own recording from a pattern generator with 1kHz modulation. Further tests established that the trouble was confined to LP operation – half an hour would have been saved had the customer's note mentioned this! – and that it consisted of audio flutter. This was quite noticeable during playback of an LP recording made by another machine. It was even worse with playback of the machine's own recordings.

The fact that the sound flutter effect was confined to LP operation hampered the diagnostic process somewhat. Apart, possibly, from one or two odd peripheral components in the capstan servo circuit everything else, both mechanical and electrical, is common to both SP and LP operation. But a start had to be made somewhere. So Ray replaced the pinch roller and cleaned and polished all the components in the tape path. The result of this was discouraging – the flutter effect was still present. Remembering the nasty effect caused by excessive friction in the reel drive clutch in an Amstrad machine he'd struggled with recently, Ray measured the take-up torque. It was normal at about 100g/cm. In fact the flutter was not caused by a fault in the take-up spool drive system.

Fortunately there was an identical machine on the scrap pile. Its capstan motor was next transplanted into the machine being repaired. Again this had no real effect on the symptom. Could the cause be a faulty or worn audio/control-track head? Ray vaguely recalled something of the sort with an old Ferguson machine that Sage had dealt with when they sat together during the training sessions in the early days of video. Anyway in for a penny, in for a pound. The ACE head was removed from the scrap machine (fortunately it was fitted with plug/socket connections and was secured by a single nut). After a clean and polish it was installed in the recalcitrant Sharp machine. You've guessed it: this didn't cure the trouble either!

Could the new lower drum assembly have caused or exacerbated the problem? This seemed unlikely: indeed fitting it should have cured rather than caused a symptom of this type. But though it was not directly responsible, it may have brought forward the real cause of the trouble. If only Ray had taken a long look at the deck and the tape motion while it was running in the LP mode! All is revealed in the solution on page 294

The spectrum space above the video signal in a satellite TV channel can be used for a number of digital stereo radio channels. Astra's Digital Radio (ADR) system has been designed to exploit this otherwise spare bandwidth. Subscription services are due to start in the UK shortly. Eugene Trundle describes the technology involved

Digital radio from space

From the start of the compact disc era in 1982, digital audio has spread into all areas of home entertainment and communication. The analogue transmission and storage systems that we continue to use are retained primarily because of their compatibility with existing equipment and networks. The inroads of digital audio can be expected to increase, since the processing and memory chips required for receivers and decoders are now easy to manufacture and cheap to buy. With the use of various types of compression and the availability of more spectrum space, there is no problem about finding sufficient bandwidth for digital audio. We are now used to digital audio storage on discs and in memory chips, to Nicam at u.h.f. and DAB at v.h.f. These are being complemented by digital radio at s.h.f.

Table 1: ADR transmission parameters.

Audio frequency range:	20Hz-20kHz
Sampling frequency:	48kHz
Dynamic range:	90dB
Audio coding:	ISO/IEC 11172-3 Layer II (Musicam)
Stereo channels:	Up to 12 above video, 48 with full transponder use
Modulation:	Differential QPSK
Data rate:	192kbits/sec (including ancillary data at 9·6kbits/sec)
Protection:	CRCC for data and scale factor
Bandwidth:	130kHz (between –3dB points)
Channel spacing:	180kHz
Threshold:	9·5dB carrier-to-noise ratio with 26MHz bandwidth
Scrambling:	IDR/IBS implementation of CCITT V.35

Digital Radio from Astra

The first satellite sound transmissions for domestic reception were in analogue form, consisting of an f.m. mono carrier that was spaced at 6·5MHz from the accompanying f.m. video transmission. Before long stereo carriers were added alongside, at 7·02 and 7·2MHz, using the Wegener-Panda-1 analogue compression system to provide a better dynamic range and signal-to-noise ratio. The spare space in each satellite transponder's baseband spectrum, up to 8·6MHz or so, can be put to use for TV related (for example multilingual) or radio broadcasting purposes, using a series of single (mono) or paired (stereo) carriers spaced 180kHz apart. The available spectrum has been used in this way for some years. Fig. 1(a) shows a typical spectrum allocation for the region above the video signal in an Astra transponder's demodulated output, with a mono carrier at 6·5MHz, two TV stereo sound carriers at 7·02 and 7·2MHz and two pairs of stereo radio carriers, all in analogue f.m. form.

Fig. 1(b) shows how the audio subcarrier slots can be rearranged to provide a number of digital stereo radio channels. Each carrier handles a digital stereo pair, using quadrature phase shift modulation. The 6·5MHz mono carrier has gone – stereo has been standard in satellite receivers for many years. The main analogue stereo carriers at 7·02 and 7·2MHz are retained, to provide compatibility with existing equipment: any additional analogue subcarriers required for, typically, multilingual sound on the sports and cartoon channels could also be retained. The other carriers, spaced at 180kHz intervals, are

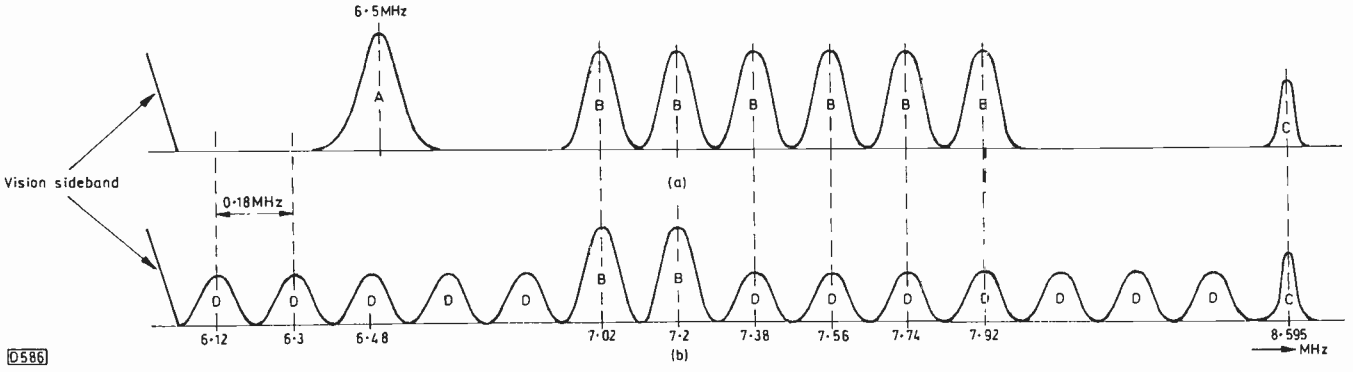


Fig. 1: Demodulated Astra transponder signal spectrum in the region above the vision signal. (a) Typical current allocation, with a non-companded, 200kHz bandwidth mono TV sound carrier (A) at 6·5MHz, six carriers (B) for companded stereo TV and radio sound, and a network control subcarrier (C) with a 14·4kbits/sec data rate signal. The sound subcarriers all carry analogue signals. (b) The same region with the same two analogue stereo TV sound signals (B) and control subcarrier (C), and twelve subcarriers (D) modulated with digital stereo sound – the bandwidth for these is 130kHz.

available for relatively low-level digital radio signals. A maximum of twelve such carriers can be fitted in with a transponder that carries an f.m. video transmission. Alternatively 48 subcarriers can be used, spaced at 180kHz intervals between 0·18-9MHz, if the transponder's full capacity is devoted to radio transmissions.

The four Astra 1A-D satellites have sixteen transponders each. This gives a maximum capacity, alongside the video and companded stereo TV sound pairs, of 64 x 12 = 768 digital stereo radio channels. Some transponders already carry individual 'free' digital radio programmes – German broadcasters use this digital system as a trunk-carrier of radio transmissions to the eastern region.

Modulation and Transmission

The Astra Digital Radio (ADR) system has much in common with the Nicam system (a lengthy description of this appeared in the September and October 1990 issues of *Television*). The sampling frequency with the ADR system is 48kHz, which with 16-bit resolution ensures a level audio frequency response over 20Hz-20kHz, with a dynamic range of over 90dB and a signal-to-noise ratio of typically 96dB. This means that the transmission system imposes fewer limitations on the sound quality than most of the equipment at either end of the chain. The audio bit rate is 192kbits/sec, of which 9·6kbits/sec are reserved for 'ancillary data'. This provides a caption service at the receiving end, similar to that of RDS (Radio Data System) – it can be used for a read-out of the station name, programme category, music title, artist, album and order number.

As with Nicam, QPSK (Quadrature Phase-Shift Keying) is used to modulate the carrier, see Fig. 2. Pay channels are scrambled, using a system known as CCITT V.35. This can be sorted out at the receiving end by using a smart card similar to that now used for Sky TV programmes. An abridged list of the transmission parameters is shown in Table 1.

ADR Reception

Several different receiving equipment arrangements can be used. The simplest, see Fig. 3, is to have a satellite TV receiver that's also equipped with a digital audio decoder and smart-card reader. It can provide TV and digital radio reception simultaneously but can be tuned to only one transponder at any time, confining the choice of digital radio channels to those (if any) carried alongside the TV transmission being viewed. With the TV set switched off, there is full sound only reception capability.

Alternatively a separate ADR receiver, taking its input from the same standard LNB as the vision integrated receiver-decoder (IRD), could be used, see Fig. 4. In this arrangement the i.f. signal from the LNB is looped through the ADR receiver before going to the vision IRD. When the latter is switched on it overrides the operation of the sound receiver, which now relays the polarisation and 22kHz-tone switching commands of the vision IRD. The ADR receiver can function fully only when the vision system is not in use.

Optimum versatility is obtained with separate ADR and vision IRD receivers fed via separate downleads from a twin LNB, see Fig. 5. The two receivers can now operate simultaneously and independently, selecting their own transponders and signal polarisations as required: you could have The Simpsons in the kitchen and Beethoven in the lounge if you want, or QVC Home Shopping downstairs with Easy Listening in the boudoir.

Receiver Design

About five satellite receiver manufacturers make ADR equipment at present,

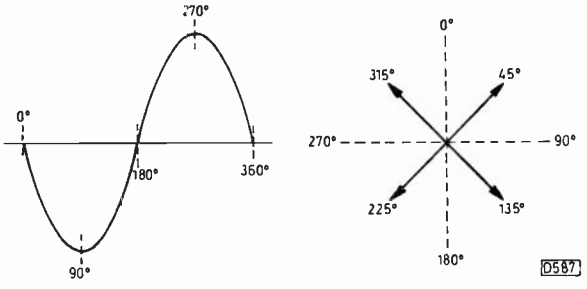


Fig. 2: Principle of quadrature phase shift key modulation. Phase modulation of the carrier conveys different signal values.

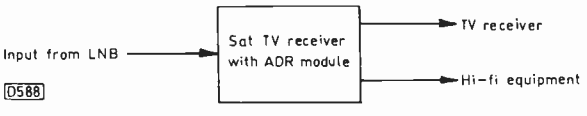


Fig. 3: Use of a combined satellite TV/radio receiver.

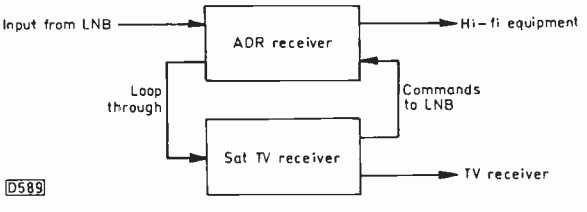


Fig. 4: Use of separate satellite TV and ADR receivers, with r.f. and control signal loop-through.

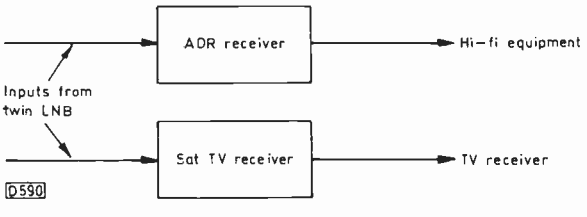


Fig. 5: Use of separate satellite TV and ADR receivers fed from a twin LNB. The separate receivers have independent access to all transponders.

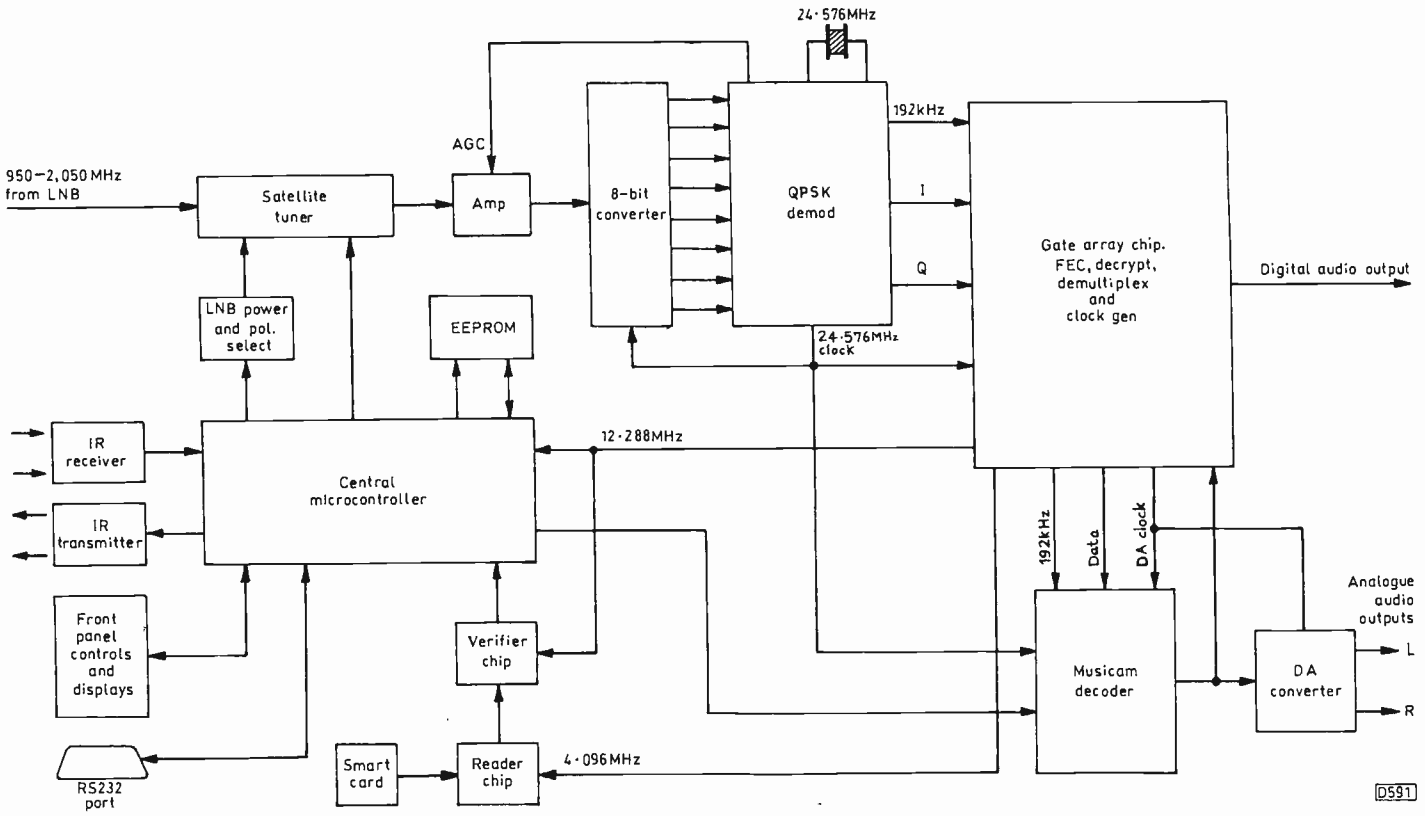


Fig. 6: Block diagram of an ADR receiver.

though there's a waiting list for receivers at the time of writing this – nearly all production is being poured into mainland Europe as fast at it can be churned out.

A typical receiver block diagram is shown in Fig. 6. It has a conventional tuner at the input to accept the 950-2,050MHz first i.f. signal from the LNB, with polarisation and band switching under the control of the central microcontroller chip. The tuner's i.f. filter has a 26MHz bandwidth, its f.m. demodulator being able to recover a standard video signal. The baseband output from the tuner is passed to the 8-bit converter via an amplifier with a.g.c., so the converter is presented with a regulated signal-level input. The following narrowband QPSK demodulator uses an application-specific chip which selects a signal subcarrier in the baseband range of the transponder, demodulating it as I (in-phase) and Q (quadrature) components for feeding, along with 192kHz bit-rate reference and 24·576MHz clock signals, to a purpose-designed gate array chip where the demultiplexing and decrypting are carried out.

This gate array chip is the heart of the receiver. It carries out data demultiplexing (RDS data decoding), first-level decoding, unscrambling of pay-radio digital audio, data transfer to the central microcontroller, audio clock PLL control and digital output data conversion. Its data, bit clock and DAC clock outputs pass to an MPEG layer II Musicam decoder chip which decodes the audio data stream, delivering it in PCM form to a conventional DA converter chip of the type used in CD players.

To avoid distortion and dropouts under marginal signal reception conditions, the decoder chip uses the scale-factor CRC (Cyclic Redundancy Code) part of the signal to conceal errors: it can ignore erroneous scale factors or use a more advanced technique, repeating previously received correct scale factors. The DA converter delivers L and R audio outputs. It incorporates a volume control prior to its output filters.

The central microcontroller chip is an 8-bit device that's similar to those used in conventional satellite TV IRDs. It controls the demodulator and decoder chips, the smart-card interface, the decoding and display of the control and RDS sata, the IR decoding and transmission (more on this shortly) and the internal signal and command routing. It works in conjunction with EEPROM programme memories and RAM for operational purposes.

Conditional access is based on an algorithm contained in the smart card. The card is interfaced and scanned by one i.c. and verified by a second which is a custom-designed chip for the system in use. The mask program it contains and the software involved are of course proprietary and confidential.

Programme Acquisition

When it's initially powered up the ADR receiver scans the whole satellite frequency range and the relevant sub-carrier frequencies in both polarisation planes for each transponder, searching for ADR subcarriers. It stores all relevant i.f. and subcarrier frequencies, along with polarisation data, band and programme-related information, in a non-volatile memory, ready for interrogation and selection by the user. This scan, search and store process takes up to two minutes and is repeated at conventient intervals, typically whenever the set is switched to standby, to update on new ADR transmissions. In some cases the 'stereo pair' carried by a subcarrier actually consists of two monaural programmes combined in a single bit stream. They are separately assigned and memorised and, when one is selected, it feeds both the L and the R outputs.

The automatic search, select and store processes relieve the user of the weary and uncertain task of tuning in the ADR receiver. Further simplification in use is provided by the electronic programme-category tag present in each audio data stream. This instructs the receiver to group programmes of the same or similar character. As a result the listener can use four basic methods of service selection, as follows:

(1) Select category – the type of music (jazz, rock, etc.) is keyed in – after which the listener can use the up-down keys to browse.

(2) Select the ADR function followed by a three-digit channel number and/or use of the up/down keys to select from

a channel list supplied to subscribers.

(3) Select the Astra Channel function, followed by a two-digit transponder number, then use the up/down keys to select from the ADR subcarriers available. This method is useful for finding services quickly when their presence and position is already known.

(4) Select the Favourite Channel mode followed by a two-digit number and/or use of the up/down keys to select from say up to twenty favourite channels.

In all cases the selected service can be stored as a favourite channel.

Receiver Features

A typical ADR receiver has a 512-channel memory for digital radio broadcasts, plus fifty storage slots for individual favourite channels, along with an eight-digit front panel LED or fluorescent display that indicates the broadcast service, channel type or operating mode.

It's also possible for the receiver to transmit an IR signal to the remote control handset. This data can drive a twin-row, 16-digit LCD panel on the remote control unit to show details of the song title, singer, composer, album, CD number etc. If required, the information can be stored for later display at the touch of a button.

Audio line outputs are provided at standard level for linking to hi-fi equipment. There may also be audio inputs for looping through in the standby mode, a digital audio output and an RS232 interface for linking to a PC for receiver control, preprogramming and fault diagnosis.

The retail price of ADR receivers in the UK is expected to be in the region of £250.

DMX

Digital Music Express (DMX) is the service provider for the subscription pay-audio channels transmitted by the Astra satellite group. Its service has been up and running in Austria, Germany and Switzerland since the begining of last September and is scheduled for UK launch in March 1996. The subscription fee is expected to be about £6.99 a month.

The most likely marketing arrangement is that you will get a smart card validated for ten days or so with the receiver you purchase. Then, if you subscribe to DMX after this initial period, the card will be validated for as long as the subscription lasts.

At present the DMX package offers 62 music channels. This is expected to increase to 90 by the end of the year. The channels are broadly grouped under ten main categories as follows: classical, popular, oldies, rock, jazz, country, speciality, regional, news and general entertainment. The music channels have no commercials, no announcers and no news bulletins, the effect being like playing an endless CD.

The central music library is a very large one and is continusouly updated. For more information, contact DMX-Europe (UK) Ltd., Europa House, Church Street, Old Isleworth, Middx TW7 6BW – telephone number 0181 569 9500. ■

Digital TV

The specification for terrestrial digital TV in Europe has taken a step forward with the adoption by the DVB (Digital Video Broadcasting) group of 2,000/8,000 carrier QAM (quadrature amplitude modulation) as the transmission system. The DVB group has already agreed standards for satellite, cable and microwave (MMD) systems. In the USA, the advisory committee to the Federal Communications Commission has recommended adoption of the digital HDTV standard proposed by the 'Grand Alliance', which includes AT&T, General Instrument, NBC, the David Sarnoff Research Centre and Zenith. According to the committee the technology is "far superior" to any alternatives. Formal adoption of an HDTV standard is expected in the early part of the current year. Sets are expected to cost around $2,000 initially.

A group of leading German and French companies, including Deutsche Telekom, Veba, Bertlesmann and Canal Plus, has agreed to a standard for set-top boxes to decode digital signals that provide interactive TV services. Initial use is expected to be in the German market, but the hope if that the standard will become a general European one.

The German public broadcasters ARD and ZDF have leased digital transmission capacity aboard Astra 1E for distribution of their main programmes in the clear. They will be leasing additional transponders on Astra 1G for further services.

Pace has received worldwide orders for over a quarter of a million digital TV decoder boxes, also incorporating NewsCrypt, for supply before July. A fire at Panasonic South Africa's Cape Town plant has led to a worldwide shortage of digital satellite TV decoders – the plant is one of only two in the world that can produce these set-top boxes.

DVD Specification

Agreement has at last been reached on the specification for the new generation high-density CD. It will be known as the DVD (Digital Video Disc), not the SD-CD (super-density CD) as originally proposed by the Toshiba group or the MMCD (MultiMedia CD) as proposed by Philips and Sony. The agreement between Toshiba, Matsushita, Sony, Philips, Pioneer, Time Warner, JVC, Hitachi and Mitsubishi also provides a specification for the DVD Movie Player and the DVD ROM (for computer applications).

Disc diameter will be 12cm, thickness 1·2mm (2 x 0·6mm discs bonded back-to-back), capacity 4·7Gbytes per single side and the track pitch 0·74 microns. The capacity of a double-layer, two-sided disc is likely to extend to 18Gbytes. A 635-650nm wavelength laser will be used to read the discs, the numerical aperture of the lens system being 0·6. RS-PC (Reed Solomon Product Code) error correction will be used, with 8:16 (EFM Plus) signal modulation.

Audio/video discs will have a variable-speed data rate, the average being 4·69Mbits/sec. This includes three audio and four subtitle channels. MPEG-2 compression will be used for the video signal, with Dolby AC3 sound for NTSC signals and MPEG for PAL/Secam signals. A maximum of eight audio channels and 32 subtitle channels can be stored. Running time will be 133 minutes per side.

The first products from Philips will be ROM drives for computer applications, expected by the end of the year, with consumer discs and equipment to follow. Toshiba and Matsushita also aim to have products available this autumn, in Japan initially followed by launches in North America and Europe. Consumer DVD systems from Japanese manufacturers are expected to be priced at something above the originally hoped-for $600.

TV Licence Fee Increase

The TV licence fee will be increased to £90 for colour and £30 for monochrome from April 1st.

New Generation Games Console

Nintendo's new 64-bit video games console, the Ultra 64, is to be launched in April at about £200. The console and its supporting games will take Nintendo from 16-bit to 64-bit technology, leapfrogging Sony and Sega's 32-bit games machines. According to Alan Taylor, managing director of Nintendo's UK games distributor THE Games, the new player will offer "incredibly realistic graphics, exceptional games play, performance and a multi-directional controller". It uses a Silicon Graphics reality co-processor and a MIPS 64-bit RISC microprocessor.

Advantages include real-time anti-aliasing to smooth off jagged edges, advanced texture mapping techniques, real-time depth buffering for more realistic 3D displays, and automatic load management for smoother movements. The three-grip controllers include a 3D stick with 360° control of movement and control of speed, C buttons that change players' perspectives, a Z trigger for shooting games, and a memory pack to store game information.

Catalogues

Willow Vale Electronics (11 Arkwright Road, Reading, Berks RG2 0LU – telephone 01734 876 444) has developed and released a first in its field, a CD ROM catalogue. The disc, with colour and sound, takes customers through the entire range of Willow Vale spares, accessories, security devices and sound and communications products. There are 280,000 stock codes, 400,000 descriptions and alternative products, 340,000 part numbers and 3,000 pictures and drawings. It can be accessed via a Windows-based PC (386 SX33 or above) with 4Mbytes of memory. The user simply keys in a part number, manufacturer's model number or a stock code to find the part required. A help file shows how to get around inside the CD ROM.

The Willow Vale CD ROM has a helpful order form facility that enables the user to pop items into a 'box' while going through the system, retrieving them all at the end of the process. If the user's machine has a built-in fax, all that's required for an order to be processed at Willow Vale is to press a button.

CPC (Component House, Faraday Drive, Fulwood, Preston PR2 4PP – telephone 01772 654 455) has launched a new product supplement to keep customers informed on the ever-increasing range of products on offer. It's issued to all account holders, providing at least four pages of latest products a month. CPC also issues a weekly offer list with up to twenty pages of reduced prices on a selected range of products.

The EMC Directive

From January 1st all electrical goods sold should carry a CE mark to show that they comply with EC regulations on electromagnetic interference. This is referred to as EMC – electromagnetic compatibility. The aim is to ensure that electrical equipment doesn't cause excessive interference and is not affected by such interference. A "grace period" is being allowed for the clearance of non-CE stock.

There seems to be a certain amount of confusion about how the directive is to be implemented. In some cases self-certification seems to be acceptable. A number of laboratories are offering an equipment check service, at about £1,000 a time, which is obviously an onerous sum where small-scale production runs are involved.

Cable TV

According to the ITC's most recent survey of viewing in homes connected to a broadband cable service, the cable/satellite channels have regained some of the audience share they lost during 1994. Viewing of the cable and satellite channels increased from 34·9 to 39·6 per cent between October 1994 and October 1995. The ITC also reports that during the third quarter of 1995 the number of telephone lines installed by cable operators exceeded, for the first time, the number of TV connections. US cable TV operators have called for an international cable modem standard that will work with all cable TV networks. An international specification would, according the John Malone, chairman of US Cable Television Laboratories, the industry's R&D consortium, "take the World Wide Web a step further, bringing broadband interconnections into homes worldwide".

Sony Service Contest

Richard Flowerday of Harborne TV, Birmingham and Steve McEvoy of The Sound Shop, Drogheda, Ireland won gold medals in the finals of the biennial Sony European Service Contest held recently in Milan. Richard's was in the TV category, Steve's in the audio category. 58 contestants from 17 countries competed in the finals. Medals could be won for TV, video and audio repairs, with Sony Service Centres and Authorised Network companies competing separately in each of the three categories.

MANOR SUPPLIES

QUALITY TV & VIDEO SPARES SUPPLIED FOR ENGINEERS *BY ENGINEERS*

MKV PAL COLOUR TEST GENERATOR FOR DOMESTIC TV & VCR p.p. £5.00

TEST DEMONSTRATIONS AT 172 WEST END LANE

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

Price of Kit	**£79.00**
Case (10″×6″×2¼″) app	**£19.00**
Optional Sound Module (6MHz or 5.5MHz)	**£5.90**
Built & Tested in Case including Sound Module	**£139.00**

Post/Packing £4.50
Add VAT 17.5% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)

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

PRICE OF Mk4 COLOUR BAR GENERATOR KIT £39.00.
CASE £6.90. BATT HOLDERS £4.20
MAINS SUPPLY KIT £5.80
(Combined P&P £5.00)
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £6.80
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.R.V

ADD VAT 17.5%

LINE OUTPUT TRANSFORMER TESTER

NEW

- ★ Service Aid.
- ★ Saves time and Money.
- ★ Checks short turns.
- ★ Simple to use.
- ★ Reliable.
- ★ Battery operated.
- ★ Pocket size

ADD VAT 17.5%

PRICE £24.00
POST/PACKING £2.50

VIDEO (PAL) TO R.G.B. CONVERTER

NEW

- ★ Ready built & tested
- ★ R.G.B. + Sync Out –Scart
- ★ Incl. Power Supply
- ★ Colour/Brightness/ Contrast Controls
- ★ Video In – Phono
- ★ 5-VHS Adaptable
- ★ Size 5″ x 5″ x 2″

PRICE £99.00 POST/PACKING £3.50

CRT TESTER & REACTIVATOR KIT

★ For Colour & Mono complete with Case. Panel Meter Indicator – can be adapted for latest CRTs **£55.00** P.P. £4.50

KITS AND PROJECTS

SAW IF AND TURNER UNIT complete and tested for video & audio outputs **£28.50** p.p. £1.80.
PAL DECODER KIT (Video to RGB) for Monitors **£27.00** p.p. £1.80.
PAL ENCODER KIT (RGB to Video) **£20.00** p.p. £1.80.
INFRA RED REMOTE CONTROL TESTER Infra Red Remote Control Tester **£10.00** P.P. £2.50.

TV & VIDEO SPARES

REMOTE CONTROLS

Replacement for: Ferguson, Hitachi, Philips, Panasonic, Grundig, ITT, Sony, Saisho, Granada, Saisho + many others **Phone for make and model no.**

IC SELECTION p.p. 90p

14DN487	£15.80	SAB3037	£8.80	TA7681P	£7.80	TDA2594	£3.80	TDA6200	£22.50
AN5521	£3.80	SAF1039	£2.20	TA7698P	£6.80	TDA2595	£4.80	TDA7052	£2.50
AN5900	£2.20	SDA2516	£9.90	TA7699	£13.50	TDA2600	£6.80	TDA8138	£2.20
BA6209	£6.80	SDA2546	£9.00	TA8690	£22.50	TDA2611A	£1.90	TDA8140	£2.20
BA6219	£3.80	SL470/471	£4.00	TA8691N	£6.80	TDA2653A	£2.90	TDA8153	£13.80
BA6229	£3.80	SL486	£3.20	TA8739P	£4.50	TDA2654	£5.70	TDA8170	£3.00
BA6238A	£6.80	SL490	£3.80	TBA121	£5.80	TDA2670	£3.20	TDA8172	£3.00
BA6239	£3.80	SL1430	£2.40	TBA120S	60p	TDA2680	£3.80	TDA8175	£3.50
BA6435	£9.80	SL1432	£6.80	TBA750	£2.20	TDA2690	£3.80	TDA8180Kit	£7.50
CCUFRG07	£14.50	SN7526DN	£1.80	TBA950	£2.20	TDA3301	£6.80	TDA8190	£3.80
CNR50	£6.00	SN76705	£9.80	TBA2800	£1.80	TDA3303	£19.80	TDA8305	£12.90
CNX50	£6.00	STA441	£2.80	TCA270	£1.80	TDA3330	£12.50	TDA8341	£6.20
CNX62	£4.00	STK5322	£21.80	TD6316AP	£4.80	TDA3504	£6.80	TDA8372A	£8.40
CNX83A	£4.80	STK5325	£6.80	TDA1011	£2.20	TDA3505	£15.80	TDA8380	£3.20
HA11211	£2.80	STK5326	£6.80	TDA1013	£2.20	TDA3506	£4.80	TDA8442	£2.50
HA11423	£3.80	STK5331	£3.80	TDA1015	£2.20	TDA3540	£2.50	TDA9403	£3.80
HA51338SP	£11.50	STK5332	£4.80	TDA1035T	£2.80	TDA3541	£3.50	TDA9503	£3.80
LA4270	£4.95	STK5333	£13.80	TDA1044	£2.90	TDA3561A	£5.80	TDA9513	£4.80
LA4445	£3.00	STK5337	£4.80	TDA1060	£3.80	TDA3562A	£4.00	TEA1009	£2.20
LA4520	£3.80	STK5338	£6.80	TDA1082	£4.00	TDA3562ATFK		TEA1014	£3.50
LA7520	£2.80	STK5339	£6.80	TDA1170S	£1.80		£5.80	TEA1039	£1.90
LA7530	£8.50	STK5342	£4.80	TDA1180	£2.20	TDA3561A	£2.50	TEA2014	£3.80
LA7800	£1.80	STK5372H	£8.80	TDA1185A	£3.20	TDA3565	£3.80	TEA2018A	£2.20
LA7801	£3.50	STK5392	£6.80	TDA1190Z	£2.20	TDA3566	£5.80	TEA2025	£5.80
LA7820	£3.80	STK5421	£6.80	TDA1432P	£5.70	TDA3571B	£9.50	TEA2029	£5.80
LA7830	£2.80	STK5422	£5.30	TDA1512	£3.20	TDA3576B	£10.25	TEA2031	£1.80
LA7835	£2.20	STK5471	£4.50	TDA1515	£4.50	TDA3640	£5.20	TEA2164	£3.95
M104B1	£6.80	STK5481	£8.80	TDA1521	£2.50	TDA3650	£8.50	TEA2165A	£6.80
M293B1	£21.80	STK5482	£4.90	TDA1524	£6.80	TDA3651	£3.20	TEA5101	£2.80
M490BB1	£18.80	STK5487	£6.80	TDA1670A	£3.20	TDA3653A	£3.20	TEA5115	£6.80
M491BB1	£9.80	STK5490	£7.80	TDA1701	£3.80	TDA3653B	£3.20	TMS1000N21.1	
M494	£9.80	STK6962	£3.80	TDA1870	£6.80	TDA3654	£1.80		£6.80
MDA2062	£3.80	STK7253	£5.80	TDA1872	£9.80	TDA3810	£5.50	TMP47C432AP-	
ML926	£4.80	STK7308	£4.80	TDA1904	£1.80	TDA4420	£2.20	8188	£21.95
MN1220	£6.80	STK7348	£5.40	TDA1908	£2.80	TDA4426	£3.20	TMP47C432AP-	
MN15425	£15.80	STR3125	£4.80	TDA1940	£3.20	TDA4427	£3.20	8189	£15.50
PCD8572P	£9.00	STR4090	£13.50	TDA1950	£3.50	TDA4442	£2.80	TMP47C434N-	
SAA1024	£5.80	STR4211	£7.80	TDA2004	£2.80	TDA4443	£7.80	3415	£14.90
SAA1061	£2.80	STR5412	£4.95	TDA2006	£2.80	TDA4500	£4.00	TMP47C434N-	
SAA1124	£3.50	STR6020	£7.80	TDA2009A	£2.80	TDA4501	£5.00	3555	£15.50
SAA1250	£3.80	STR10006	£5.80	TDA2030	£2.80	TDA4502A	£18.50	TMP47C434N-	
SAA1251	£8.40	STR40090	£6.80	TDA2030A	£3.80	TDA4503	£7.80	3559	£14.90
SAA1293.02	£7.50	STR44115	£9.80	TDA2040	£7.80	TDA4505E	£5.00	TUA2000	£8.50
SAA1293.03	£6.80	STR50020	£6.80	TDA2050	£4.80	TDA4510	£3.80	U2829B	£6.50
SAA1294.2	£25.00	STR50103	£4.80	TDA2270	£3.90	TDA4555	£9.80	U4606	£14.80
SAA1296	£12.00	STR50115	£14.50	TDA2540	£2.20	TDA4565	£3.80	UC3842	£2.20
SAA5000	£6.80	STR54041	£6.80	TDA2548	£5.80	TDA4600	£2.85	UC3844	£1.50
SAA5010	£5.80	STR55041	£10.50	TDA2576A	£5.80	TDA4601	£2.80	UPC1363C	£5.80
SAA5012	£5.80	STR58041	£5.80	TDA2577A	£3.20	TDA4601D	£2.80	UPC1363CA	£5.80
SAA5020	£5.80	STR59041	£6.80	TDA2578A	£2.70	TDA4605	£2.20	UPC1378	£1.90
SAA5050	£11.80	STRD1806E	£6.80	TDA2579A	£3.60	TDA4610	£6.80	UPC1394	£3.80
SAA5231	£7.80	STRD4420	£12.80	TDA2581	£3.80	TDA4950	£1.60	UPC1420CA	£12.20
SAA5243	£17.80	STRD6108E	£5.80	TDA2582	£2.50	TDA5510	£12.50	UPC1488	£3.20
SAB3035	£9.80	TA7680AP	£5.80	TDA2593	£1.50	TDA5850	£2.80	UPC1498	£3.20
								UPD1397C	£4.80

LINE OUTPUT TRANSFORMERS p.p £1.80

ALBA CTV14RS	£23.80	PHILIPS K30	£22.80
B&O LX2500, 2800 AT2077/81	£23.50	PHILIPS CTX-E/S	£23.80
B&O MX2000	£15.00	PHILIPS KT4	£22.50
BUSH 2914T	£15.50	PHILIPS 2A	£16.90
BUSH AT2079/10	£34.80	PHILIPS K40	£27.50
DECCA/TATUNG 145,146,147 P/N853786	£21.80	PHILIPS 3A	£16.90
FIDELITY ZX2000	£15.50	PHILIPS 2B	£16.90
FIDELITY ZX3000	£14.50	PHILIPS CF1	£23.80
FIDELITY ZX3000 22″	£21.80	PHILIPS CP90	£15.50
FIDELITY CTV140	£15.00	PHILIPS CP110	£32.00
GOLDSTAR 154-132	£16.95	PHILIPS GR1AX	£15.50
GOLDSTAR 154-194	£19.80	PHILIPS NC3	£29.50
GOLDSTAR CTT9325 154-125 A	£16.95	SAISHO CT14R, CT141, 3714002	£15.00
GOODMANS TV20	£15.50	SAISHO CT141B, CT142B, 3214009	£16.80
GRUNDIG CUC70	£19.80	SAMSUNG FCM 20A021	£25.00
GRUNDIG CUC2201, 2401, 3300, 3400	£19.80	SANYO CBP2144, 2145	£21.80
HINARI CT4, CT5	£14.00	SANYO CTP7132, 7135	£39.80
HITACHI CPT1455, 1456, 1476, 2434/4/1	£14.50	SELECO 145E 121 UK	£24.00
HITACHI CPT2158	£19.50	SOLAVOX 14R19	£16.50
HITACHI CPT1446, 1626 2432981	£15.90	SOLAVOX 16R19	£16.50
HITACHI CPT2174, 2176, 2178 2434274	£14.00	SOLAVOX 20T19	£21.80
HITACHI CPT2476, 2478 2434002	£16.50	SOLAVOX 22R19	£15.00
HITACHI CPT2074, 2274 2433752	£15.50	SOLAVOX 22S19	£15.00
HITACHI/SALORA FM503A	£49.80	SOLAVOX 22T09	£15.00
HITACHI/SALORA FM0513	£55.00	SOLAVOX 22T19	£15.00
ITT/NOKIA Compact B 110°	£17.80	SONY KV1612UB2	£21.80
ITT/NOKIA Compact 80, 110°	£14.80	SONY KV1882	£24.80
ITT/NOKIA Compact 80, 90°	£14.70	SONY KV2020	£18.50
ITT/NOKIA Compact 80, 110° FST	£19.80	SONY KV2052/56, 2060/62	£21.80
ITT/NOKIA Monoprint A	£15.80	SONY KV2090/92/96	£15.50
ITT/NOKIA Monoprint B	£14.70	SONY 21XMTU 1-439-416-11	£39.80
ITT/NOKIA CVC 25, 30, 32	£10.00	SONY KV21XRTU	£21.80
ITT/NOKIA CVC 800, 801, 803	£14.95	SONY KV2212/15/17	£24.80
ITT/NOKIA CVC1100, Picos	£16.50	SONY KV2652/56RX	£24.80
ITT/NOKIA CVC1150, 1175	£14.95	SONY KV27XRTU	£16.50
ITT/NOKIA CVC1200, 1201, Min. 2	£16.80	SONY KV2704	£29.00
ITT/NOKIA CVC1204	£11.50	SONY KV2752/56RX	£21.80
ITT/NOKIA CVC1210/12/15/17	£15.80	SONY KV2752/56PE3	£29.00
ITT/NOKIA Digi 3, 110°	£18.45	SONY KX27PS1	£22.80
ITT/NOKIA Core 90° 4515-03-46	£19.80	THORN/FERG TX85, 86	£22.80
ITT/NOKIA Core 110°, 4515-03-48	£15.50	THORN/FERG TX89	£23.50
ITT/NOKIA Core 110° FST	£15.80	THORN/FERG TX90 14″, T9031, Red Spot	£16.90
LOEWE C9000, Art1, Art T21, Art T28, Contur T24, T28, Profi T28	£18.50	THORN/FERG TX90 20″, T9044, White Spot	£14.80
LOEWE C8001, Classic M24, S12°, S28, Contur S124, S127, S128, S24, S28, Profi S28	£22.50	THORN/FERG TX100/110° T6033L, Green Spot	£13.50
LOEWE Classic M124, M27, Contur M27	£18.50	THORN/FERG TX100/90° 243892, Yellow Spot	£16.90
LOEWE Profi M21	£34.40	THORN/FERG TX100/110° FST, T6045L	£16.80
LUXOR 5810110 01	£27.60	THORN/FERG TX100/90°, T6031, Blue Spot	£15.00
MATSUI 1440A, 1480A, 3714002	£15.00	THORN/FERG AS1F	£17.90
MATSUI 1420B, 1440B, 3214009	£16.80	THORN/FERG SIK5, SIK7, S9P7, 47319700	£19.50
MATSUI 1422, 1450, 1455	£16.80	THORN/FERG 51P7	£15.00
MATSUI 1465	£21.80	THORN/FERG 59K5, 68K4, 47235901	£15.50
PANASONIC TLF14520F, TLF14568F	£23.80	THORN/FERG 59M5, 68M5	£17.50
PANASONIC TLF14521F, TLF14576F	£23.80	THORN/FERG 47328700	£16.50
PANASONIC TLF14586F	£23.80	TOSHIBA 1400RB, AT2079/23	£15.00
PHILIPS KT3	£15.50	TOSHIBA 150R6B, AT2079/09	£15.00

MANY OTHER LOPTS IN STOCK, PLEASE PHONE WITH MAKE AND MODEL NUMBER

TRIPLERS EHT MULTIPLIERS p.p. £1.80

CONTINENTAL UNIVERSAL TVK & BG RANGE (Quote exact no) **£13.80**
TVK 96-1 £13.80
TVK 96-3 £18.00
U.K. UNIVERSAL (best quality) **£7.80**
DECCA/TATUNG BG 200/44 TYPE £9.80
GRUNDIG BG 2077-642-1003/1004 £14.80
GRUNDIG BG 2087-642-1001/1002/1006 £14.80
GRUNDIG BG 2000-641 £13.80
THORN 9000 £9.80

MISCELLANEOUS p.p. £1.80

VHF/UHF upconnvertor **£40.00** p. p. £3 50
Mains Isolating 500VA **£51.25** p.p £5.25
455 CRYSTALS for handsets, 4 for **£2.00** p.p. 80p
DEGAUSSING ROD £33.75 p.p. £4 70
TRANSPARENT VIDEO SERVICE CASSETTE £6.80 p.p. £1.80
TV FAULT FINDING GUIDE £18.50
VCR FAULT FINDING GUIDE £18.50
HITACHI FRAME MODULE HM 6251 £9.80, HM6232 £12.80 p.p £1.80
HITACHI THERMISTOR TH902 £2.85
FERGUSON TX10 FOCUS UNIT £8.50 p.p. £1.80
PHILIPS BACK UP BATTERY: 2 4V **£3.00,** 1.2V **£2.00** p.p. 90p

HOW TO ORDER: ADD p&p TO ORDER + VAT 17.5% TO THE TOTAL
PRICES ARE SUBJECT TO CHANGE WITHOUT NOTICE

Telephone 0171-794 8751/794 7346 Fax 0171-431 5778
172 WEST END LANE, LONDON NW6 1SD
CALLERS WELCOME AT SHOP
Mon-Fri 9.30-6pm – Thurs 9.30-1pm – Sat 9.30-5pm

TV Fault Finding

Reports from
Mike Leach
Philip Blundell
Michael Maurice
Eugene Trundle
Glyn Dickinson
Chris Watton
John Edwards
Phil Marrison
Denis Foley
Chris Avis
Roger F. White
Tony Ashworth

Hitachi C2133TN (Stereo Plus Chassis)

No results was the complaint with this fairly new set. Only the standby light came on, nothing else. As I'd not worked on one of these sets before, I first had a good look round to see if anything obvious, such as dry-joints, might be responsible for the fault. Everything was o.k. Out came the manual, and it was a matter of starting from square one.

Power was clearly present, as the standby light was on. I assumed that the cause of the fault could lie in one of three areas, the power supply, the line timebase or the control circuitry. After a few d.c. checks I decided that the control system was to blame – the 12V was missing at pin 16 of the TEA2164 chopper circuit chip. This line goes high or low for on and standby respectively. It's controlled by a group of components on the front panel. When I finally got the board out I found that the BC858B chip transistor VE07 was short-circuit. This removed the 12V feed to the power supply chip. A replacement transistor restored normal operation. **M.L.**

Philips 40 Chassis

Very poor colour from cold was the complaint with this set. It looked as if something was wrong in the reference oscillator circuit, though the crystal and the chip both proved to be o.k. Use of a hairdryer and freezer brought us to the culprit, which was the 2·2µF, 63V capacitor C2164 near the TDA3561 colour decoder chip. A new capacitor restored normal colour. **M.L.**

Ferguson TX85 Chassis

This set was dead. The mains fuse had blown and the chopper transistor TR6 was short-circuit. R101 in the snubber network was dry-jointed, so this was resoldered. Resistance checks around the TEA2018A chopper control chip then showed that the earth print from the emitter of TR6 to pin 2 of the chip via pin 2 of the chopper transformer was open-circuit: the break was near the transformer. After linking across the break we continued our tests. R98, which is in series with TR6's base, was open-circuit; D20 (1N4148) in the error feedback network was short-circuit; and the TEA2018A chip had blown its top.

After replacing these items we connected the set to the mains supply via the variac and carefully increased the input. Fortunately the set was now o.k. **P.B.**

Philips Anubis A AC Chassis

This set worked fine with dark scenes. When the picture was bright however it would flicker and the power supply output voltages would fall. Was the line output stage taking too much current, or was the power supply unable to provide sufficient current to meet the line output stage's normal requirements?

Fortunately we were able to make some comparisons with a stock set of the same type. By loading the good set's power supply with bulbs, we found that its 95V output could provide 700mA before the supply began "chirruping" and the voltages began to fall. The faulty set could provide only 500mA.

At least we knew that the fault was in the power supply. Fitting repair kit SBC7021 (part no. 4822 310 20491) made no difference, neither did bridging the various electrolytics. I finally checked the gain of all the power supply transistors that hadn't already been replaced. Tr7554 (BC337A) was leaky. **P.B.**

JVC AV21F1EK

This Nicam set suffered from an intermittent fault that was described as no sync. About five minutes after switching the set on from cold the picture would shake from left to right, sometimes violently. If text was selected the display was all right. If mix was selected there would be no line lock between the text and the picture. This would last for about three minutes, after which the fault would clear. No amount of freezing or heating would then instigate the fault. Switching the set off overnight would bring the fault back however.

JVC thought that the problem might be caused by the 6MHz crystal on the text panel – the sync pulses come from the text processor chip in these sets. So I started to check around in this area and found that when the fault was present there was noise on the sync pulses in the video input waveform. This comes from the i.f. unit, where a tantalum capacitor (C02) that decouples the i.f. a.g.c. was found to be the culprit. Replacing it cleared the fault completely. **M.M.**

Sony KV2217

This old-timer had an EW fault. Our field service engineer had replaced a number of capacitors before giving up. The first thing we noticed was that the tube was as flat as a pancake. It was an insurance job however, so we delved into the EW correction circuitry and found that coils L552 and L554 were open-circuit. After replacing these and the tube, then setting up, we had an excellent picture. **M.M.**

Ferguson ICC5 Chassis

The tuner was cutting out occasionally. Fortunately the cause was easy to rectify: there was a dry-joint in the tuner. **M.M.**

ITT ST35767

This set appeared to be dead. For once the line output transformer was not the cause. We found that the field output chip had blown up. Replacing it got the set working, but the picture was rather sick. Fortunately the customer had an extended warranty which paid for a new tube. **M.M.**

Sony KVX2162

According to the flashing LEDs at the front this set was in the protection mode. The way in which I tackle this fault is to disconnect the protection

line from the main microcontroller chip and switch on. This produced a picture with a small frame. The EEPROM had become corrupted, a replacement plus setting up clearing the fault condition. **M.M.**

Ferguson ICC5 Chassis

The picture would go in at the sides very intermittently. This was caused by cracks in the print around the line output transformer. **M.M.**

Grundig CUC740 Chassis

This proved to be quite an elusive fault: the set would intermittently cut out, sometimes going dead and sometimes to standby. The cause of the trouble was in the 5V supply, where D671 (BY299) was going open-circuit intermittently. A new diode followed by a long soak test proved that the fault had been cured. **M.M.**

Sony KVG2512

These sets are similar to the KVX series but incorporate a built-in satellite receiver/decoder. Card access is through a slot in the front, hidden by a flap. It was the satellite section that had failed: there was no supply to the LNB. The cause was traced to the power supply on the main board D, where CP605 was open-circuit. This item is very difficult to get at – you have to remove a heatsink clip to do so. A new CP restored the satellite reception. **M.M.**

Saisho CM2080

This set produced only half a picture. A previous engineer had replaced the field output chip, but the culprit was C421 in the voltage boost circuit. It had dried up. **M.M.**

Pioneer SV2803

This was a misleading fault. At the bottom of the screen there was about 15mm of picture foldover, which freezing the TDA8370 chip IC7550 seemed to cure. So we replaced the chip – and the foldover remained. The real culprit turned out to be the 680µF, 35V field scan coupling capacitor C2582. **E.T.**

Hitachi CPT2078 (NP83CQ2 Chassis)

No sound or picture was not caused by failure of the line output transformer on this occasion. The set was stuck in the AV mode. When the AV switching link from the CITAC panel was disconnected the signals were restored. We found that the 12V zener diode ZD1438 was leaky. **G.D.**

Sanyo CPT3104

We don't see many of these sets. This one's picture was jumping, and an ominous arcing noise came from the line output stage. Fortunately the cause of the trouble was easy to spot. The width adjustment, a cut piece of wire, was arcing to an adjacent capacitor. Cutting it short restored a perfect picture, after which a quick clean of the customer controls made the set fit for another fifteen trouble-free years! **G.D.**

Toshiba 255T7B

It's worth checking that these sets go into standby after a repair. This is often not mentioned until afterwards – "it wasn't like that before you fixed it". The cause of the timebases remaining active is Q803 (2SC2023) and/or Q804 (2SA1321) going short-circuit. **G.D.**

Mitsubishi CT2555STX

Teletext could not be selected via the remote control unit at any time, but when the set was cold it would go into garbled teletext of its own accord. As the SAA5243 chip is well known for doing odd things I changed this first, to no avail. A check on the 5V feed to the teletext panel then revealed that it was slightly low. Back then to the power supply, where C922 and C923 (both 100µF) were both low in value. While in this area I checked the other electrolytics and replaced them as necessary. **G.D.**

Finlux 3024F

There was no picture though the e.h.t. was present and the tube's heaters were alight. When the set was switched off you could see a faint line down the centre of the screen. A look around the line output panel, on the component side, soon revealed that the 470nF, 250V MKP line scan coupling capacitor C219 had a split right across the middle. **C.W.**

Bush 2131T

We've had a good few of these sets with intermittent loss of picture or text faults. These are normally cleared by resoldering the whole of the text panel. On this occasion we discovered, while carefully moving individual components with the set in the text mode, that one lead of R13 (10kΩ) was loose in its end cap. As a result the combined line-field sync pulse waveform was losing its d.c. level. This upset the timing of the teletext processor chip. **C.W.**

Amstrad TVR3

The cause of line disturbance on dark scenes was found by connecting the scope to the cathode of the h.t. rectifier D306. The display showed a smooth d.c. supply when the picture was bright. When the picture was dark however there were negative-going spikes (gaps) in the supply. Replacing the diode and the associated capacitors made no difference. The cause of the trouble was the STK7348 chip IC301. **C.W.**

ITT CT3437 (Compact B Chassis)

Although the report said that this set was dead, its power supply and line output stage were up and running. 88 was showing in the display, there was neither sound nor raster, the customer controls had no effect and the tuning didn't work. The cause of all this was the fact that the 5V supply to the memory chip on the customer control panel was missing. Regulator IC05 (TDD1605S) on this panel was open-circuit. **C.W.**

Beon CTV14R

There was a snowy raster but no sound or channel indicator illumination. Checks in the low-voltage section showed that the standby transformer was open-circuit. It supplies the remote control section, and of course channel selection was lost. I must say that the Beon Corporation in Cumbernauld is more helpful than many other manufacturers. **C.W.**

Matsui 2150TX

If one of these sets is stuck in standby check the h.t. feed to the line output transistor. It passes from pin 5 of the line output transformer via L603 to the transistor's collector connection. As with many of the other coils in these sets, L603 may appear to be soldered though the joint is poor. When you remove the old solder you find that the wire is black. Clean up and resolder. **C.W.**

Loewe-Opta C8001 Chassis

The customer complained that "the telly smelt hot then just smelt then went off". It's quite common for the h.t. reservoir capacitor C652 (47µF, 250V) to leak and cause a bit of a burn up between its positive connection and the upper side of the PCB, as the upper side is clad with copper that's connected to chassis. In such a case I find that a quarter-inch drill bit put through the board will clear the carbon from the burnt area. Then fit some sort of insulator over the leg of the replacement capacitor and wire it in. This usually does the trick. **C.W.**

ITT CVC1210 Chassis

This set was dead. You can tell from the chopper transformer's squeak whether the mains side of the supply is working. It was. So we discon-

nected the scan coil plug and checked the power supply by loading it with a bulb across the interlock pins of the socket. This proved that the cause of the fault was in the line output stage, where the output transistor was short-circuit. When this had been replaced there was some sort of waveform at its collector, and after a short time the faintest glimmer of line collapse appeared on the screen. A few further checks revealed that the EW modulator driver transistor was short-circuit and R503 (100Ω) open-circuit. The cause of all this was the scan coil coupling capacitor C511 (330nF, 400V). When it was removed one leg remained in the board. **C.W.**

Sony KV2752 (RX Chassis)

The customer told me over the phone that the on/off switch was broken. It's a very common job, so an estimate was given and accepted – yes, I know, I'll never learn! When I fitted the switch and turned the set on there was nothing. Quick checks showed that although there was h.t. at the collector of the chopper transistor there were no outputs from the power supply. This called for removal of the set to the workshop – and a bit of explaining. Once the set was on the bench it didn't take us long, using the scope's component tester, to discover that the 2SC2958 chopper driver transistor Q601 was slightly leaky base-to-emitter. A replacement brought the set back to life. **J.E.**

Philips 2A Chassis

This set was dead with a shattered mains fuse and open-circuit surge-limiter resistor (R3654). The BUT11AF chopper transistor, D6664 (BYD33J) and two of the bridge rectifier diodes were short-circuit. In addition to these items I replaced the CNX62 optocoupler and the 2·2nF, 2kV pulse capacitor C2664, just in case. A check for dry-joints then revealed a beauty at one leg of the 9·1nF flyback tuning capacitor C2609. After resoldering this I switched on and found that the set worked normally. It surprised me that the line output transistor had survived all this. **J.E.**

ITT CVC40 Chassis

This set was dead but there was 320V at the collector of the TE1233 series chopper transistor T807. I disconnected the scan coil plug to isolate the line output stage and used a 100W bulb to load the power supply. At switch on it glowed far too brightly – there was 316V across it. T807 was short-circuit of course. As no obvious cause of its failure could be found I fitted a replacement, using a BU326 as I was unable to find a supplier for the TE1233.

At switch on the set worked normally and continued to do so for about an hour. It then suddenly went dead again. The BU326 had failed. Fortunately years ago I'd scribbled a note on the circuit diagram naming R833 (1·5MΩ) as the cause of intermittent chopper transistor failure. A check showed that it was open-circuit. Replacing this resistor and fitting another BU326 restored reliable operation. **J.E.**

Philips K40 Chassis

This set came in dead. Replacing our old friend R3192 (680Ω) brought it back to life, but there was severe EW distortion. Although R3177 (12Ω) was charred and open-circuit replacing it made no difference. When resistance checks were carried out in the diode modulator circuit one of the diodes appeared to be short-circuit, but it was the parallel 0·02µF, 250V capacitor C2164 that was the culprit. Replacing it produced a normal raster. **J.E.**

Contec KT8135

This set had a very bright raster with flyback lines. R474 (390kΩ) on the tube base panel was found to be open-circuit. As a result the tube's first anode voltage was high. **J.E.**

Philips CP90 Chassis

Field collapse was the complaint with this set. The cause was traced to R3623 (8·2Ω) being open-circuit. It's in the rectifier circuit that produces a 163V bias supply for the field output stage. **J.E.**

Bush 1452T

This receiver was dead, with a blown mains fuse (F901), as the 2SD1554 chopper transistor Q404 was short-circuit. When these items had been replaced we powered the set via a variac. The power supply now produced an h.t. output, but there was no regulation and the line output stage derived 12V supply was missing. The 12V supply was missing because the 12V, 1·3W zener diode ZD402 was short-circuit. This had seen off R425 (5·6Ω, 3W). After much checking we traced the cause of the failure to regulate to C911 (47µF, 50V) in the chopper transistor's base circuit. It had gone low in value. We decided to replace C909 (47µF, 50V) as well. **P.M.**

Casio TV100

This set was dead: fuse FU100 (1A) had blown because the LCD backlight board inverter transistors Q901/2 had gone short-circuit. They are surface-mounting types and are available from Casio. We replaced these items, but the only result was that Q901/2 became hot. Further checks revealed that there were short-circuit turns in the primary winding of the inverter transformer. This is easy to remove and, with a little care, can be rewound. This restored the set to normal operation. **P.M.**

Samsung CI338GA

This set suffered from field roll because the lubricant in the field hold control had become conductive. It had reached the point where there was only a limited change in the control's resistance when the slider was moved from one end to the other. Three potentiometers of the same type on the front panel were in a similar state. We cleaned and relubricated all four, restoring normal operation. **P.M.**

Matsui 1440/Saisho CT142R

Pressing the remote control unit's standby button would sometimes result in the set going into standby, or coming out of it, for only as long as the button was held. In addition, when the set was in the standby mode the selected channel LED would go out instead of staying on to indicate standby operation.

We checked the supply to the OEC3005 remote control decoder chip IC103 and its peripheral components. As everything seemed to be o.k. we fitted a replacement chip. This made no difference. Eventually we decided to try a universal remote control unit. The set then responded normally. Does anyone want a nearly new OEC3005 chip?! **P.M.**

Osaki CI5013T/Samsung CI5052XT (P68SW Chassis)

The complaint with one of these sets was no sound or vision with the standby light flickering. When switched on these sets come on in the standby mode. In this state the h.t. voltage should be 125V. In our faulty set it was at approximately 70V and the set wouldn't come out of standby. The solution was to replace the SDH209B chip IC801. **D.F.**

Bush 2002/2052T/Matsui 2074

The line output stage derived 12V supply was missing. Replacing R421 (0·68Ω), R419 (5·6Ω) and the BYX61-C12 zener diode ZD401 cured the fault (no sound/vision) for three weeks. Then ZD401 failed again.

I obtained a circuit diagram and found that the h.t. (+B) voltage was

high at 124V. When C909 and C919 (both 47µF, 63V) had been replaced it was possible to adjust VR901 for the correct 115V h.t. Why don't manufacturers print important voltages on the PCB? **D.F.**

Rediffusion Mk4A Chassis with Text

We'd replaced the memory battery, stored the owner's local channels and tested the set before returning it. Soon after the owner complained that there was no teletext or clock display, just a blank screen with "0000" in the top left-hand corner when teletext was tried. It took a while before we realised that the Mk4A has a page-store facility, which requires a page number to be stored on each active channel before the teletext will function. The header page 100 was memorised for each channel and the mystery was solved. **C.A.**

Ferguson 22B5 (TX10 Chassis)

A silly one this, but it might save someone else from wasting time. The owner had bought the set, which has teletext and stereo sound, secondhand. He then discovered that although it would produce a mixed picture and text, if text alone was requested nothing happened – except for a slight picture shift to the left. We tried fitting a good text board from a scrap set but this made no difference. We then noticed that PL31, which plugs into the text board, has an extra grey flying lead with a connector on it. This had been pushed on to pin X on the board, though the manual labels it as "not used". Disconnecting it restored correct operation. **C.A.**

Ferguson 14L2 (TX85 Chassis)

This set switched on but wouldn't produce a picture: it was stuck on channel 0. Neither the channel change nor the tuning worked. The cause of the fault was the 8·2V zener diode D901 in the 9V regulator circuit on the remote contol board. **R.F.W.**

GoldStar CIT2181

Intermittent loss of sync was the problem with this set. The input to the sync separator in the TDA1940 chip was being lost because C413 was leaky. **R.F.W.**

Ferguson TX10 Chassis

This old timer was dead but apparently produced a really good picture before it went off. We soon found that there was no chopper transistor drive. The cause of the fault was R724 (1·2kΩ) which biases the base of the chopper driver transistor TR721. **R.F.W.**

Tatung 165 Chassis

The problem with one of these sets was low gain. Its cause was R102 (4·7kΩ) which was open-circuit. This resistor biases the base of the SAWF driver transistor Q101.

Another of these models displayed a peak white raster. The cause was the TDA3565 colour decoder chip I501. **T.A.**

JVC AV25S1EK (MX II Chassis)

The standby light would change colour but there was no line drive. Voltage checks showed that there was no supply to the line driver transformer because the standby switching transistor Q902 was not being switched on. Its base bias resistor R903 (2·2kΩ) had risen slightly in value. **T.A.**

Matsui 6092

The cause of weak, distorted sound was traced to the 2SD400 transistor Q706 on the power PCB. A BC639 proved to be a suitable replacement. **T.A.**

Letters to Television
Quadrant House
The Quadrant
Sutton Surrey
SM2 5AS

VCR HEAD CLEANING TAPES

Ever since I confronted my first faulty VCR over twenty years ago I have been told, mainly by people in the know and fellow technicians, that video head cleaning tapes are useless. Since that first time I have seen no reason to doubt this. I was told that the early cleaning tapes were abrasive and had to be used sparingly. Presumably the tape composition has changed during the intervening years, but customers who have tried to clean their tape heads with a cleaning tape because of the dirty heads symptom regularly tell me that the tapes are ineffective. A quick wipe with the trusty chamois leather and isopropyl alcohol has always cured the problem

I've seen cleaning cassettes jammed in machines because the top bottle compartment has struck the cassette-in switch, and cleaning tapes that have dirtied instead of cleaning the heads. Many customers seem to think that a head cleaning tape will cure any VCR fault – "it's chewing tapes, bung in the cleaner".

Yet the tapes must be good since nearly all dealers sell them! I'd welcome any comments on the subject.

Edward Branch,
Northallerton, N. Yorks.

FINANCING A RENTAL BUSINESS

The last five or six years have in some ways been the toughest period that many a TV business has experienced. Recovery from the deep recession has been slow, and has been marked by intense competition amongst white and brown goods dealers in the high street. Many small firms have been saved from going under by having a reasonable rental business, but here too competition has been fierce.

For many smaller rental businesses the problem has been to ensure that leaflet-drop competition and the big boys don't steal their customers. Good personal service and an offer to replace an ageing set – before someone else does – will often ensure that business is retained and in fact grows.

Finance can be a major problem. Banks are not always willing to lend to finance new equipment for rental, and the larger finance companies will sometimes arrange facilities only in excess of a minimum amount, which may well be too much for a small rental business.

There are specialised finance companies that don't advertise but will, subject to the usual credit checks, finance as little as £1,500 worth of equipment over periods of 12-36 months. The dealer chooses the period which will ensure that, after renting out the equipment and paying the finance company, a positive cash flow is retained.

Another alternative is block discounting, where the finance company in effect makes a cash advance against the deposit of existing rental agreements. Usually, but not always, these have to be for the rental of new equipment and to have been signed during the last three-four months.

Dealers often need finance to cover only a period of high rental demand, so that they can sign up new agreements rather than let the business go elsewhere.

Bob Wickham, Managing Director, Broughframe Limited.

THE PHILIPS G110 CHASSIS

I'd like to add a few comments to Richard Newman's excellent article (December) on servicing the Philips G110 chassis.

My experience of this chassis has been mainly with the 8841 projection model. We've sold many of these sets, and have a number that we either rent out to pubs and clubs on a long-term basis or hire out for one-day seminars etc.

Two screws at the front, next to the dust cover that surrounds the lens, have to be taken out when removing the top section. Richard didn't mention them. They are accessible only after removing the loudspeaker grill, then removing two screws that hold the front control panel which is then swung down. As our one-day hire sets are constantly being moved around, we tend to leave these two front screws out. Removal of the top section is then as Richard describes.

In my experience the blue tube seldom fails. What does happen is that the cooling fluid turns a dark brown, resembling the colour of strong lager. In addition, when you split the tube from the optics you find that its face plate is covered with a brown substance. You also find traces of the adhesive that a plastic face-plate protector has left behind after removal in the factory prior to fitting the tube in the set. It can easily be cleaned off with isopropyl alcohol. Something else you'll find is a trapezium-shaped phosphor burn across the tube: this seems to have little effect on the picture produced by the blue tube.

Because of leakage, I've had to replace the fluid in the red and green assemblies as well. The remaining fluid has been slightly discoloured, but the picture has been o.k. I assume that this is because the blue tube contributes on average only eleven per cent to overall brightness, the red and green tubes contributing thirty and fifty nine per cent respectively. Hence the fact that the blue output suffers most. Once the fluid has been replaced, the blue picture is restored to normal.

Finally a note on convergence, regarding the magnets on the scan coils. If you use a crosshatch pattern without a circle, you may find that the picture is displaced horizontally or vertically by one complete square without this being noticed – until you change channel to a normal picture!

Incidentally it would have been nice had Philips fitted some A1 switches (remember them?).

Martin Cole, Service Manager, Central Radio Services, Burnham-on-Sea, Somerset.

PANASONIC Z3 CHASSIS

For the benefit of other readers I would like to correct an error that occurred in the Panasonic Z3 chassis fault report on page 639 of the July 1995 issue – a set that wouldn't start up because of an X-ray (overvoltage) protection circuit fault. The offending 270kΩ resistor is R560, not R506. It's hard enough trying to find anything in this chassis! But many thanks to Mike Rathbone, without whose report I would probably never have found the cause of the trouble.

The note that came with the set I had to deal with said it went off a few seconds after being switched on, which was not surprising considering the burnt out line output transformer pin. After dealing with this I was taken aback to find that there was also an X-ray protection circuit fault. It seems to have been unconnected with the dry-joint.

Laurie Watkinson, Holsworthy, Devon.

STUDENT'S DILEMMA

I wonder how many of your readers will find my problem familiar? Ever since I completed a degree in electrical and electronic engineering people have assumed that I can repair TVs etc. I couldn't of course, since all I knew were the basics. The inside

of even the simplest TV set was a daunting prospect.

I decided to pursue TV and video repair work: it was otherwise a question of back to school or work at McDonalds. My knowledge of the theory is o.k., but I need practical experience to pass the courses let alone get a job. Could any readers of *Television* provide any help, advice or suggestions that would assist me with the courses I'm studying? I have to find a way around or over this brick wall called 'experience'.

Ms C. Raynor, 39 Northway, Lymm, Cheshire WA13 9AT.

OBTAINING SPARES

My experience of ordering spare parts over the last few years has been that very, very few companies give truly good customer service. Many of the companies that advertise regularly in this excellent magazine do not reply to faxes, even pretend they haven't received them. If they do reply, they don't answer queries carefully and are not helpful. I'm often made to feel that my queries are a disturbance! Even large, reputable consumer electronics companies will put you in a queue when you telephone. When they do finally claim to have what you want, the wrong item is often sent.

Fax communication seems to me to be by far the most efficient method. I spend a lot of time preparing my faxes and provide as much information as possible, mostly to no avail. How is it that fax enquiries to German, US and Japanese companies are usually answered within 24 hours? UK firms are fooling themselves if they think that they are providing good customer service. Come on, customer service departments: jack up your efforts or let's hear your side of the problem.

Ritchie Langu, Zambia.

WHEN IS A WARRANTY NOT A WARRANTY?

The other day I was asked if I would have a look at a closed-circuit TV system at a customer's premises. It consisted of a number of CCD outdoor cameras, a digital switcher, a 20in. monitor and a time-lapse VCR, all made by Sony. The company that had installed the system, only a couple of months previously, had gone into liquidation. The problem was that one of the cameras had failed.

I explained the situation to Sony Broadcast at Basingstoke. "No problem" they said, "return the camera and we'll see what we can do". A couple of days later I received a letter explaining that while the camera was well within its twelve months' warranty period it would have to be returned to the wholesaler from whom it was purchased. I again explained that this was not possible, because the company that had installed it had gone bust, and pointed out that as the customer had just purchased over £5,000 worth of Sony equipment, and expected to expand the system, repair of the camera free of charge would be good customer relations. All to no avail. I just had an estimate of £86.53 to repair an item less than three months old. My customer is not particularly pleased about this.

Martin Crossman, Electrical and Electronic Services, Southend-on-Sea.

FAULT DATABASE

I'm currently compiling a TV and VCR fault database to assist me in my repair work, and at present have 800 TV and 50 VCR faults stored on a Psion Series 3 pocket computer. Readers could help me and themselves by sending me any number of faults on a 3·5in. 1·44Mb disc with a stamped, addressed envelope so that I can send back the full collection. The database fields should be set in the following format:

Make: Hitachi
Model: C2519T
Fault: No sound, OP stage OK
Replace: D401 in i.f. can

To conserve disc space, try to be as concise as possible. I can accept files in the following formats: dBase III, dBase IV, Foxpro, Windows cardfile, HP 95LX Phone book, Psion Series 3 DBF. A covering letter stating the format sent and required would be helpful. Anyone requiring a copy to start them off is welcome to send a blank disc and a stamped, addressed envelope so that I can send as many faults as I have at the time.

M. Stevenson, 5 Clements Court, Victoria Road, Mablethorpe, Lincs LN12 2AQ.

DAISY-CHAINING

The government's infuriating decision to go ahead with Ch. 5 brings up once more the subject of daisy-chaining, with most modulators confined to chs. 32-40. For single-set installations the answer is the scart system, but how many sets are provided with even as few as two such sockets? Even four would hardly be future proof.

Designs for adding scart sockets have appeared in *Television* over the years, but none to date have remote control, either via the set's unit or an additional one. Could someone come up with a design to suit at least a fair proportion of the more common TV models? The sequential channel-hopping arrangement used with early remote control systems might provide a starting point.

U.H.F. modulators remain a necessary evil with multi-set systems, so some means of shifting the frequency of the older chs. 32-40 type outside that range would be welcome. Does anyone have any bright ideas?

Finally, a plea to manufacturers: please fit all future video/satellite/computer units with a means of depowering the u.h.f. modulator. For those who use scart connections, no good can come of having the unwanted signals produced by these modulators hanging around, however careful the EMC precautions. And please also equip your future TV models with more scart sockets.

Philip Lane, Aberaeron, Dyfed.

VCR Signal Processing

In Part 4 of his series Joe Cieszynski looks at the basic problems involved with recording and playing back the colour-under chroma part of the signal

With the luminance signal frequency modulated on to a 3·8MHz carrier, the chroma signal can no longer be at the PAL standard of 4·43MHz. If it was left there the result would be excessive luminance-chroma signal cross-modulation. A method known as colour under is therefore employed: the frequency of the chroma carrier is shifted from 4·43MHz to 627kHz, placing it beneath the luminance carrier. This frequency changing is complex, because for faithful colour reproduction the correct chroma carrier phase must be maintained at all times.

Playback signal crosstalk and chroma carrier phase/frequency errors caused by mechanical variations further complicate the chroma signal processing.

There are therefore four primary aspects to chroma signal processing in a domestic VCR: chroma carrier frequency changing; crosstalk signal cancellation; chroma carrier frequency error correction; and chroma carrier phase error correction.

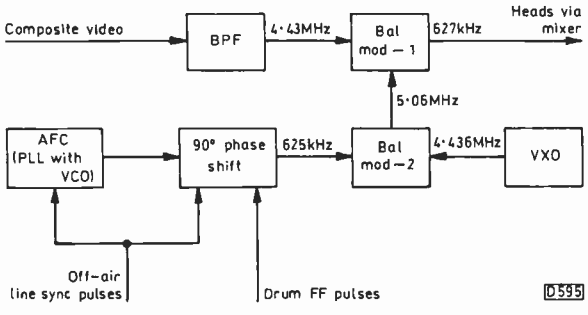


Fig. 1: Block diagram (simplified) of the basic VHS chroma record system.

Basic Chroma Record Processing Block Diagram

Fig. 1 shows in simplified form a standard VHS chroma record system. The composite video input is first fed to a bandpass filter which removes the luminance signal component and reduces the chroma signal bandwidth to 1MHz. This bandwidth limiting is necessary because the lowest luminance sideband is at 1·2MHz: there is thus only a 1·2MHz wide slot into which the chroma signal can be fitted. With a guard space left to minimise cross-modulation, the VHS chroma bandwidth becomes 1MHz (carrier frequency fc ± 500kHz).

Balanced modulator one performs the frequency changing required, using the same heterodyne principle employed in a superhet radio receiver. For reasons that will be made clear later, the second input to the modulator comes from a second balanced modulator rather than a simple local oscillator.

The voltage-controlled oscillator (VXO) provides one of the two inputs to the second balanced modulator. The automatic frequency control (AFC) block provides the other input. To ensure correct luminance and chroma signal frequency interleaving, this input is locked to the off-air line sync pulses. It is also phase retarded by 90° on each line, though this is done with only the ch. 2 head signal (even fields). This phase shifting is part of the chroma crosstalk

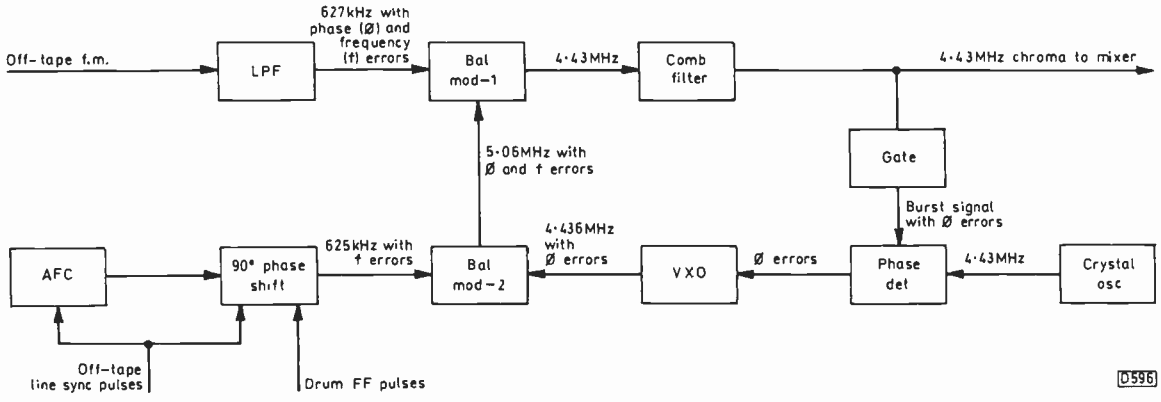


Fig. 2: Block diagram, again simplified, of the basic VHS chroma playback arrangement.

cancellation process, which we'll consider in more detail shortly.

Basic Chroma Playback Processing Block Diagram

Fig. 2 shows what has to be done when playing back the chroma signal. The off-tape f.m. signal is first fed to a low-pass filter, with a cut-off frequency of about 1·2MHz, to remove the luminance signal component. The two balanced modulators operate in basically the same way as in the record mode, the main difference being the reversal of the input/output frequencies at balanced modulator one.

The effect of the 90° phase-shift block is this time to phase advance the previously retarded ch. 2 head carrier on each line. We'll return to this.

The AFC circuit corrects playback chroma carrier frequency errors by detecting the amount of frequency shift and then introducing an opposite amount of shift. This shift passes through balanced modulator two, appearing at the input to balanced modulator one where the frequency correction occurs. If for example the carrier frequency rises by 1kHz, the AFC output will fall by this amount. Subtraction of the two signals in the first balanced modulator, i.e. the off-tape signal with the frequency increase and the second signal with the frequency decrease, results in an output at the correct frequency. The AFC circuit uses off-tape line sync pulses to detect frequency variations in the playback signal.

In the playback mode the voltage-controlled oscillator is controlled by an automatic phase control (APC) system which corrects chroma carrier phase errors caused by minor mechanical variations. The phase detector that controls the VXO compares the phase of the off-tape chroma burst signal with that of the output from a 4·43MHz crystal oscillator. It introduces a compensating phase shift in the VXO's output. This is passed via balanced modulator two to balanced modulator one, where error correction occurs in the same way as with frequency correction.

The comb filter uses the ch. 2 carrier phase retard/advance to cancel chroma crosstalk between adjacent video tracks.

Crosstalk Cancellation

Before we consider chroma signal record/playback processing in greater detail, it's necessary to look at the problem of chroma crosstalk and how this is dealt with.

All current domestic VCR formats dispense with a guard band between adjacent video tracks. This is done to increase the playing time of the tapes. When the VHS and Betamax systems were being developed, playing time was a major consideration – the 'longest' tapes then available had a playing time of only two hours. Much had been learnt from the public's reaction to the earlier Philips N1500 format. This had a guard band between each track, but the maximum playing time was only half an hour. It soon became clear that users would be quite happy to sacrifice picture quality to attain a longer playing time. The trouble is that when the guard band is removed luminance/chroma crosstalk becomes evident. If uncorrected, this crosstalk will result in colour interference and distortion.

Luminance crosstalk is largely eliminated by the use of the slant-azimuth video head technique. This has very little effect at the much lower chrominance frequencies however, see Fig. 3. The two-line offset hides the crosstalk to a large degree, but if patterning is to be avoided chroma signal crosstalk cancellation must be used.

The VHS system uses a phase rotation arrangement to cancel chroma crosstalk. This is best explained using phasor diagrams. The following description, see Fig. 4, assumes for simplicity that the VCR is recording then playing back a pure magenta raster (R – Y chroma signal). For those who are a little rusty about this sort of thing, in a phasor diagram phase retardation is represented by a clockwise movement of the phasor.

Fig. 4 (a) shows that the ch. 1 head (odd field) records the chroma information with no alteration to the phase of the PAL signal.

Fig. 4 (b) shows that the ch. 2 head (even field) records the chroma information with the phase of the PAL subcarrier retarded by 90° on successive lines, i.e.

Line 1 0° phase retardation

Line 2 90° phase retardation

Line 3 180° phase retardation

Line 4 270° phase retardation

Line 5 0° (= 360°) phase retardation.

Fig. 4(c) is based on the ch. 1 head playing back a video track. The large phasors represent the off-tape PAL chroma signal from the track being scanned. The smaller phasors represent crosstalk from adjacent ch. 2 tracks. Because of the phase retardation that took place during the record process, these phasors are generally out-of-phase with the main off-tape signal. At this point no cancellation has occurred.

Fig. 4(d) shows in block diagram form the comb filter system included in Fig. 2, with a two-line delay line. This usually consists of a glass delay line, the delay time being 127·88µsec (two lines). It operates on similar principles to the chroma delay line in a PAL decoder. The adder following the

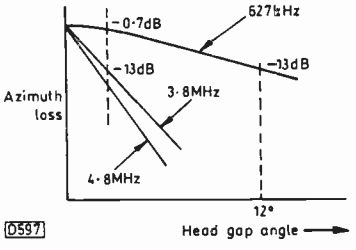


Fig. 3: Graph showing the effect of the slant-azimuth technique on f.m. (3·8–4·8MHz) and chroma (627kHz) crosstalk signals.

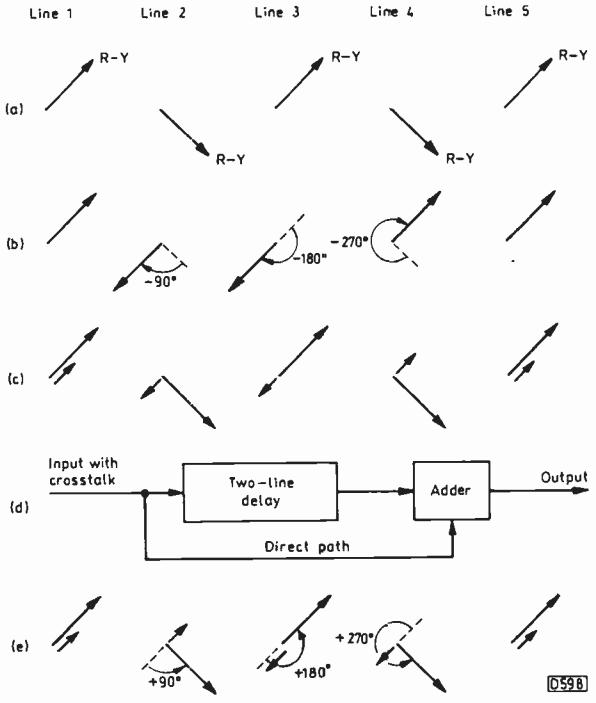


Fig. 4: How ch. 2 signal phase shifts introduced line-by-line during the record process enable chroma crosstalk to be cancelled when playing back the signal.

ELECTRONIC TEST EQUIPMENT

PROMAX

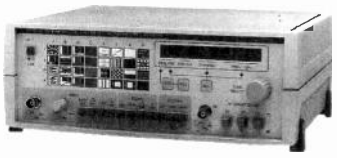
Audio - Video - Television - Satellite TV - Telecomunications

The manufacturer who cares about quality & features rather than being lowest in price !

Audio Analyser
Model AA-930

Multi-function meter. Measures distorsion, wow & flutter, stereo power, signal levels in & out; generates audio test signals. Features include large clearly marked analogue meters. Performs the work of many individual instruments. £ 490

Television Pattern Generator
Model GV-698/11



32 patterns, 32 internal memories. PAL/NTSC/SECAM standards, with I, B, G, H, M, M, N, D & K, NICAM, teletext all in one instrument.
Optional on screen logotype. (Other pattern generators available from £ 210). £ 1428

Television Pattern Generator
Model GV-298

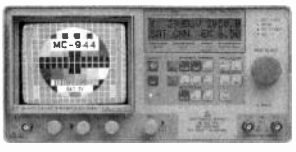
Compact high performance generator, RF and video outputs. Frequency range same as GV-698/11, 37 to 865 MHz. Circle pattern included. £ 433

TV & Satellite Level Meter
Model MC-360

Ideal instrument for the professional installer of FM/TV aerials and satellite TV dishes. Covers 48 to 856 MHz and 950 to 2050 MHz. Lighweight, compact and rechargeable battery operated. £ 654

Frequency counters Models FD-250 & FD-252

FD-250 covers 20 Hz to 160 MHz and FD-252 covers same plus, 100 MHz to 2.4 GHz. Large L.E.D. display. Wide performance at low cost. £ 153 & £ 206



TV & Satellite Level Meter
Model MC-944

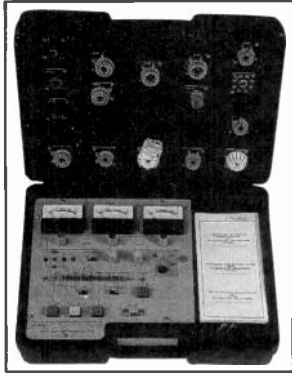
This meter has everything for the top flight instaler of aerials, dishes, CCTV, MATV, SMATV and others systems. Features include TV monitor, spectrum analyser, sync pulse, teletext, printer output, 99 memories, tuneable audio subcarriers, etc. Full autocorrection for superb, unequalled accuracy!. RS-232 as standard. £ 1895

Low Distortion Low Frequency Generator
Model GB-212

20 Hz to 200 kHz, harmonic distortion 0.02 % maximum over audio band. Frequency counter resolution ashigh as 0.1 Hz. 600 ohms impedance. Output level attenuation range 60 dB, with analogue meter for setting accuracy. Excellent output level flatness. £ 219

Functions Generators
Models GF-230 & GF-232

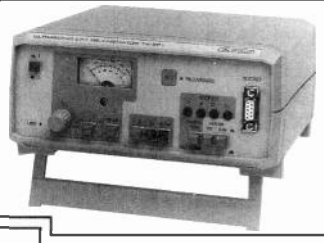
Two versions available· 0.1 z to 1 MHz and 0.2 Hz to 2 MHz. Producing sine, triangular and square waveforms, with variable symmetry. Excellent performance. £ 153 & £ 206



CRT Rejuvenator
Model TA-903

Similar to TA-901, but has three meters to monitor cathode current. Special technique allows repeated rejuvenation of CRT. Supplied in attache style case, for easy field and workshop use. £ 498

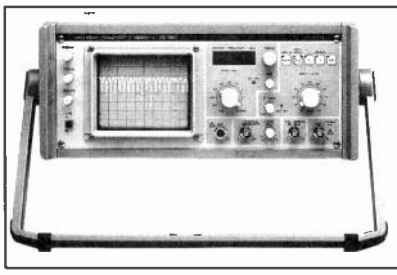
CRT Rejuvenator
Model TA-901



An essential tool for every TV workshop. Promax have made many thousands. Supplied complete with a set of base adaptors. £ 235

TV/FM Level Meter
Model MC-160B

The aerial installers best friend. Calibrated for accurate signal level measurements. Digital frequency display ensures correct signal selection and identification.
Built-in demodulator for easy station ident, and audible tone foreasy positioning. This meter is light in weight, but has outstanding technical features. £ 354



R.F. Spectrum Analyser
Model AE-566

1 to 1000 MHz, with 950 MHz to 1750 MHz option. Built-in tracking generator. Offers spanwidths from 1 MHz to 1000 MHz. Includes normalizer. This analyser is ideal for production and educational applications, as well as R+D. £ 2800

PROMAX

The company has been producing test equipment in Spain for over thirty years, earning a strong reputation for excellent engineering, quality performance at budget prices. The equipment is supported by Alban Electronics from their St Albans facility. These products are suitable for only professional and educational applications.

VISA

Prices shown exclude VAT, but includes UK delivery.
Most items available for immediate despatch.

Access

ALBAN ELECTRONIC LIMITED

4 – St Albans Enterprises Centre – Long Spring
Porters Wood – St Albans – Hertfordshire – AL3 6EN
Tel: 01727 832266 – Fax: 01727 810546

delay line receives both a direct (undelayed) and the delayed signal. Let's assume that line 3 is being scanned by the ch. 1 video head (direct signal) and that line 1 is going to the adder from the delay line. As you can see from Fig. 4(c), the crosstalk phasors are in antiphase. They therefore cancel out in the adder (the in-phase signals add). The same thing occurs with lines 4 and 2, lines 5 and 3 etc.

Fig. 4(e) shows that cancellation also occurs when the ch. 2 head is scanning the tape. During playback the ch. 2 chroma information is phase advanced to restore it to the correct PAL phase, so in this diagram the phasors are advanced from their positions shown in Fig. 4(b). The crosstalk phasors are also phase shifted. As you can see from comparing lines 3 and 1, 4 and 2 etc. crosstalk cancellation occurs.

This crosstalk cancellation system relies on two factors. First that the content of the chroma in the pictures does not change much over two lines. In fact this is largely so. Secondly, the system can function only when the crosstalk signals are correlated vertically, i.e. when they are from the same point in the picture. Because of the two-line offset when recording, this will be the case. The offset is lost in the long-play mode however, so that the chroma crosstalk cancellation system would fail miserably unless steps were taken to compensate for this. More expensive LP machines incorporate a half-line jump circuit to overcome the problem.

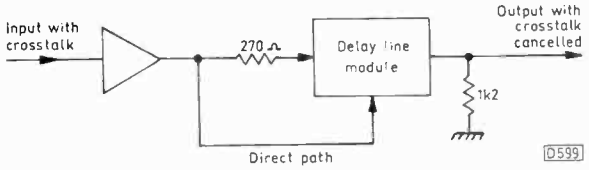


Fig. 5: Typical delay-line comb filter arrangement.

Fig. 5 shows a typical comb filter arrangement. In most cases the circuitry for adding the direct and delayed signals is contained within the delay line module. Adjustments in this area were eliminated soon after the introduction of the earliest machines that used the technique, and on the whole the delay lines are very reliable. As digital techniques take over the signal processing, the delay line will become a thing of the past: digital methods will take over crosstalk cancellation.

Next Month

Next month's instalment will look at VHS chroma signal recording in greater detail.

Book Reviews

Newnes Guide to TV and Video Technology, Second Edition, by Eugene Trundle. Published by Butterworth-Heinemann Ltd., Linacre House, Jordan Hill, Oxford OX2 8DP. 382 pages.

The prodigious rate of development in our field in recent years means that this book's terms of reference are very wide. A major problem therefore is what to include and how deeply to go. The book is aimed at interested lay people, students, technicians and those in allied fields seeking an insight into current TV and video practice. I'd say it does an excellent job of meeting the needs of such an audience, and have already found it a useful reference source for a quick check on several points, thanks to its excellent index.

If you feel the need to freshen up on things like enhanced text, Pal-Plus and other enhanced TV systems, satellite and cable TV technology, you'll find useful sections on all these. The video section includes a helpful chapter on the care, operation and maintenance of VCRs.

The book can be recommended as an ideal introduction to the technology of modern TV and video equipment. It's available from from Paul Richard Books, 28 Boscobel Road North, St. Leonards-on-Sea, East Sussex TN38 0NZ at £16.49 inclusive of post and packing. The credit-card order-line is 01424 434 874. The book can also be obtained from the usual retail bookseller sources. **J.A.R.**

Birth of the Box – the story of television, by Ian Sinclair, published by Sigma Press, 1 South Oak Lane, Wilmslow, Cheshire SK9 6AR (telephone 01625 531 035) at £9.95. 200 pages.

This book covers the subject of TV technology from the first stirrings to fairly recent developments such as Nicam and the camcorder. The emphasis however in on the pioneers and their work. It does the job thoroughly and is an excellent read. I looked hard to see whether I could find anything that was missing, and found very little. There could perhaps have been a little more on developments in the USA during the Thirties, and on the origins of the helical scan system. Otherwise, it's all there – the whole fascinating story. There is of course much on the developments in electronics that made TV possible – the valve, electronic amplifiers and so on. Anyone interested in how it all came to be will find this book an authoritative guide. **J.A.R.**

MPEG – Digital Television for All. Compiled by NTL, published by Swift Television Publications, 17 Pittsfield, Cricklade, Wilts SN6 6AN (telephone 01793 750 620). £19 plus £1.50 postage in the UK, £3 postage to other European countries or £8 postage to the rest of the world. 40 large (A4) pages.

That this is an authoritative guide to the subject is guaranteed by is authorship, NTL, the former ITC engineering side. It contains detailed information on all relevant aspects of the subject, including the need for digital compression, methods of coding, the MPEG standards, how compression is achieved, the treatment of signals for transmission, satellite and cable requirements and the various NTL compression systems now available. The explanations are clear, though I found some of it heavy going, particularly the section about redundancy coding on different MPEG frames, with related discussion of quantised coefficients, scale matrix and DCT processing. There are however many diagrams that clarify the text, and digital compression is of course a complex subject.

NTL/Swift have is this book provided timely information for the trade, broadcasters and interested enthusiasts. As far as I know there is no other publication with so much detail on the working of digital compression. This is therefore essential reading, a topical guide to the digitally compressed transmissions about to come our way and already available elsewhere – for example Direct TV in the USA and the Australian Foxtel service.

The price may discourage some readers. This is a pity since they will be in the front line when digital TV arrives, and a grasp of the technology now should reap a good harvest later on. I suspect that the Inland Revenue would allow such essential educational material to be offset as expenses. **R.B.**

1000's

Thousands of semiconductors I.C's etc.
of video parts, heads, belt kits etc.
of remote controls. etc. etc.

80,000

over 80,000 database records to help find the difficult
video parts quickly. Stock availability & price in seconds

We compete on **QUALITY** - We compete on **SERVICE**
We will not compromise and yet our prices are often less.

.....and look at the special offers.

(strictly while stocks last)

BU208A	X 5	£4.95	BUT11AF	X 5	£3.45
BU508A	X 5	£3.60	BU426A	X 5	£3.75
BU508AF	X 5	£5.00	TDA4601	X 2	£2.55
BUT11A	X 5	£2.25	TDA3654	X 2	£2.50
Philips type 1.2 volt Back up battery				X 5	£4.50
Philips type 2.4 volt Back up battery				X 5	£8.75
Scart - Scart lead 1.5m Fully wired				X 2	£2.90
3V29 etc. Belt kit				X 5	£4.50
3V35/36 etc. Belt kit				X 5	£4.25
VT11E etc. Belt kit				X 5	£5.50
Standard video sensor lamp				X10	£2.50
Std video sensor lamp + plug				X10	£4.00
Thorn TX9/10 Remote control				each	£7.49
Thorn TX10 Green spot LOPTX				each	£14.95

.....and now ask for a full price list.

(please add £1.00 handling all + VAT)

YOU!!

NEED ECONOMIC

- Economic supply TV & Video parts. *VERY FAST*
- Our experienced staff *WANT* to help you !!
- We can give you an instant answer from our database that contains over **80,000** items and we can give that answer *IN SECONDS*
- If we cannot find it immediately
  - We will *'SEARCH THE HEAVENS'*
  - We will hassle our suppliers
  - We will hassle the manufacturer
  - We will make phone call after phone call
  - We will send Fax after Fax on your behalf
- **WE WILL DO ALL THIS FOR YOU**
- We do it willingly and for free - *YOU NEED ECONOMIC!!*

Satellite PSU Repair / Refurb kits

Over 20000 kits sold

Experience in one of the largest repair centres has shown that all repairs to Power supply units require special treatment with not only the obviously faulty parts being replaced but a number of others also changed to ensure a satisfactory repair. Experience shows that up to 50% of all power supply repairs 'bounce' unless the correct procedure and the correct precautionary changes to certain components are made.

At last 4 repair kits are available to cover the majority of all Amstrad and Pace receivers each with a simple to understand instruction sheet to guide you through the correct way of repairing and refurbishing satellite receiver

	MANUFACTURER	MODEL NO.		PRICE
SATKIT1	PACE	PRD800	PRD900	£6.95
SATKIT2	PACE	SS9000	SS9200	£6.95
		SS9010	SS9210	
		SS9020	SS9220	
SATKIT3	AMSTRAD	SRD510	SRD520	£6.95
SATKIT4	AMSTRAD	SRD500		£6.95

Please add £1.00 handling all + VAT

Economic Devices

PHONE (01902) 773122 FAX (01902) 29052

32 Temple Street, Wolverhampton WV2 4 AN, United Kingdom.
International Phone ++ 44 1902 773122 Fax ++ 44 1902 29052

Also available - D2mac Decoders - RTL Decoders - Secam/PAL Transcoders - A/B Switches
Tone Switches - Multiswitches - Please phone for current prices.
Larger Quantity Trade enquiries welcomed.

Chinese Junk

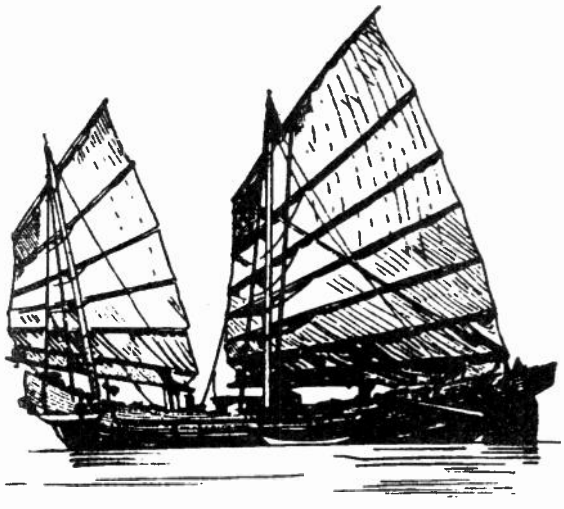
More Adventures in CD Land

Les Austin on his servicing experiences with dubious Chinese audio equipment

If you want a gondola, try Italy. Portugal is the place to look for a man-of-war, and of course China for a junk. For me, the problem is that China sends too much junk to this country. When you consider the change over the years in what comes from Japan, and more recently from some other Far East manufacturing countries, we may well get better products from China before too long. So what wound me up this time?

The Crown CDK2300

Do you recall the Crown CDK2300 midi system I told you about a year or so ago? The one with the faulty RAM chip in the CD player section? Initially, I sold it to a happy customer. After about three months he brought it back, complaining that the sound was rough. A dirty volume control was diagnosed, and a call was made to HRS for a replacement (part no. 9500702). After fitting this the customer returned to his state of happiness. But not for very long.



And there's more on the way...

His next complaint was that the CD section had packed it in, stealing his favourite disc and becoming noisily unco-operative. So I took the record deck off and peered inside. At switch on the disc rotated at speed and the sled was at the outermost part of its track. This suggested that there was a fault in one side of the symmetrical power supply system.

I adopted the simple course of removing the CD PCB in order to get at everything more easily – and was amazed to find that the RAM chip I'd previously fitted was hanging on to the board with just about five hands, the others having let go. Apparently they'd burnt their fingers. I next found that the CXD1130Q servo chip was split across the middle. What was going on? When I made some voltage measurements I was in for a surprise.

The PCB carried +8V and –8V supply rail markings, which a check with the service manual confirmed. The readings I obtained were +18V and –18V respectively. Now since each of these supplies is obtained individually by full-wave rectification of the output from a transformer with a centre-tapped secondary winding, not much maths is needed to calculate that the winding should be rated at about 7-0-7V a.c. I was not pleased to find that it was 17-0-17V a.c. It seems that someone in China had not done his sums correctly when the player was designed.

The +8V and –8V rails are used to drive the motors, an M5290P regulator chip producing, via series regulator transistors, +5V and –5V supplies for the general-purpose chips. Needless to say the M5290P chip was short-circuit. Thus instead of +5V and –5V we had +18V and –18V, the poor little chips having 36V across them. This was obviously far too much: one had hung itself, one had been rent asunder, yet another had been killed and probably the rest all murdered.

Out of respect, I didn't investigate further. I put them all to rest quietly, the customer had his money refunded, and we tried to put it behind us. Repair seemed pointless: the cost of the chips would probably be far more than the unit's worth, with no great prospect of assured future reliability.

Another One!

About a month later my eldest son asked me if I would look at a pal's midi system. Imagine my horror when he produced a Crown CDK2300! The problem was poor sound. I diagnosed a faulty volume control, and confirmed that the mains transformer was of the crazy design the inscrutable fellow in a far off land had specified. My initial response was to refuse to touch it, but I was persuaded to try to do something.

I was not prepared to repair it with that transformer still fitted. But, if I fitted a transformer from some other manufacturer's midi system, would I be on dodgy ground if anything went wrong? What to do? I knew that there was a new Crown importer. Perhaps they could help? It took many phone calls before I located the correct people. They were very helpful but had not been the importers for long and had yet to get their spares sorted out. A current model (CDK193R) seemed to correspond with the midi system in my workshop, and in due course the service manager rang to tell me that this had a transformer that provided the correct output voltages (thanks Wilf). They were eventually able to send me one. The original transformer, marked CDK23B, is still stocked by HRS. The one I bought from Independent Services Ltd of Ellesmere Port, for Model CDK193R, is part no. EP50-101-570068-4C. After fitting this transformer and a volume control from HRS a satisfactory repair was achieved.

An Alba CD1010

An Alba CD1010, also made in China, was brought in a few days later. "I don't know what's the problem with

this one" said John, "but the drawer flies open, the sled moves to the outside of the disc and makes a noise like a machine gun, and the laser's lens leans over to one side as if it's drunk. I'll leave it with you and give you a call later." I suggested calling him, to put off the moment of truth.

It seemed obvious that this was going to be another power supply problem. So I connected my meter's black lead to a main PCB test point marked 0V, then checked the d.c. voltages at the power supply connector. Instead of +12V and –12V supplies there were excessive negative voltages. When I pulled the connector off I found that both voltages were still present! Strange, I thought. I decided to remove and examine the main PCB.

More problems. No chips hanging on in their death throws this time, but a series of lengths of burnt-off print. This was earth line print from the centre pin of the power supply connector. It follows a tortuous path around the board. I checked along it until I came to a diode where the damage ceased. I sat back and mused. We get these little safety resistors that go open-circuit for no apparent reason all over the place. But when there's a real need for one the inscrutable designer in China doesn't bother to fit it.

Time for a quick bodge with some jumper wires and a search for the obviously short-circuited cause of the trouble. I won't bore you with a tedious account of the search, just provide a list of the initial toll of damaged parts: D104 (7·5V zener diode), D114 (1N4148), IC110 (7805), IC112 (79L06), Q115 (2SA608), Q101 (2SC2458), Q107 (a DTC124 digital transistor), the LA6520 sled driver chip and R243 (22Ω). These items are all on the main panel. Q06 (2SD1384) and both 500mAT fuses on the power supply subpanel were also faulty.

After replacing these items the voltage on the negative side of the supply was correct, but there was only about 2V on the positive side. Checks along the positive rail were obviously called for. I arrived at pin 23 (Vcc+) of the LA9200 chip and disconnected it from the board. This reinstated the full supply voltage. The next move was to replace this chip with a known good one from my junk box. I used the celebrated leg lifter (see earlier article), some Philips desoldering braid and the big Weller gun to carry out the repair.

Time to try the player again. No luck. The laser lit (continuously) but there was no sled motion or focus search, and the display remained unilluminated. Definitely give in time now, as there was no chance of the job making a profit. Ring John and suggest he tells his customer that I wish to file it in the bin, where much of this Chinese junk belongs. . .

A Couple More

Shortly after the above episode a chap arrived in a BMW, clutching two CD players. The first was a Sony CDPM29, which required a new drawer drive belt and the cheaper KSS210 laser unit from CPC. The second was an Alba CD1010.

I opened the latter up and looked, fearfully, at the underside of the main PCB. To my surprise all was well. After replacing the two fuses on the power supply subpanel the machine worked satisfactorily. I noticed that the fuses, though both of the correct type, were clearly from different sources. So there'd been a previous failure. What had it been, and how long would my replacements last? I can report that the machine hasn't bounced yet, but to be fair I should add that it was collected only about two hours ago. . .

Converting the Amstrad SRD510

for Astra 1D Reception

P. Haylor, G6DRN

This little modification was discovered one afternoon while there was a lull in the workload and an old workshop SRD510 was found lurking on a shelf, looking sorry for itself.

Since Sky Gold was moved to ch. 60, many people have discovered to their cost that their equipment will not receive this and many other programmes. The first phone call usually begins with "why can't I get this programme now? I've spent the whole b****y morning and I still can't f***ing find it!!" – why customers must swear to you on the phone is still a mystery to me. So you start to explain about 1D, which only makes them more irate. They've usually missed the special offer from Sky for a low-price ADX, and when you tell them the cost they moan like mad.

As I specialise in repairs, spares and replacement receivers, it would be to my advantage if the receivers I sold were all able to receive the 1D channels. So this is the result of my experiments.

Procedure

Make sure that the receiver is working fully before making the following alterations. On checking with the service manual for the SRD510 I found that there's a link, marked LK1, which is not fitted. It's right next to the main chip IC5, just in front of pin 40 and before C87 (see Fig. 1). Remove the PCB carefully, then add this link. When you reassemble and test the receiver, on going into the menu mode you will notice a few additions. The SIS now works, and there's the addition that you require, the dish A/B setting. When this setting is changed the voltage at pin 14 of the decoder scart connector is switched on or off. With this information, you can carry out the rest of the conversion.

Obtain a Global ADX Plus converter and remove the plastic case. Turn the receiver around so that its back is facing you (see Fig. 2). From the top left-hand corner measure 75mm across and mark. Then from the top measure 15mm down. Mark the case so that a hole can be drilled at this point. Draw another line 20mm to the right of the first one, again 15mm down from the top, for a second hole. Drill these two holes – both 3/8th inch. If you have measured them out correctly, the ADX converter can be fitted from the inside with the lead at the left of the converter (viewed from the rear of the receiver). Cut away any plastic lugs so that the converter sits straight. Fix the converter to the case with two nuts and washers (I obtain these from F connectors).

The converter should now be installed just below the receiver's lid line, with the small switch and the LED facing the front of the cabinet. If all's well, the lead can be soldered to pin 14 of the decoder socket, on the inside: alternatively pass it through the case and push it into the socket. This assumes that the socket is not being used for an external decoder.

Make up a 15cm long satellite coaxial cable lead with F connectors at each end. Connect one end to the receiver's F connector and the other end to the converter's left-hand F connector (viewed from the rear of the receiver). Connect the feed from the dish, then switch on. The converter's switch should be in the left-hand position when viewed from the front of the receiver. The original programmes should still be there. If so proceed, if not recheck!

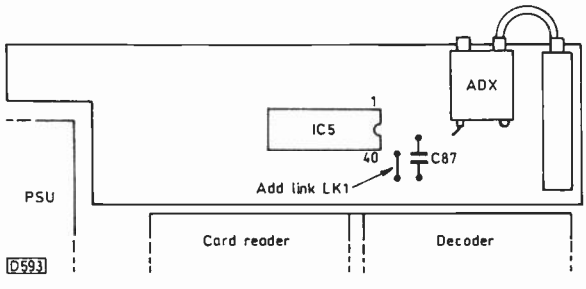


Fig. 1: Position of link LK1, which has to be added, and the ADX converter when installed at the rear of the receiver.

Tuning

If you are still using a 10GHz LNB, try it – it may work, saving the need to spend out on a 9·75GHz one.

Tune in Sky News (11·376GHz vertical). Go to dish selection on the menu and change to B. The converter's light should come on and Sky Gold should be present. If so, and there's a good picture, the only thing still to be done is to replace the case. You may then like to try the other 1D channels.

If you cannot get a good picture with the existing LNB, a 9·75GHz one will have to be obtained and fitted. You will also have to operate the small hidden switch in the converter and retune the programmes 250MHz higher, except for the following:

UK Gold	11·303 H
Movie ch	11·229 V
Disney	11·347 V
Sky Sport	11·259 V
VH-1	11·288 V
CMT	11·318 V
CNN	11·377 V
TV3	11·362 H
TV3	11·421 H
1 Plus	11·244 H
DSF	11·273 H
N3	11·332 H
NTV	11·391 H
Premiere	11·241 H
Cinemania	11·406 V
Documania	11·436 V

These channels are programmed to the frequencies above, and the 'chan' setting on the menu is set to B.

In Conclusion

This has made the SRD510 1D compatible – if you don't mind the tuning!

If you are not one hundred per cent sure what you are doing, don't try any of this – there are mains voltages in the power supply, and these need to be treated with respect.

To ensure reliability I would advise upgrading the SRD510's power supply. This has been described in the magazine before (see page 346, March 1995 for example). Also earth the ADX converter to the main chassis with a wire.

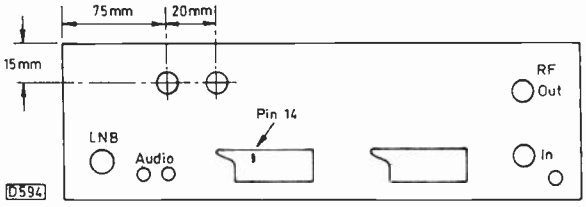


Fig. 2: Positions of the holes that have to be drilled in the back panel to mount the converter inside the receiver's case.

This modification may work with the SRD520 as well, but I've not tried it.

HELP WANTED

The Help Wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department – do not write to or phone the advertisement department about this feature.

Wanted: Teletext panel for the Sony Model KV2256UB. Also i.c. type TDA2800. R.M. Webb, 78 Station Road, Rolleston, Burton-on-Trent DE13 9AB. 01283 814 582.

Wanted: Relay type TV5 and zener diode type ZTE2V4 (D17) for the Ferguson Model 22D2 (TX100 chassis). V. Jeremy, 7 Tai Penyard, Penyard, Methyr Tydfil CF47 0LP.

Wanted: Circuit diagram (photocopy would do) for the Hinari HT-5T1 CTV. J. Naughton, c/o Domestic Electronic Repair Services, 40 Gala Crescent, Wishaw ML2 7JR.

Wanted: For the Philips VR6462 VCR, left and right gear wheels (item 294), part no. 4822-522-31833, or a complete deck in working order. J. Whittle, 51 Amberley Drive, Bognor Regis, Sussex PO21 5NP. 01243 828 765.

Wanted: LOPT (numbers 4206MSH1FAP32 or MHF028-17-4101-4-100 on the case) and circuit diagram for the Videoport Model VCP36 video player/TV with Ferguson type top-loading video that ejects at the right-hand side of the unit. Contact Mike on 01244 537 198 or 01244 815 718.

Wanted/for disposal: LOPT wanted for the NEC Model 14T412SB. Have for disposal *Television* magazines 1980-1990 and some earlier ones. Offers please. B. Weston, 8 Llainwen, Tynygongl, Anglesey, Gwynedd LL74 8SD. 01248 852 950.

Wanted: Liquid crystal display for the Altai DD6010 digital multimeter. S.J. Riley, 201 Piperknowle Road, Hardwick, Stockton on Tees, Cleveland TS19 8JG. 01642 606 091.

Wanted/for disposal: Operating instructions (photocopy would do) wanted for the Xerox 7010 fax machine/telecopier; also parts for or a scrap Xerox 1020 photocopier. Have for disposal, boxed and unused, a Leader LCG396 pattern generator (NTSC system). Any offers? Ian Harrison, 321 Old London Road, Hastings, East Sussex TN35 5BD. 01424 435 462.

Wanted: Circuit diagram for the Technics stereo amplifier Model SU8080. G. Cannon, 16 St Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 01912 620 712.

Wanted: Complete drum motor assembly for the Fisher FVH-P716 VCR. Also a Sony power supply module, CD-09-520305 (part no. 1-464-217-11) as used in the SLC9UB. I. Mackintosh, 7 Wellington Court, Treardour Bay, Holyhead LL65 2LJ. 01407 860 864.

Wanted: Information on a 'Duke box', make NSM, Model CITY ES 160 ST. R.H. Lees, 58 Coxithill Road, St. Ninians, Stirling FK7 9HY. 01786 479 931.

Wanted: Manual or circuit diagram (photocopy will do) for the Osaki Explorer Model P10R. Also IC402 for this set – there is no type or part no stamped on it. Don Aird, 29 Leachkin Avenue, Inverness IV3 6LH. 01463 233 441 or fax 01463 243 224. I can provide copies of almost any *Trader* service sheet from the mid-Thirties to the early Seventies.

Wanted: HA11741 (7F3) servo motor controller or PCB for the Osaki VCR31. Also service data for the Ferguson 3V29 and Saisho CT142R. Could stat and return. Dennis Bowman, 52 Tomlin Avenue, Mirehouse, Whitehaven, Cumbria CA28 8BS. 01946 590 940.

Wanted: Help with a Matsui 1455. It's o.k. with an input of 100V: anything higher and the 125V h.t. leaps to 300V. Has anyone any information on the Philips Viewtext (viewdata) system? Jack McDonald, Mews Cottage, Pond Lane, Clanfield, Waterlooville, Hants PO8 0RG. 01705 596 058.

Wanted: Circuit diagram (photocopy would do) for the Toshiba Model 145E7B. R.S. Emmett, 124 Heol Dulais, Birch Grove, Swansea, Glamorgan SA7 9LW. 01792 323 090.

For disposal: Early Murphy colour set with four tuning buttons on top and a blue cabinet, also various TV/video boards/chassis. Peter Shoreland, 5 Russell Way, Winnersh, Reading, Berks RG41 5SN. 01734 789 579.

Wanted: Circuit diagram for the Combi-99 decoder. Ron Bromley, 208 Canterbury Road, Leyton, London E10 6EH. 0181 556 4627.

Wanted: Set of field driver and output transistors for the Philips K12 chassis – BD291, BD292, BD327, BC337. A.S. Tagone, 210 Rochester Road, Chalk, Gravesend, Kent DA12 4TY. 0141 355 357.

Wanted: Back copies of *Television*, 1980-1992. Justin Smith, ATV, 4 Shenstone Road, Hillsborough, Sheffield S6 1SQ. 01142 854 254.

Wanted: Manual/circuit for the Samsung BT309K mono portable and the Philips CTX-E chassis (20in.). Also a suitable rotary tuner for the BT309K. Michael J. Levy, 19 Totternhoe Close, Kenton, Harrow, Middx HA3 0HS. 0181 907 3620.

Wanted: Encapsulated transformer or complete PSU panel for the Infotec 6155 fax machine. The transformer is marked HIT8702, N6016562, Lot no. F880802, Ricoh, Japan. Also any information of the Sony KTX9100UB Viewdata terminal with a view to conversion to RGB/composite video inputs. Andie Wilkes, 34 Tideswell Road, Great Barr, Birmingham B42 2DT. 01926 404 935 (day), 01216 050 720 (evenings).

SURVEILLANCE TELESCOPE Superb Russian zoom telescope adjustable from 15x to 60x! complete with metal tripod (imposible to use without this on the higher settings) 66mm lense, leather carrying case £149 ref BAR69

RADIATION DETECTOR SYSTEM Designed to be wall mounted and connected into a PC, ideal for remote monitoring, whole building coverage etc. Complete with detector, cable and software. £19.95 ref BAR75

WIRELESS VIDEO BUG KIT Transmits video and audio signals from a minature CCTV camera (included) to any standard television! All the components including a PP3 battery will fit into a cigarette packet with the lens requiring a hole about 3mm diameter. Supplied with telescopic aerial but a piece of wire about 4" long will still give a range of up to 100 metres. A single PP3 will probably give less than 1 hours use. **£99** REF EP79. (probably not licensable!)

CCTV CAMERA MODULES 46X70X29mm, 30 grams, 12v 100mA. auto electronic shutter, 3.6mm F2 lens, CCIR, 512x492 pixels, video output is 1v p-p (75 ohm) Works directly into a scart or video input on a tv or video. IR sensitive. £79 95 ref EF137.

IR LAMP KIT Suitable for the above camera enables the camera to be used in total darkness! £5 99 ref EF138.

TANDATA TD1400 VIEWDATA Complete system comprising modem, infra red remote keyboard, psu, UHF and RGB output, phone lead, RS232 output, composite output. £9.95 ref BAR33.

MAGNETIC CARD READERS (Swipes) £9.95 Cased with flyleads, designed to read standard credit cards! they have 3 wires coming out of the head so they may wnte as well? complete with control elctronics PCB. just £9.95 ref BAR31

PANORAMIC CAMERA OFFER Takes double width photographs using standard 35mm film Use in honzontal or vertical mode. Complete with strap £7.99 ref BAR1

COIN OPERATED TIMER KIT Complete with coinslot mechanism, adjustable time delay, relay output, put a coinsiot on anything you like! TV,s, videos, fridges, dnnks cupboards, HIFI, takes 50p's and £1 coins DC operated, price just £7.99 ref BAR27

ZENITH 900 X MAGNIFICATION MICROSCOPE Zoom, metal construction, built in light, shrimp farm, group viewing screen, lots of accessories. £29 ref ANAYLT.

LUBITEL 166U Twin lens Russian 2 1/4" sq reflex camera supplied with two free rolls of colour film, flip up magnifier, 3 element f 4.5 lens. £19.99 ref BAR36.

AA NICAD PACK Pack of 4 tagged AA nicads £2.99 ref BAR34

PLASMA SCREENS 222x310mm, no data hence £4.99 ref BAR67

NIGHTSIGHTS Model TZS4 with infra red illuminator, views up to 75 metres in full darkness in infrared mode, 150m range, 45mm lens, 13 deg angle of view, focussing range 1.5m to infinity. 2 AA batteries required. 950g weight. £210 ref BAR61. 1 years warranty

FILIN-1 150m range, 15 deg angle of view, focusing 10m-infinity, £179 ref BAR62 A separate infra red light is available at £30 ref BAR63.

WHITE NIGHT SIGHTS Excellent professional night sight, small, hand held with camoflaged carrying case £325. 1 years warranty.

MEGA AIR MOVERS 375 cubic feet per min!, 240v 200 watt, 2,800 rpm, reversable, 7"x7" UK made, new, Aluminium, current list pnce about £180 ours? £29.95 ref BAR35.

LIQUID CRYSTAL DISPLAYS Bargain prices,
16 character 2 line, 65x14mm £1.99 ref SM1612A
16 character 2 line, 99x24mm £2.99 ref SM1623A
20 character 2 line, 83x19mm £3.99 ref SM2020A
16 character 4 line, 62x25mm £5.99 ref SMC1640A

TAL-1 110MM NEWTONIAN REFLECTOR TELESCOPE Russian. Superb astronomical 'scope, everything you need for some senous star gazing! up to 169x magnification. Send or fax for further details £249 ref TAL-1

GOT AN EXPENSIVE BIKE? You need one of our bottle alarms, they look like a standard water bottle, but open the top, insert a key to activate a motion sensor alarm built inside. Fits all standard bottle carriers, supplied with two keys. **SALE PRICE £7.99** REF SA32.

GOT AN EXPENSIVE ANYTHING? You need one of our cased vibration alarms, keyswitch operated, fully cased just fit it to anything from videos to caravans, provides a years protection from 1 PP3 battery, UK made. **SALE PRICE £4.99** REF SA33

DAMAGED ANSWER PHONES These are probably beyond repair so just £4 99 each. BT response 200 machines. REF SA30.

COMMODORE GAMES CONSOLES Just a few of these left to clear at £5 ref SA31. Condition unknown.

COMPUTER DISC CLEAROUT We are left with a lot of software packs that need clearing so we are selling at disc value only! 50 discs for £4, thats just 8p each!!(our choice of discs) **£4** ref EP66

IBM PS2 MODEL 160Z CASE AND POWER SUPPLY Complete with fan etc and 200 watt power supply. **£9.95** ref EP67

DELL PC POWER SUPPLIES 145 watt, +5,-5,+12,-12, 150x150x85mm complete with switch, flyleads and IEC socket. **SALE PRICE £9.99** ref EP55

1.44 DISC DRIVES Standard PC 3.5" drives but returns so they will need attention **SALE PRICE £4.99** ref EP68

1.2 DISC DRIVES Standard 5.25" drives but returns so they will need attention **SALE PRICE £4.99** ref EP69

PP3 NICADS Unused but some storage marks. £4.99 ref EP52

DELL PC POWER SUPPLIES (Customer returns) Standard PC psu's complete with fly leads, case and fan, pack of two psus **SALE PRICE £5 FOR TWO!!** ref EP61

GAS HOBS AND OVENS Brand new gas appliances, perfect for small flats etc. Basic 3 burner hob **SALE PRICE £24.99** ref EP72. Basic small built in oven **SALE PRICE £79** ref EP73

BITS AND BOBS We have a quantity of cased modems, multiplexers etc different specs but ideal strippers **£4** each ref EP63

RED EYE SECURITY PROTECTOR 1,000 watt outdoor PIR switch **SALE PRICE £9.99** ref EP57

ENERGY BANK KIT 100 6"x6" 6v 100mA panels, 100 diodes, connection details etc. £69.95 ref EF112.

PASTEL ACCOUNTS SOFTWARE, does everything for all sizes of businesses, includes wordprocessor, report writer, windowing, networkable up to 10 stations, multiple cash books etc. 200 page comprehensive manual. 90 days free technical support (0345-326009 try before you buy!) **Current retail price is £129, SALE PRICE** £9.95 ref SA12. SAVE £120!!!

WOLVERHAMPTON BRANCH NOW OPEN AT WORCESTER ST W'HAMPTON TEL 01902 22039

MINI MICRO FANS 12V 1.5" sq **SALE PRICE £2.** Ref SA13.

REUSEABLE HEAT PACKS. Ideal for fishermen, outdoor enthusiasts elderly or infirm, warming food, drinks etc, defrosting pipes etc.reuseable up to 10 times, lasts for up to 8 hours per go, 2,000wh energy, gets up to 90 degC. **SALE PRICE £9.95** REF SA29

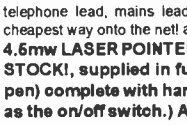
12V 2AMP LAPTOP psu's 110x55x40mm (includes standard IEC socket) and 2m lead with plug. 100-240v IP **£6.99** REF SA15.

PC CONTROLLED 4 CHANNEL TIMER Control (on/off times etc) up to 4 items (8A 240v each) with this kit. Complete with Software, relays, PCB etc. £25.99 Ref 95/26

COMPLETE PC 300 WATT UPS SYSTEM Top of the range UPS system providing protection for your computer system and valuable software against mains power fluctuations and cuts. New and boxed, UK made Provides up to 5 mins running time in the event of complete power failure to allow you to run your system down correctly. **SALE PRICE just £89.00.**

SOLAR PATH LIGHTS Low energy walklights powered by the sun! built in PIR so they work when you walk past. Includes solar panel & rechargeable bat. **SALE PRICE £19.95** REF EP62

BIG BROTHER PSU Cased PSU, 6v 2A output, 2m o/p lead, 1.5m input lead, UK made, 220v. **SALE PRICE £4.99** REF EP7



Check out our WEB SITE

http://www.pavilion.co.uk/bull-electrical

RACAL MODEM BONANZA! 1 Racal MPS 1223 1200/75 modem, telephone lead, mains lead, manual and comms software, the cheapest way onto the net! all this for just £13 ref DEC13.

4.5mw LASER POINTER. BRAND NEW MODEL NOW IN STOCK!, supplied in fully built form (looks like a nice pen) complete with handy pocket clip (which also acts as the on/off switch.) About 50 metres range! Runs on 2 AAA batteries. Produces thin red beam ideal for levels, gun sights, experiments etc. just £39.95 ref DEC49 TRADE PRICE £28 MIN 10 PIECES

BULL TENS UNIT Fully built and tested TENS (Transcutaneous Electrical Nerve Stimulation) unit, complete with electrodes and full Instructions TENS is used for the relief of pain etc in up to 70% of sufferers. Drug free pain relief, safe and easy to use, can be used in conjunction with analgesics etc. £49 Ref TEN/1

COMPUTER RS232 TERMINALS. (LIBERTY) Excellent quality modern units,(like wyse 50,s) 2xRS232, 20 function keys, 50 thro to 38,400 baud, menu driven port, screen, cursor, and keyboard setup menus (18 menu's). £29 REF NOV4.

RUSSIAN MONOCULARS Amazing 20 times magnification, coated lenses, carrying case and shoulder strap £29 95 REF BAR73

PC PAL VGA TO TV CONVERTER Converts a colour TV into a basic VGA screen. Complete with built in psu, lead and s/ware . Ideal for laptops or a cheap upgrade. Supplied in kit form for home assembly. **SALE PRICE £25** REF SA34

EMERGENCY LIGHTING UNIT Complete unit with 2 double bulb floodlights, built in charger and auto switch. Fully cased. 6v 8AH lead acid req'd. (secondhand) £4 ref MAG4P11.

SWINGFIRE GUIDED MISSILE WIRE. 4,200 metre reel of ultra thin 4 core insulated cable, 28lbs breaking strain, less than 1mm thick! Ideal alarms, intercoms, dolls house's etc. **£13.99** ref EP51

ELECTRIC CAR WINDOW DE-ICERS Complete with cable, plug etc **SALE PRICE JUST £4.99** REF SA28

ASTEC SWITCHED MODE PSU BM41012 Gives +5 @ 3.75A, +12@1.5A, -12@.4A. 230/110, cased, BM41012. £5.99 ref AUG6P3.

AUTO SUNCHARGER 155x300mm solar panel with diode and 3 metre lead fitted with a cigar plug. 12v 2watt. **£8.99** REF SA25.

TOP QUALITY CENTRIFUGAL MAINS MOTORS SALE PRICE2 FOR JUST £2.50 REF SA38

ECLATRON FLASH TUBE As used in police car flashing lights etc, full spec supplied, 60-100 flashes a min. **£6.99** REF SA15.

24v AC 96WATT Cased power supply. New. £9.99 REF SA40

MILITARY SPEC GEIGER COUNTERS Unused and straight from Her majesty's forces. **SALE PRICE £44** REF SA16

MICRODRIVE STRIPPERS Small cased tape drives ideal for stripping, lots of useful goodies including a smart case, and lots of components. **SALE PRICE JUST £4.99 FOR FIVE** REF SA26

SOLAR POWER LAB SPECIAL You get TWO 6"x6" 6v 130mA solar cells, 4 LED's, wire, buzzer, switch plus 1 relay or motor. Superb value kit **SALE PRICE JUST £4.99** REF SA27

RGB/CGA/EGA/TTL COLOUR MONITORS 12" in good condition. Back anodised metal case. **SALE PRICE £49** REF SA16

PLUG IN ACORN PSU 19v AC 14w , £2.99 REF MAG3P10

POWER SUPPLY fully cased with mains and o/p leads 17v DC 900mA output. Bargain price £5.99 ref MAG6P9

ACORN ARCHIMEDES PSU +5v @ 4.4A. on/off sw uncased, selectable mains input, 145x100x45mm **£3.99** REF MAG7P2

13.8V 1.9A PSU cased with leads. Just £9.99 REF MAG10P3

200 WATT INVERTER Converts 10-15v DC into either 110v or 240v AC. Fully cased 115x36x156mm, complete with heavy duty power lead, cigar plug, AC outlet socket. Auto overload shutdown. auto short circuit shut down, auto input over voltage shutdown, auto input under voltage shut down (with audible alarm), auto temp control, unit shuts down if overheated and sounds audible alarm. Fused reversed polarity protected. output frequency within 2%, voltage within 10%. A well built unit at an keen price. Just £64.99 ref AUG65.

UNIVERSAL SPEED CONTROLLER KIT Designed by us for the C5 motor but ok for any 12v motor up to 30A. Complete with PCB etc. A heat sink may be required. £17.00 **REF: MAG17**

COMPUTER COMMUNICATIONS PACK Kit contains 100m of 6 core cable, 100 cable clips, 2 line drivers with RS232 interfaces and all connectors etc. Ideal low cost method of communicating between PC's over a long distance. Complete kit £8.99.

VIEWDATA SYSTEMS made by Phillips, complete with internal 1200/75 modem, keyboard, psu etc RGB and composite outputs, menu driven, autodialler etc. **SALE PRICE £12.99** REF SA18

AIR RIFLES .22 As used by the Chinese army for training puposes, so there is a lot about! £39.95 Ref EF78. 500 pellets £4.50 ref EF80.

PLUG IN POWER SUPPLY SALE FROM £1.50 Plugs in to 13A socket with output lead. three types available, 9vdc 150mA £1.50 ref SA19, 9vdc 200mA £2.00 ref SA20, 6.5vdc 500mA £2 ref SA21.

VIDEO SENDER UNIT. Transmits both audio and video signals from either a video camera, video recorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel) 12v DC op. Pnce is £15 **REF: MAG15** 12v psu is £5 extra **REF: MAG5P2**

***FM CORDLESS MICROPHONE** Small hand held unit with a 500' range! 2 transmit power levels. Reqs PP3 9v battery. Tuneable to any FM receiver. Price is £15 **REF: MAG15P1**

***MINATURE RADIO TRANSCEIVERS** A pair of walkie talkies with a range up to 2 km in open country. Units measure 22x52x155mm. Including cases and earp'ces. 2xPP3 req'd. £30.00 pr. **REF: MAG30**

***FM TRANSMITTER KIT** housed in a standard working 13A adapter!! the bug runs directly off the mains so lasts forever! why pay £700? or price is £15 REF: EF62 (kit) Transmits to any FM radio.

***FM BUG BUILT AND TESTED** superior design to kit. Supplied to detective agencies. 9v battery req'd. £14 REF: MAG14

TALKING COINBOX STRIPPER COMPLETE WITH COINSLOT MECHANISMS originally made to retail at £79 each, these units are designed to convert an ordinary phone into a payphone. The units have the locks missing and sometimes broken hinges. However they can be adapted for their original use or used for something else?? **SALE PRICE JUST £2.50** REF SA23

GAT AIR PISTOL PACK Complete with pistol, darts and pellets £12.95 Ref EF82B extra pellets (500) £4 50 ref EF80.

6"X12" AMORPHOUS SOLAR PANEL 12v 155x310mm 130mA. **SALE PRICE £4.99** REF SA24.

FIBRE OPTIC CABLE BUMPER PACK 10 metres for £4.99 ref MAG5P13 ideal for experimenters! 30 m for £12.99 ref MAG13P1

MIXED GOODIES BOX OF MIXED COMPONENTS WEIGHING 2 KILOS YOURS FOR JUST £6.99

4X28 TELESCOPIC SIGHTS Suitable for all air rifles, ground lenses, good light gathering properties. £19.95 ref R/7.

RATTLE BACKS Interesting things these, small piece of solid perspex like material that it you try to spin it on the desk it only spins one way! in fact if you spin it the 'wrong' way it stops of its own accord and go's back the other way! £1 99 ref GI/J01.

GYROSCOPES Remember these? well we have found a company that still manufactures these popular scientific toys, perfect gift or for educational use etc. £6 ref EP70

HYPOTHERMIA SPACE BLANKET 215x150cm aluminised foil blanket, reflects more than 90% of body heat. Also suitable for the construction of two way mirrors! £3.99 each ref O/L041.

LENSTATIC RANGER COMPASS Oil filled capsule, strong metal case, large luminous points. Sight line with magnifying viewer. 50mm dia, 86gm. £10.99 ref O/K604.

RECHARGE ORDINARY BATTERIES UP TO 10 TIMES! With the Battery Wizard! Uses the latest pulse wave charge system to charge all popular brands of ordinary batteries AAA, AA, C, D, four at a time! Led system shows when batteries are charged, automatically rejects unsuitable cells, complete with mains adaptor. BS approved. Price is £21 95 ref EP31.

TALKING WATCH Yes, it actually tells you the time at the press of a button. Also features a voice alarm that wakes you up and tells you what the time is! Lithium cell included. £7.99 ref EP26.

PHOTOGRAPHIC RADAR TRAPS CAN COST YOU YOUR LICENCE! The new multiband 2000 radar detector can prevent even the most responsible of drivers from losing their licence! Adjustable audible alarm with 8 flashing leds gives instant warning of radar zones. Detects X, K, and Ka bands. 3 mile range, 'over the hill' 'around bends' and 'rear trap facilities. micro size just 4.25"x2.5"x.75". Can pay for itself in just one day! £79.95 ref EP3.

SANYO NICAD PACKS 120mmx14mm 4.8v 270 maH suitable for cordless phones etc. Pack of 2 just £5 ref EP78.

3" DISCS As used on older Amstrad machines, Spectrum plus3's etc £3 each ref BAR400.

STEREO MICROSOPES BACK IN STOCK Russian, 200x complete with lenses, lights, filters etc etc very comprehensive microscope that would normally be around the £700 mark, our price is just £299 (full money back guarantee) full details in catalogue. Ref 95/300.

SOLAR POWERED CAR VENTILATOR Simply fits along the top of the glass in a side window and provides a constant supply of fresh air in hot sunny conditions! keeps your car cool in summer. £19.95 ref s/vent.

*SOME OF OUR PRODUCTS MAY BE UNLICENSABLE IN THE UK

BULL ELECTRICAL

250 PORTLAND ROAD, HOVE, SUSSEX. BN3 5QT. (ESTABLISHED 50 YEARS).

MAIL ORDER TERMS: CASH, PO OR CHEQUE WITH ORDER PLUS £3 P&P PLUS VAT.

PLEASE ALLOW 7-10 DAYS FOR DELIVERY PHONE ORDERS WELCOME (ACCESS, VISA, SWITCH, AMERICAN EXPRESS)

TEL: 01273 203500
FAX 01273 323077
E-mail bull@pavilion.co.uk

WE BUY SURPLUS STOCK FOR CASH

FREE CATALOGUE

100 PAGE CATALOGUE NOW AVAILABLE, 45P STAMP OR FREE WITH ORDER.

What a Life!

Donald Bullock recalls some of the troubles that beset him during the month

There had been thunder storms all day and the workshop was cold and damp. I'd just put my feet up and poured myself a smallish whisky when there was a frantic banging at the door. I went to answer it. My first mistake. It was Mr Snide.

"Hello Don. Got a bit of trouble with the old Philips telly. Can you open up the workshop?"

I nodded. My second mistake. Then we paddled off towards his car. As I did so he started to rub his back. "Got a bit of back trouble" he wheezed, "can you get it from the car?"

I struggled through a car full of old lumber, yanked the set out and took it back to the bench. Then he came out with his punch line.

"Do it if it comes to a tener or less."

For once I was too tired to straighten him out. Not that it mattered. I've been straightening out customers for over forty years. They're worse than ever now.

As he departed Greeneyes came in then started her vacuum cleaner up. That was all I needed. It crackled then emitted a cloud of dust and a nasty burning smell.

"Must have it" she said, yanking out the plug. I hate having to mess about with vacuum cleaners.

The mains lead was cooking where it had worn, as it enters the body of the cleaner. I had it done it no time. Then back to Mr Snide's set.

The Philips 2A, Part 1

When I opened it up there was a 2A chassis inside. I plugged it in and got a pattern of sparklers at the front right. On closer examination I saw that it was damp – and smelt of gin. Several chopper circuit components had been the sparklers I'd seen. "Up to ten quid, eh?" I mused.

When Mr Snide called first thing next morning I pushed the set back to him. "Try Snoddies" I said. "They like to do these. I can't manage it at the moment." Well, it was one way of dealing with the situation.

The Mighty Grundig

Then I looked about me and saw a huge white cabinet with a massive tube. I struggled to get it on to the bench. Another mistake.

It was a Grundig set fitted with the CUC4620 chassis. This has seven large subpanels connected to it and two more panels slotted into the front. With no circuit diagram, and realising that I'd be little better off if I did, I peered through its spaghetti junction of pretty wiring and wondered whether I had any whisky left. "Be a man" urged a little voice in my mind. "Who, me?" I answered as I looked at the card.

"Was plugged in and on standby in a thunder storm" it said. "The mains supply flicked off then back on and the set died. Only the green 'on' LED lights."

There was voltage across the mains rectifier's reservoir capacitor, but there were no chopper circuit output voltages. Maybe there was a short-circuit across one of the outputs. I checked the line output stage, to no avail. Then I noticed a wad of ceramic resistors and decided that it would be easier to check these than try to think. They were all o.k. Oh dear. I wished I had stayed at that local newspaper job all those years ago. But I didn't. Time to face up to the chopper circuit.

I checked the chopper transistor, which was o.k. Then I went on to check the rest of the components. Some time later I'd cleared everything except the TDA4601 chopper control chip IC631. I replaced it, counted the remaining stock, then reached for the variac and the waste bin.

I switched on gingerly and wound up the variac's output by degrees. Suddenly four thumps shook the room and a raster came up before I could dive for cover. I plugged in an aerial feed and breathed a sigh of relief. "That wasn't too bad, was it?" coaxed a fat, cross-eyed lady on the screen.

Richard's Colour Portable

As I boxed the Grundig set up I noticed that Richard Renton had sidled in. He was standing at the counter looking down.

"It's gone all red" he protested about the Toshiba 143R4BR portable he'd brought in. I looked at the door and off he went.

I plugged in the set which wasn't red, it was dead. But I don't mind working on this model. It's a tidy, well planned set. I went straight for R801, the 6·2Ω ceramic resistor in the power supply. It was open-circuit. When I replaced it the set, to my surprise, came on fully: it should have come on in standby. Then I noticed that my nice new 6·2Ω resistor was glowing like a hot poker.

The thing to check was the over-voltage protection diode D808, which was short-circuit. So I replaced it then turned to C813, a 47µF, 50V electrolytic capacitor that's connected to pin 2 of the STR50020 chopper regulator chip. You sometimes find that it has gone low in value, triggering such troubles. But it was all right this time.

I connected the set to the mains via the variac and wound up the input. At 100V the ammeter needle shot over and the over-voltage diode said goodbye. As I was fitting a replacement Richard Renton returned.

"Oh, Mr Butcher. . ." he began.

"Hang about" I replied.

I took out the STR50020 chip and found that it was short-circuit. After fitting a replacement I gingerly wound the set up again. This time it came on in standby. When I switched on there was a picture, but it was red. I noticed that the tube base was slightly askew.

"That's the fault" he volunteered as I pushed the base on properly. "Oh, you've cured it. Wasn't much, was it?"

Incidentally Toshiba is the only major manufacturer I know of that still gives technical help to non-dealers. What's more, the engineers are cheerful, polite and eager to help. They usually can, knowing their sets well. We don't sell new TVs now, but if we did we'd be after a Toshiba agency. We recommend the company's sets whenever a customer decides it's time to buy a new one.

An Amstrad CTV2210

Our next customer was Timothy Tapworth. He had an Amstrad

CTV2210 in his arms. "Oh no!" I cried. But I like Tim, so I decided to look at his set while he waited.

It was dead. Fuse F502, which lives – and dies – in the centre back of the chassis, was blackened. I took out the 2SC3156 chopper transistor for test, without much hope. But it was faulty, a new one restoring the set to life. The picture was excellent.

"Wonderful" shouted Tim, pulling out his wallet. "'S nothing" I said, "fifteen". He dropped a couple of coins on to his fivers. "Have a drink" he said.

He went off, leaving me happy. Then a dark cloud came along. It was Mr Snide, clutching his Philips telly, the one with the 2A chassis. I was unhappy again.

The Philips 2A, Part 2

"Did what you said Don. Took it to Snoddies. They've got a new engineer, a Mr Bathwater. He tried, but couldn't fix it. They said they'd put a lot of stuff in but it still blows the fuse at switch on. Charged me thirty five quid. When I complained the tall chap with the rotten teeth got nasty, so I paid. Will you have a go? Forget the ten quid bit."

I felt sorry for Snide this time, and curious about his set. So I offered to have a look at it. Sure enough Snoddies had dried out the chassis and replaced several components – the mains fuse, the line output transistor and a number of items on the primary side of the power supply, including the BUT11 chopper transistor, C2664 (1·5nF, 1kV) which often splits, transistors 7685 and 7686, the CNX62 optocoupler, all the diodes and a lot of resistors. Every other component had been unsoldered and tested, and the chopper transformer had been taken out. They'd then moved to the secondary side of the circuit, where the tale was similar.

I studied the chassis, looking for unintentional shorts or cracks, but couldn't find any. The soldering was awful and lumpy, and the print covered with old flux. So I got to work with solder braid, tidied up the soldering and cleaned off the flux. Then I studied the bench, swept the floor and thought about coffee. But I couldn't put it off any longer.

After fitting a new 2A fuse I started the set up gradually via the variac. The fuse blew almost immediately. I disconnected the load from the mains bridge rectifiers, leaving the reservoir capacitor C2659 connected. When I tried again the fuse remained intact and there was 300V across C2659. This cleared the input circuitry. I next set out to clear the line timebase by disconnecting the supply to it and loading the h.t. line with a 100W bulb. On my next try the lamp lit brightly for a split second then the fuse blew violently. I replaced the chopper transformer, but this made no difference. At any rate I'd established that the cause of the trouble was on the primary side of the circuit.

I decided to check the transistors first. They were all of the right type and good. Then I checked the diodes similarly. I turned to the capacitors, checking each one for leakage and capacitance value. I still couldn't find anything wrong.

Short of something really odd, this left only the resistors. Most were new, and none looked discoloured. But there was nothing for it but to check each one. I found the cause of the trouble when I got to R3666. It should have been 1·5Ω but was actually 15Ω! I studied it and realised what had happened. The replacement that had been fitted was colour coded brown, green, black, plus the tolerance band. It should have been brown and green plus the tolerance band. Fitting the correct value restored the set to perfect operation. An easy mistake to make, especially as a chap becomes increasingly disorientated by a tricky repair. For once I almost felt sorry for Snoddies. I also wondered how poor Mr Bathwater would fare in his new job.

Then I thought of the time I'd spent on Mr Snide's set, and wondered how much to charge him in the circumstances. Then I thought of me, and wondered how on earth I'd managed to become a TV repairman.

Variac Tip

Incidentally when I made up my variac I took a tip or two from Richard Pollock. I've mentioned him before – he's retired now and lives close by. He housed his in a wooden case, and included in series with it an old Ferguson 2A mechanical cutout (as used in the 3000 series chassis). This trips in the event of an overload. He also fitted amp and volt meters, so that he can monitor the voltage applied and the current consumption as the variac's setting is advanced. I wired mine up similarly.

The trouble with a chopper power supply is that it won't normally come to life until the variac's output has reached about 100V. The primary side of the circuit then starts up and, if there's a short-circuit on the secondary side, current is drawn suddenly and heavily. This is where the 2A cutout comes in. Often the cause of the trouble is in the primary side of the circuit however: in this case the variac can be very helpful.

VCR CLINIC

Reports from
Philip Blundell
Chris Watton
Nick Beer
Stephen Leatherbarrow
Eugene Trundle
Gerald Smith
Ronnie Boag
Richard Newman
John Edwards
Michael Maurice

Ferguson FV72

If the machine takes in a tape but the threading poles move only slightly then stop, suspect that the main cam has lost a tooth. The Ferguson part number is 20086520. **P.B.**

Grundig VS340

For intermittent or complete loss of the control track signals, check for dry-joints where the cables connect to the audio/control/erase head. **P.B.**

Mitsubishi HSB12

There was no play, and no counting in the fast-wind modes. A look at the deck showed that the tape wasn't being loaded correctly: the half-loading arm was jammed by the soft-brake arm on the take-up side, and as a result didn't take the tape around the audio/control head – hence no counter. The pad on the end of the soft-brake arm had fallen off, leaving the arm in the wrong place all the time. As the arm was o.k. and the pad was lying by the take-up reel disc we decided to stick it back on. The machine then worked perfectly. **C.W.**

Amstrad TVR3

The strange report with this VCR/TV set combination read "plays films in green though the TV pictures are all right". Sure enough, this was so. After some contemplation we decided to replace HIC101 (1812421), which restored normal colour in all modes. The CPC part code is AM152030. **C.W.**

Ferguson FV31

This machine carried out all functions except stop. Playback and record were fine, but when stop was selected the machine might carry out any function. It would sometimes switch off, and at other times perhaps go into reverse picture search. If a cassette was loaded and the machine was left in the stop mode, it might set off by itself after a while. A replacement HD614081S microcontroller chip cured the fault. We later learnt that the fault had started after a storm during which the power supply to the house had been struck. **C.W.**

Samsung SI1260

There were no deck functions. The usual cause of this is loss of the power supply to the motor and servo sections because D112 (1N4001) has failed. Experience has shown that to ensure reliability it's wise to replace D108, D109, D110 and D123 as well. They are all type 1N4001 and are on the main, not the power supply, panel. **C.W.**

General VGX520

This machine worked well in the E-E mode, but when playback was tried the colour was present for only about five seconds after which the picture became black-and-white. Call it intuition if you will, but I suspected the power supply and was rewarded when the colour returned for a few seconds after a shot of freezer on capacitors C1002 and C1003. Replacing these two 47µF capacitors restored good pictures in all modes, but as I was in the mood I decided to replace all the electrolytics on the board. Perhaps the machine will still be going in the next century! **C.W.**

Matsui VX2000Y

As these machines have no fast wind buttons you need the handset for servicing. This one came in without the handset. The faults were noisy fast winding and an intermittently wobbly playback picture. The fast wind groaning was caused by a noisy capstan motor. Dismantling it then cleaning and lubricating the bearing cured that – there was a huge amount of sticky mess in there. Back-tension arm oscillation was the cause of the wobbly playback. This was in turn caused by dirt on the tension band pad. Cleaning sufficed. **N.B.**

Sanyo VHR3100

This machine had been elsewhere. Its power and eject buttons didn't work. Everything else did – there's a power button on the remote control handset. But there was no remote eject.
The two buttons are on a separate PCB from the timer and all the other buttons. They share it with the tracking control, which worked. The cause of the problem was lack of an earth connection to the two switches: the print was intact, but the lead that should have earthed the area to the mechanism was loose inside the unit. It should have been screwed to the top of the cassette carriage. **N.B.**

Panasonic NVJ40/2/5/7/F55

No output is a very common problem with the handsets that come with these machines. The display lights up, the bar scanner works but there are no IR commands. The cause is simple: the IR output LED goes open-circuit or high resistance (causing poor range). Spares for the units are available, despite the absence of a list in most of the service manuals. The part number for the LED is SE303ACY: it costs about a pound. Being complex, replacement handsets are extremely expensive. So repair is by far the best idea. **N.B.**

Ferguson 3V57

This machine was completely dead: no functions, no clock, no nothing! When we measured the power supply outputs at CN3 we found that the unswitched 12V and 17V outputs were o.k. at pins 7 and 8. But there were no switched output voltages – pins 1 and 2 should be at 5V and 12V respectively. As a check, take pin 9 (labelled P CTL IN) of CN3 low: the switched voltages should then appear.

In this case they did. So over to the microcontroller board, where the 5V supply was missing at pin 32 of the chip. This is derived from the unswitched 12V rail via TR201 (BC337), which was open-circuit.

After replacing it the clock worked but the machine still wouldn't power

up when asked. Over next to the servo/MDA section, where IC607 (M50730-610SP) had no 5V supply at pin 52. This time Q602 (2SD638 – use a BC639) was open-circuit. The machine worked normally when this had been replaced.

The common denominator was the unswitched 12V supply, but a check on the components here proved fruitless. No further problems arose during the soak test. **S.L.**

Amstrad VCR9140

Intermittent mains fuse failure was the complaint with this recent machine. We failed to find any contributory cause. As its F200mA value seemed to be very low, we checked with Amstrad techical who told us that it has been uprated to T500mA. **S.L.**

Hitachi VTF770

A defective capstan motor is usually the cause of failure of the 1·6A delay fuse in the power supply at intervals varying from days to weeks. There may be other symptoms, perhaps a screech or roar during loading, eject or fast tape transport. **E.T.**

Goodmans GVR4500

Although these machines are relative strangers to us, we've recently had two with the same puzzling symptom: intermittent failure to load a tape, followed by reversion to the standby mode. In both cases we found that the loading motor spindle was turning inside the hollow worm shaft, which had cracked and thus loosened its grip on the spindle. **E.T.**

Akura VX140

This machine wouldn't accept tapes fully: they would go in partially then come back out again. The cassette flap releaser was missing. The cure was to replace the 'lift slide holder assembly'. **G.S.**

Nokia VR3615

The picture was intermittently too bright. On checking the video waveform at the input to the modulator I found that it was producing overmodulation. The cause of the fault was traced to a damaged solder pad at the bias feed resistor R189, which is connected to the video buffer transistor Q181. Normal operation was restored by repairing a small piece of print. **G.S.**

Samsung VIK326

This machine wouldn't tune in any channels: it searched for stations but wouldn't find any. When I checked the i.f. output from the tuner during search I found a reasonable signal as the tuner passed through the station, but there was no output from pin 13 of IC401. Replacing this chip cured the fault. **G.S.**

Panasonic NVG21

This machine was dead with no functions. When I checked the power supply outputs I found that the regulated 5V and 6V supplies were far too low. Replacing the STR5338 regulator chip restored normal operation. **G.S.**

Nokia VR3615

This machine wouldn't come out of standby and wouldn't accept tapes. At switch on the drum and capstan started but the loading motor didn't shuffle. The power supply outputs were all present and correct, but when a check was made at pin 8 (V ref) of the loading motor drive chip IC602 the reading was very low. It should be around 8V. Zener diode D607 was found to be virtually short-circuit, a replacement restoring normal operation. **G.S.**

Samsung VI375

This machine was dead with no clock and no functions. Checks in the power supply showed that IC101 (STR11006) was short-circuit, R101 open-circuit and ZD101 short-circuit. As ZD101 provides over-voltage protection, it seemed that the power supply outputs had gone high before these various items failed. The culprit was C110 (100µF) which had fallen in value to around 10µF. **G.S.**

Nokia VR3615

This machine wouldn't tune in any channels. When the tuner's VT input was checked during search a ripple was seen to be present – and the search wouldn't go below 12V. A check on the PWM output from the microcontroller chip showed that this was noisy, irregular and erratic. I then noticed the presence of discoloured manufacturer's flux in this area. After treating the area with PCB cleaner the machine worked normally. **G.S.**

Samsung VIK326

There were no functions with this machine, which wouldn't come out of standby. A check in the power supply showed that the ALL 5·8V supply wasn't being smoothed. Replacing C35 and C36 cured this smoothing problem, after which the machine worked normally. **G.S.**

Samsung SI3240

When the power button was pressed the channel number failed to light up and the machine wouldn't accept a tape. The cure is to replace the lift right-hand side and align the mechanism. **R.B.**

Sanyo VHR7250

At switch on this machine wouldn't accept a tape and the drum failed to turn. Checks in the power supply showed that the always 13V output was low. The cause was a dry-joint at D5107. **R.B.**

Nokia VR3761

This machine wouldn't come out of standby. When the switched power supplies were checked we found that there was no switched 5V output. Q5402 (2SC4484S) was found to be short-circuit base-to-emitter, a replacement restoring normal operation. **R.B.**

Panasonic NVFS100

There were snowy E-E and r.f.-r.f. outputs and no reel counter operation. Voltage checks at plug P1101 in the power supply showed that the non-switched 12V output at pin 1 was missing. Q1102 was found to be open-circuit base-to-emitter. **R.B.**

Nokia VR3783

There was a loud tone during playback and an intermittent tone was recorded. The cure was to refit the full erase head to the audio/control head PCB. **R.B.**

Sanyo VHR244

There was no record colour with this machine. A check on oscillator X1001 showed that it wasn't running. Replacing the crystal cured the fault. **R.B.**

Philips VR7225 Turbo

This machine's lift didn't work. Tests showed that the gear which operates the lift was slipping on its shaft. The assembly forms part of the worm gear on top of the deck, and is driven from the main cam. Order kit A and you get a worm gear plus cassette drive gear and main cam. Fitting these parts and retiming the lift in accordance with the instructions in the manual produced perfect results. **R.N.**

Philips VR6185

The customer had got a tape stuck in this machine. Instead of calling me first, he took the top off and used a knife to get the cassette out. When I looked at the machine the lift was lying loose inside together with the remains of lever arm 238. According to the customer there had been intermittent picture rolling for some time, then the machine had continuously ejected tapes. The problem tape got

stuck when he had physically blocked the cassette opening by holding the cassette down while the machine was trying to eject it. In spite of all this mistreatment, the rest of the mechanism seemed to be in reasonable order.

The cause of the rolling picture was a disintegrated pinch roller. After splitting the deck and fitting a replacement and a new lever arm, then reassembling everything, I found that the deck seemed to work when run with a d.c. supply to the loading motor. But when a tape was tried it was immediately ejected. The service mode indicated that there were no capstan pulses. As the capstan was turning, I decided to check the sensor. Once again the deck was split, and when the sensor panel was removed one of the sensor's leads was seen to be adrift. On putting this right and reassembling the deck I found that the machine now worked mechanically.

* = Philips VR6462

My problems were not over however, as the customer had fiddled with the sync head. In fact he'd tightened the screws to the extent that the base of the head was bent. I had to fit a new head and set it up.

So the original faults had been a worn pinch roller and a lead off the capstan sensor. What should have been a half-hour job had taken almost three hours. **R.N.**

Philips VR6462

The 330µF, 16V capacitors used extensively in this and other Philips VCRs seem to fail quite often, usually going short-circuit. The complaint I had with one machine that came in recently was no sound. C2007 on the audio panel had gone short-circuit. **R.N.**

Hitachi VT19

During playback the capstan would, after a while, gradually slow down, with slurred sound and cyclic tracking bars. The symptoms were similar to those produced by lack of control pulses because of a worn or dirty ACE head. Eventually the capstan would stop, followed by the tape unloading into the stop mode. In the fault condition there was a healthy 12V at one side of the posistor (PH1151 – 4R7) that supplies the capstan drive chip, but the voltage at the output side dropped rapidly. When it reached 4V the capstan stopped. The PTC was very hot to touch. Fortunately a replacement cured the fault. **J.E.**

Matsui VCP550

This machine is actually made by GoldStar, the same mechanism being used in that company's models, in particular the RC703I. The half-load arm can cause several faults. This particular machine failed to load the tape to the audio/control head and the capstan shaft. A previous engineer had thought that the capstan motor was faulty and had replaced it. The cause of the fault was much simpler: the half-load arm had gone out of mesh with the lever gear. Realignment put matters right. **M.M.**

Toshiba V213

The power and rewind buttons on the front of this machine didn't work, though these functions could be controlled by the remote control handset. I found that pins 1 and 3 of BK05 on the front panel PCB were bridged. Resoldering them cured the fault. **M.M.**

Logic VR955/Samsung VI710

This machine wouldn't record. Checks showed that there was no record 9V supply because Q110 was open-circuit. This was in turn caused by bias coil L504 having gone short-circuit. Replacing these items, also an idler and the pinch roller, restored correct operation of the machine. **M.M.**

JVC HRD830

The mechanism would jam when loading. On investigation we found that the brass shaft on which the control cam rotates had risen slightly. As a result the cam rose and jammed on the half-load gear. The solution is to push the shaft back down, using the back of a screwdriver. A click will often be heard as the shaft goes back into place. **M.M.**

Sharp VC750

This machine's mechanism kept jamming. The cause was the loading gears which were worn. They would jump a tooth, particularly when unlacing. As a result the back-tension arm fouled the movement of the supply guides. Fitting replacement gears cured the trouble. **M.M.**

Philips VR522

This machine was jammed. A field engineer had removed the tape, only to find that the entry guide had parted company with the load arm. Refitting was all that was necessary – a quick and easy repair for a change. **M.M.**

Sanyo VHR190E

A common fault with this Sanyo model and its clones is mechanism lock-up, i.e. intermittent failure to accept a tape. The cause is usually the mode switch, Sanyo part number 613 1100 374. Note that carriage replacement should be done in the down position. **M.M.**

Ferguson FV74L

A buzz on sound was the complaint with this machine – but only during playback of its own recordings. E-E and prerecorded tape playback were fine. The cause of the fault was that the recorded video level was too high: slight adjustment of the deviation control PV04 cured the buzz. **M.M.**

Matsui VX990

This old timer had two faults that initially appeared to be unrelated: there was loss of playback colour and wow and flutter on the sound. Investigation revealed that there was excessive ripple across C08 in the power supply. A replacement cured both symptoms. **M.M.**

B and O VHS63*

Playback with this Philips clone was marred by the fact that all vertical lines were affected by what appeared to be a hum bar. But it wasn't a hum bar: there were approximately six cycles per frame! Neither the f.m. envelope nor the video signal provided a clue, but a check on the drum motor's connection revealed massive spikes. The fault was cured by replacing the lower drum. **M.M.**

Ferguson FV32L

The reported fault was incorrect tracking. When we tested the machine we found that playback of its own recordings was poor. Replacement of the upper drum produced little improvement, but replacing the lower drum cured the fault. **M.M.**

Sanyo VHR350E

This machine had an intermittently low gain tuner. Fortunately all that was wrong was some dry-joints in the tuner can. We dealt with these then gave the machine a long soak test. This proved that the fault had been cured. **M.M.**

Panasonic NVL28

Intermittent failure to record or play and tape chewing were the complaints with this machine. On inspection I found that arm P5 was sticking on its post. It would sometimes fail to go into the fully eject position, thereby catching the tape. At other times it wouldn't pick up the tape and take it past the capstan shaft. Lubricating the shaft and arm cured the trouble. **M.M.**

SPECIAL OFFER £149.00 + vat TELEVISION Readers Only

Normally £199

ServiceBase

PROFESSIONAL SOFTWARE FOR THE SERVICE INDUSTRY

PC CONTROL SYSTEMS

Specifically designed for service companies new to computing

ServiceBase *Lite* *is easy to use, cost effective and fully upgradable*

It's good to know that if your business grows or changes direction your favourite computer software can keep pace. With a full upgrade path to the industry standard ServiceBase Professional suite of computer programs there really isn't much this powerful software can't supply.

Straight forward and simple to use **ServiceBase Lite** is the definitive answer to entry level computing whatever your current or future requirements.

3 Simple Steps to ServiceBase *Lite* ...

Step 1: Complete a data entry screen to record the customer & unit details then press a single key to produce a receipt.

Step 2: Enter the engineers screen to create and display the billing information. Write a description of the work carried out and append any spare parts used.

Step 3: A simple print routine will bring all the required information together to produce a professional looking invoice.

SYSTEM SPECIFICATION
486DX4-100 Computer - PCI Board - 256K Cache - 4MB RAM - Mini Tower
1 MB Video Card - 520MB Hard Disk Drive - 1.44 Floppy Disk Drive
14" SVGA Multisync Colour Monitor
Panasonic KX-P 1150 Dot-Matrix Printer

If it's software only then ServiceBase *Lite is the answer*

but if you are looking for a complete solution contact the ServiceBase...

ONE STOP SHOP

When you are ready to computerise your business speak to PC Control Systems. We will help you choose a computer system and if necessary a finance plan that best suits your requirements.

Our ***One Stop Team*** will deliver a pre-configured computer directly to your premises and spend a full day teaching your staff how to maximise its potential.

Interest Free Credit

Plan A 3 Year System Lease

Hardware Cost*	799.00
ServiceBase *Lite***	149.00
Full Day System Training	250.00
Total System Cost	1,198.00
Deposit	127.65
Followed By 11 Qtr. Payments of	127.65
Total Paid Over 3 Years	1,531.80
Amount of Interest	333.80
Equivalent Weekly Cost	**9.82**

*System specification as detailed above

Plan B 1 Year System Lease

Hardware Cost*	799.00
ServiceBase *Lite***	149.00
Full Day System Training	250.00
Total System Cost	1,198.00
Deposit 50% of Cost	599.00
Followed By 11 Monthly Payments of	54.45
Total Paid Over 1 Year	1,198.00
Amount of Interest	0.00
Equivalent Weekly Cost	**12.47**

**Upgrade To ServiceBase Pro Add £250

Plan C 1 Year Software Lease

ServiceBase Professional	399.00
Faults Database (78,000 Faults)	299.00
Full Day System Training	250.00
Total System Cost	948.00
Deposit 30% of Cost	284.40
Followed By 11 Monthly Payments of	60.32
Total Paid Over 1 Year	948.00
Amount of Interest	0.00
Equivalent Weekly Cost	**13.82**

All prices quoted are + vat at current rate

ServiceBase *Lite*

If you service consumer electronics you need to keep accurate records detailing:

- Customer Name & Address
- Booking Date
- Fault Description
- Unit Type, Make & Model
- Workshop Repair/Site Visit
- Parts List
- Invoicing Details
- Contact Instructions
- Method Of Payment

ServiceBase *Lite* will breeze through these functions in seconds printing job cards for engineers and invoices for customers.

ServiceBase Pro

Fully upgradable from *Lite* ServiceBase Professional is packed with features other programs only *"dream"* about

- Automatic Parts Ordering
- Full Stock Control
- Self Building Bill of Materials
- Field Call Diary
- IRIS Code Selection Tables
- Electronic Mailing
- Contacts Database
- Wants Database
- Enquiry Source Analysis
- Loan Unit Look-up Tables
- Report Generator
- On Board Word Processor
- Mail Merge Facility

ServiceBase will finally allow you to ***computerise In confidence...***

ServiceBase *Lite* Order Form

Name:

Company:

Address:

Post Code:

Tel:

Fax:

Please rush me a full copy of **ServiceBase *Lite*** at the special TELEVISION price of £149.00 +vat. I understand that I can claim a refund if I am not entirely satisfied within 14 days.

I enclose a cheque to the value of £175.08 made payable to:

PC Control Systems Limited

Please send me information on the full ServiceBase product array.

Other ServiceBase Products Include: ServiceBase Professional £399 - Retail Module £299 - Rental Module £299
Faults Database (empty) £99 - Faults Database (78,000 Faults) £299 - Manufacturers Warranty Module £299.00 - Network Prices on Application

PC CONTROL SYSTEMS LTD
HAMILTON HOUSE
66 PALMERSTON ROAD
NORTHAMPTON
NN1 5EX
TEL: 01604 601677
FAX: 01604 601676

Satellite Notebook

Satellite equipment servicing experiences related by Hugh Cocks

Lightning Damage

The winter storms have been causing us the usual problems. Here in Portugal the rain comes as either a full tropical downpour or nothing at all. Such downpours don't enhance satellite TV signals, and the mains supply starts to fluctuate. We try to encourage our customers to disconnect their equipment from the mains whenever this happens.

We had a call for help with a Pace SS9000 receiver one morning after a storm, the complaint being that the red light failed to appear. When we opened the receiver up we found that, as usual, the mains fuse was blackened. Checks showed that the chopper transistor and transformer were o.k. The culprit turned out to be the mains bridge rectifier's 47µF, 400V reservoir capacitor C7. It was dead short-circuit, though the diodes were all right. A replacement restored normal operation: nothing else in the house seemed to have been affected, though the storm was apparently very close by.

The man who brought in a damaged SS9200 one morning commented that "it smells of burning". Very true! R324 (4·7Ω) had totally disintegrated, leaving a black scar on the PCB. It lives behind Q2, on the front right-hand top side of the board and is part of the LNB supply. Replacement restored normal results, which was lucky. The rest of the equipment was not so fortunate however. Outside, a 2m fixed metal dish lives on an exposed hillside. It feeds two houses via around 50m of coaxial cable and two line amplifiers. The LNB and the line amplifiers had died, but the second receiver, which is a Connexions IRD, had survived.

As the owner wasn't keen on the idea of moving the dish we suggested a good earth from the mount to ground (it's fixed in concrete) and possibly fitting a well earthed metal pole higher than the dish and a little distance off to attract any strike away from the dish.

Both receivers had 2GHz tuners. So an Astra 1D LNB and a couple of 2GHz line amplifiers were fitted as replacements. All channels had to be retuned by 250MHz of course, which the owner was keen to do himself. In this situation we give customers a channel printout with the old and new frequencies – it saves on mental arithmetic if nothing else!

An Echostar SR1500

The owner of this receiver was a Swiss gentleman who had lost his Swiss radio international feed on the Kabel 1 channel (11·332GHz horizontal) since this had transferred back from Astra 1C to 1A – we don't receive the 1A horizontal channels here. Fortunately the feed is doubled on the Teleclub transponder via 1D (10·803GHz horizontal) and a 1D converter worked well.

This receiver has independent 13/17V polarisation switching and a magnetic polarotor output, the latter not being used here. Adding a 390Ω resistor across the polarotor output produced a smoothly varying voltage when the skew buttons were pressed. We connected the 1D converter's switching lead to the power polarotor terminal – the voltage swing was better here than at the upper one. The converter could then be switched in and out automatically, depending on the 'skew'. The latter is memorised on a per-channel basis.

While we were working on the receiver the picture started to come and go. It transpired that one terminal of the video gain preset VR101 had never been soldered properly.

Amstrad SRD600

A Norwegian customer rang us. He'd bought this receiver secondhand in Norway and wanted it to be installed with suitable dishes for Astra and Intelsat at 1°W (for the Norwegian channels). The receiver has Eurocrypt and VideoCrypt decoders and two card slots. A vaguely annoying feature is that if you tune in a VideoCrypt channel with Eurocrypt MAC cards in both slots "Your Card is Invalid" is displayed on the screen: the decoders look for their own type of card in the relevant slots.

After installing separate dishes I received good signals from both satellites (the receiver has two inputs, but requires a converter to cope with Astra 1D). But hard though I tried NRK in DMAC couldn't be decoded, though the Norwegian TV2 and TV3 were o.k. with their respective cards. A manual would have helped!

After a lot of fruitless effort I suddenly found that NRK would appear if it was tuned in on any of the receiver's last few channels (99 and down). These are easily reached by going below one on the remote control unit. In due course I obtained the instructions (in English, fortunately) but there was no reference to this.

The Pace MSS100

This model seems to have poorer sound sensitivity than previous Pace receivers: if the picture is at all weak, the sound quality deteriorates rapidly. Since most of the BBC radio channels are carried on UK Gold, this is a problem for us here in Portugal – from about 10 p.m. the UK Gold signal rapidly drops in strength, coming back by the morning. Astra 1B always seems to have had a bit of a 'wobble' – other 1B channels are similarly affected.

I noticed that in mono the 7·02 and 7·92MHz subcarriers are much better than those in between (7·38, 7·56 and 7·74MHz), which must mean that these are being degraded by the adjacent signals, the 7·02 and 7·92 carriers having a neighbour on only one side. So the bandwidth could be a little too wide. An inspection of the block diagram showed that the signal enters at pin 23 of U500 for audio demodulation using a phase-locked loop system. It occurred to me that the loop bandwidth might be a little wide, and that reducing the signal input at pin 23 might help.

Some experimentation showed that an 82pF capacitor to chassis (the best chassis connection is at pin 19) gives improved results, also good wider bandwidth Eutelsat audio with the other audio bandwidth settings. You start to get scratchy audio quality when the value is increased to 120pF or above.

Whilst on the subject of the MSS100, don't drop one! A customer managed to do this recently. The case and the PCB survived all right but the core of the chopper transformer cracked. In this state the receiver worked for about ten minutes then shut down. Cooling it down would give you another ten minutes' operation – together with a pattern on the picture and overheating rectifier diodes.

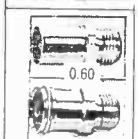
ELC EAST LONDON COMPONENTS
AUDIO TELEVISION VIDEO
COMPONENTS AT VERY KEEN PRICES
TEL: 0181-472 4871 FAX: 0181-503 5926

REMOTE CONTROLS FROM £7.99
IDLER TYRES 50p 1+, 25p 10+
VIDEO HEADS FROM £6.99
Over 200 models at very attractive prices.
AKAI, AMSTRAD, FERGUSON, FISHER, GOLDSTAR, HINARI, HITACHI, LOGI, MATSUI, ORION, PANASONIC, SAISHO, SHARP AND MANY MORE
VIDEO SPARES.

ASTRA D Converter £17.99

Satellite Finder Kit PG-753

VCR TOOL KIT



RF PLUG & SOCKET

VIDEO IDLERS, CLUTCHES
BELT KITS, PINCH ROLLERS
BACK UP BATTERIES, TV
SWITCHES, CD SPIN MOTORS
FAULT FINDING BOOKS
EQUIVALENT BOOKS
JAPANESE TRANSISTORS
RESONATORS, THERMISTORS

HITACHI TH902	£2.00
96009	£1.30
TRIPLERS UNIVERSAL	£4.99
WITH FOCUS	£7.99
CUC2410	£16.99
POWER SUPPLY MOD KITS	
FUNCTION SWITCH	85P

ELC EAST LONDON COMPONENTS
63 PLASHET GROVE, EAST HAM,
LONDON E6 1AD. TEL: 081-472 4871
two minutes walk from Upton Park Tube Station
VISIT OUR SHOP
OPEN MON-SAT 9AM-7PM
100's OF TOOLS, COMPONENTS, INSTRUMENTS, REPAIR KITS, BOOKS & CABLES TO CHOOSE FROM
ADD £1 P/P ADD 17.5% VAT
ALL GOODS DESPATCHED SAME DAY
PRICE SUBJECT TO CHANGE WITHOUT NOTICE
VISA ACCESS ACCEPTED. MIN ORDER £5.00

LINE OUTPUT TRANSFORMERS
OVER 100 MODELS AT LOW PRICES

AKAI		**MATSUI**	
CT2570E	19.99	1420	16.99
CT2870	19.99	1440B	16.99
ALBA		1450	16.99
CTV14RS	19.99	1465	19.99
AMSTRAD		1480A	16.99
CTV2200	14.99	**MITSUBISHI**	
CTV2210	14.99	CT2528ETX	16.99
TVR1/2/4	16.99	CT2839ETX	16.99
BUSH		**ORION**	
2020T	16.99	145X	16.99
2714	16.99	**PHILIPS**	
FIDELITY		KT3	13.99
ZX2000	14.50	KT4	16.99
ZX3000	12.99	KT30	16.99
FERGUSON		KT40	16.99
TX85/86	16.99	2A	16.99
TX90		3A	16.99
REDSPOT	16.99	CTX E/S	16.99
WHITE	14.99	CF1	16.99
TX98	19.99	NCR	16.99
TX99	16.99	GR1-AX	16.99
TX100		G90 AE	16.99
FST	16.99	**PANASONIC**	
BLUESPOT	16.99	TLF14520F	24.99
GREEN	14.99	TLF14521F	24.99
YELLOW	16.99	TLF14567F	24.99
GOLDSTAR		TLF14568F	24.99
CBT4282	16.99	TLF14584F	24.99
HINARI		TLF14586F	24.99
CT4/5	16.99	**SAISHO**	
CTV140	12.99	CT14R	16.99
HITACHI		CT141RB	16.99
CPT1446	16.99	**SALORA**	
CPT1455	16.99	21C60	16.99
CPT1476	16.99	25C51	16.99
CPT1493	16.99	**SANYO**	
CPT1646	16.99	CBP2146	29.99
CPT2028	16.99	CTP3246	29.99
CPT2036	16.99	CTP6262	29.99
CPT2048	16.99	CTP7130	45.00
CPT2078	16.99	CTP7132	45.00
CPT2084	16.99	CTP7135	45.00
CPT2087	16.99	**SENTRA**	
CPT2158	20.00	GX9000	16.99
CPT2174	16.99	GX9700	16.99
CPT2176	16.99	**SHARP**	
CPT2178	16.99	C1410S	29.99
CPT2238	16.99	C3700	39.99
CPT2248	16.99	CT2810S	29.99
CPT2278	16.99	**SOLAVOX**	
CPT2476	16.99	16R19	16.99
CPT2478	16.99	20R19	16.99
ITT		22R19	16.99
CT2613	16.99	26R08	16.99
CT3306	16.99	**SONY**	
CT3325	16.99	KV1442	16.99
CT3425	16.99	KV1882	16.99
CT3835	16.99	KV2052	16.99
ST3487	16.99	KV2066	16.99
ST35467	16.99	KV2096	16.99
TX2613	16.99	KV21XRTU	16.99
TX3327	16.99	KV2204	16.99
TX3447	16.99	KV2212	16.99
TX3835	16.99	KV2217	16.99
COM 80R	16.99	KV2704	16.99
COM 8	16.99	KV2705	16.99
DIGI 1-3	16.99	KV2752	16.99
MONOPRINT	16.99	KV2756	16.99
CVC25/32	9.99	**TATUNG**	
LOEWE OPTA		TN8422	19.99
ART 1	16.99	**TOSHIBA**	
CLASSIC 124	16.99	155T98Z	16.99
PROFESS 28	16.99	**ZANUSSI**	
STUDIO 1	16.99	20SM502	19.99
STUDIO S 28	16.99	22ST502	19.99
STUDIO T 28	16.99	26ZT511	19.99

AN3822K	7.99	LA7835	1.99	STK5730	6.00	TDA1510	3.50
AN5151	6.99	LA7836	3.00	STK6962	5.80	TDA1515	2.50
AN5435	2.50	LF005E	30.00	STK7216	7.00	TDA1516	4.00
AN5515	2.99	M491EB1	8.50	STK7226	8.50	TDA1518	4.00
AN5521	2.99	M4948T	8.50	STK7308	4.25	TDA1520	4.00
AN5900	1.50	M584CA-84	11.00	STK7348	4.50	TDA1521	3.50
AN7161	3.40	M54543L	2.99	STK7356	9.00	TDA1554	7.00
AN7171	4.25	M54544L	2.99	STK8250	9.99	TDA1557	7.00
AN7178	2.60	M54545L	2.99	STK73410	6.99	TDA1558	7.00
BA718	1.99	M54548L	4.25	STR3125	5.99	TDA1770	10.00
BA3402	3.99	M54549L	4.50	STR4211	5.99	TDA1908	1.00
BA5402	2.50	M54644L	3.99	STR5412	4.50	TDA2003	1.00
BA6109	1.80	M54647L	3.99	STR6020	4.50	TDA2005	1.30
BA6121	2.99	M54648L	3.99	STR9012	6.00	TDA2030	1.30
BA6122	1.99	M54649L	3.99	STR41090	6.00	TDA2270	3.25
BA6209	2.50	MB3730	2.00	STR44115	7.75	TDA2575	2.00
BA6219	2.99	MB3731	2.99	STR40090	5.99	TDA2578	3.00
BA6222	1.99	MB3732	2.99	STR50020	6.50	TDA2579A	2.50
BA6229	2.80	MC13306T3	3.99	STR50103	4.99	TDA2582	3.00
BA6238	1.99	MDA2062	4.25	STR50115	6.50	TDA2600	5.75
BA6239	2.50	PAL002A	15.00	STR54041	5.50	TDA2653A	3.50
BA6304	1.90	STRM6549	11.00	STR55051	8.50	TDA3330	7.00
BA6305	1.90	STK433	4.99	STR58041	5.50	TDA3505	4.00
BA6259	2.99	STK457	8.50	STR59041	6.50	TDA3560	3.25
BA10324	1.99	STK459	8.50	STR10006	6.00	TDA3561	3.50
BA10358	1.80	STK461	7.50	STR01806	6.00	TDA3562	3.50
BA15218	2.20	STK463	10.00	STRD5541	7.99	TDA3565	3.00
CNY65	4.99	STK465	7.50	STRD6008	8.00	TDA3576	7.00
CNY75	2.99	STK8029	3.99	SAA1025	6.00	TDA3640	4.00
CNX62A	2.99	STK0040	5.50	SAA1250	3.50	TDA3650	10.00
CNX82	3.99	STK0060	9.99	SAA1251	4.50	TDA3651	2.00
CNX83	2.99	STK2029	5.99	SAB3037	9.95	TDA3653	2.99
HA1377	1.99	STK2048	11.00	SAA1291	9.00	TDA3654	1.99
HA1397	2.60	STK2129	8.50	SAA1293-03	8.50	TDA3300	5.00
HA11225	1.99	STK2250	8.00	SAA1294-03	13.00	TDA4500	3.75
HA11227	2.20	STK3041	6.00	SAA5000	2.50	TDA4501	4.75
HA11235	1.99	STK3042II	6.50	SAA5010	4.30	TDA4502	5.00
HA11423	2.20	STK3062II	7.00	SAA5012	6.00	TDA4503	4.00
BA3910B	12.99	STK4026	9.00	SAA5020	3.50	TDA4380	3.00
HA11717	4.75	STK4121II	7.00	SAA5030	4.99	TDA4504	4.99
HA11753	5.99	STK4122	8.00	TA7193	4.00	TDA4505 E	5.99
HA11758	5.00	STK4131II	6.50	TA7205	1.00	TDA4505 M	12.99
HA13001	1.95	STK4132II	7.00	TA7222	1.20	TDA4600	1.99
HA13128	4.25	STK4141II	6.50	TA7240	2.60	TDA4601	1.99
HA13108	3.50	STK4141V	8.00	TA7241	2.60	TDA4950	1.99
HA13117	2.99	STK4142II	7.75	TA7264	4.99	TDA6200	8.00
HA13118	2.99	STK4151II	8.00	TA7269	5.50	TDA7240	3.00
HA13119	2.99	STK4152II	9.00	TA7270	2.50	TDA8170	2.99
HA13402	3.25	STK4161II	9.99	TA7271	2.50	TDA8175	2.99
HA13403V	5.50	STK4162II	8.00	TA7273	3.50	TDA8178	4.25
LA4182	1.99	STK4171II	9.99	TA7279	4.00	TDA8185	5.00
LA4270	2.99	STK4172II	9.00	TA7280	2.99	TDA8190	3.00
LA4282	6.00	STK4181II	9.99	TA7281	2.75	TDA8380	2.60
LA4440	2.20	STK4182	9.99	TA7283	2.50	TDU2732	19.99
LA4445	2.60	STK4191II	9.99	TA7288	4.25	TMS47C432	15.00
LA4460	1.60	STK4192	9.99	TA7293	4.50	UC3842	2.50
LA4461	1.60	STK4372	6.00	TA7299	3.99	UC3844	2.50
LA4465	2.99	STK4392	7.50	TA7680	4.00	UPC1378	2.20
LA4466	2.99	STK4853	9.99	TA7699	8.50	UPC1394	1.90
LA4475	2.99	STK5315	6.50	TA8200	4.99	UPC1420	5.25
LA4476	2.99	STK5325	7.00	TA8201	3.50	UPC1488	3.50
LA4495	3.95	STK5332	3.50	TA8207	3.25	UPC1185	6.00
LA4496	3.99	STK5353	10.00	TA8210	3.50	UPC1188	4.00
LA4500	2.30	STK5338	3.99	TA8214	3.50	UPC1230	2.10
LA4505	2.60	STK5342	5.99	TA8215	3.99	UPC1238	1.80
LA4508	2.60	STK5372H	5.50	TA8216	4.25	UPC1498	3.50
LA4700	3.99	STK5421	7.00	TA8220	6.75	SG264A	7.00
LA6324	3.50	STK5422	8.50	TA8221	6.75	UPC1277	2.40
LA7330	4.99	STK5434	7.00	TA8400	3.99	UPC1278	2.40
LA7520	4.99	STK5436	8.00	TA8659N	12.99	UPC1288	4.00
LA7522	6.50	STK5451	7.00	TEA1039	1.99	UPC1298	4.00
LA7530	3.99	STK5466	8.50	TEA2018A	2.00	UPC1310	8.00
LA7800	1.80	STK5471	4.99	TEA2029C	4.00	UPC1335	4.00
LA7801	1.95	STK5476	6.99	TEA2164	3.00	UPC1318	4.00
LA7802	1.95	STK5481	6.00	TEA2165	4.00	UPC1363	3.00
LA7820	3.50	STK5482	4.99	TDA1044	2.50	UPC1364	5.00
LA7830	1.99	STK5490	5.50	TDA1082	9.50	UPC1365	3.25
LA7832	3.99	STK5720	6.00	TDA1170	8.20	UPD1937C	4.25

REMOTE TESTER £14.99 LOPT TESTER £29.99 VIDEO HEAD TESTER £29.99 DEGUSSING ROD 29.99
SATELLITE FINDER KIT £29.99 MICROWAVE LEAK DETECTOR £14.99 DIGITAL MULTIMETER FROM £9.99

NIKKAI BABY 10 REGULATOR.
BL210N £12.99

VHS ALIGNMENT TAPE
BAND TRACKING, TAPE TRANSPORT, FM PICTU CURVE, AUDIO SYNC HEAD AZIMUTH TRACKING PLAYBACK SWITCHING POINT
£39.99

PATTERN GENERATOR
Colour bar, Cross hatch, Staircase.
COMPACT PORTABLE
£84.99 only

Capacitance Meters
Capacitance Meter PG015

An accurate, capacitance meter providing measurements over a very wide range.
0 TO 2000UF
ACURACY 0.5%
£29.99

Transparent Service/Cassette
£5.75

Hitachi/Salora Mains Switch

MARAPET ELECTRONIC COMPONENTS
Tel: (01452) 53 22 53 **24hr Answering Service for out of hours ordering**

We still have many SINCLAIR, COMMODORE & ATARI Home Computer Spares available from stock – Please send S.A.E. for list. We can supply all contemporary AMSTRAD SPARES – Please enquire.

SELECTED VIDEO HEADS

AMSTRAD TVR1/VCR4500/5200/9000	£13.59
FERGSON 3V42/3V44/3V45/3V52/3V54/3V55	£14.99
FERGUSON 3V64/3V65/FV10/11/20/21/26/30	£14.99
FISHER FVH420/615/720/721/722	£15.59
GEC/HITACHI V4004/V4100/VT34	£12.99
GOLDSTAR GHV1221/1232	£12.99
GRANADA VHSAH1	£12.99
HITACHI VT5xxx/VT7xxx/VT8xxx Series	£12.99
HITACHI VT110/111/113/115/118/120/220	£16.99
JVC HR3300/HR4100	£11.99
JVC HRD520EK	£14.59
MITSUBISHI HS303/304/320/700	£21.99
SALORA SV8100	£12.99
SHARP VC381/387	£14.99

THESE ARE QUALITY HEADS – Phone for Makes & Models not listed – This is only a sample.

SEMICONDUCTORS

BC848B	£0.20
BUV48A	£2.99
DTC114ES	£1.28
LM1203N	£9.92
PC713V	£2.89
R2G	£1.29
TA8410K	£4.59
UC3842	£1.99
14DN476G	£14.30
27C256-200	£3.50
2S1675	£0.85
2SC2482	£0.45
2SD471	£0.45

We can supply thousands of Custom & Industry Standard devices P.O.A

SELECTED AUDIO SPARES

AIWA CAW51K	
AMSTRAD CDX Midi (Funai)/MX200 Midi	
AMSTRAD CDX Midi (Funai)/MX200 Midi	
HITACHI CX-W500EK	
PIONEER PDX550	
SANYO M2114L	
SHARP RGF278/281/284/813K/B16	
TOSHIBA ST-U2/U2L	
KNOB – Play (R/H DECK)	£1.96
SPRING – Cassette Door	£1.34
DOOR – Cassette (R/H)	£3.40
KNOB – Operate (On/Off)	£1.85
MOTOR – Loading	£9.37
BELT – Capstan	£2.78
BELT – Main Drive	£1.33
TRANSFORMER – Mains	£9.99

LATEST ECA 'CMOS 4000 ' DATA BOOK AVAILABLE (New A4 Size)
COMBINATION 'CRIMPING' TOOL – Cuts, Crimps & Strips – Only £2.25

THIS IS JUST A VERY SMALL SAMPLE OF STOCK. Try us for ANY make or type of ★ TV ★ VCR ★ AUDIO ★ Spare. WE CAN ALSO SUPPLY – Selected COMPUTER SPARES, & many GENERAL COMPONENTS.

Our range of Video Spares is now much expanded – we can supply parts for over 150 makes Try us also for a wide range of: Remote Controls, TV On-Off Switches, Posistors, Resistors, Capacitors Fuses, Connectors, Cables, Tools, Domestic Electrical Accessories and much much more... Please send a Stamped Addressed Envelope for our latest Newsletter.

EQUIPMENT MANUALS
Large selection of Manufacturers Service & User information available. Original manuals supplied if possible We only show a few examples here.

Aiwa NSX-800 Service	£9.56
Amstrad PC4386SX Service	£16.29
Amstrad PC5086/5286 Service	£18.31
Binatone 01/9771 Service	£8.25
C64C or C+4 User	£4.99
Hitachi CPT2656/2658 Service	£9.42
Panasonic KXP-1123 Service	£14.95
Philips 4CM4270 Service	£8.99
Philips CM8524 Service	£7.95
Philips CM8833 (Mk1) Service	£8.99
Philips CM88xx Service Supp	£3.00
Philips CM8873 Service	£8.76
Philips CM11342/62 Service	£10.56

NO VAT ON MANUALS

PHONE for a 'PRICE & AVAILABILITY' on your requirements, or send S.A.E. for more information on our service.

TV/MONITOR LINE OUTPUT TRANSFORMERS

AMSTRAD, IBM, DIGITAL, etc	P.O.A
COMMODORE 1084-P/SP etc.	P.O.A
GOLDSTAR/DELL 154*166A	£29.63
OLIVETTI 1172.0018	£26.19
PHILIPS CM8533/CM8833 (popular uSLOT TYPE)	£21.27
PHILIPS CM11342/62 (CM8833 MK II)	£24.49
Ferguson TX90 14" 90°	£19.75
Ferguson TX100 20" 90°	£19.82
Ferguson TX100 51cm FST	£19.75
Fidelity (Please quote model)	P.O.A
Goldstar 154138K	£18.95
Hitachi CPT2174/2176/2178	£19.93
NE1451TX/1551TX/2131TX	£19.04
Panasonic/Philips	P.O.A

We can also supply LOPTx's for many other makes. MATSUI, MITSUBISHI, SAISHO, SONY – to name just a few others. Please supply Model Info. & No. on part.

When ordering from this advert., please add £1.25 P & P (+50p for LOPT's) then add 17.5% VAT. (NB. VAT is due on P&P – Manuals are Zero-rated) 'Validity dates' required for card orders, also issue No. for SWITCH
Please send S.A.E. with all written enquiries
Overseas orders welcome – minimum p&p charge is £2.50

All items subject to availability – Prices can change without notice.

We are Unable to accept callers at present
PLEASE ORDER BY POST OR PHONE
We accept payment by VISA, Access, DELTA, SWITCH, Cheque or P.O.

MAIL ORDER ONLY to:
M.E.C. (Dept.TV)
1 HORNBEAM MEWS
GLOUCESTER GL2 0UE

TELNET
8 CAVANS WAY, BINLEY INDUSTRIAL ESTATE, COVENTRY CV3 2SF
Tel: 01203 650702 Fax: 01203 650773 Mobile: 0860 400683
(Premises situated close to Eastern-by-pass in Coventry with easy access to M1, M6, M40, M42. M45 and M69)

OSCILLOSCOPES

Gould OS3000 – 40MHz, dual ch	£250
Gould 5110 – 100MHz intelligent oscilloscope	£950
Hewlett Packard 1707A, 1707B – 75MHz dual ch	from £275
Hewlett Packard 1740A, 1741A, 1744A, 100MHz dual ch	from £350
Hewlett Packard 54501A – 100MHz – 4 Channel digitizing	£1950
Hewlett Packard 54100D – 1GHz digitizing	£4500
Hewlett Packard 54201A – 300MHz digitizing	£1750
Iwatsu TS8123 – 100MHz digital storage	£850
Lecroy 140 – 100MHz digital storage	£3500
Nicolet 3091 – Low freq D.S.O.	£1100
Philips 3315 – 60MHz D.S.O.	£750
Tektronix 468 – 100MHz D.S.O.	£800
Tektronix 2213 – 60MHz dual ch	£425
Tektronix 2215 – 60MHz dual ch	£450
Tektronix 2220 – 60MHz digital storage	£995
Tektronix 2225 – 50MHz dual trace	£450
Tektronix 2235 – 100MHz dual ch (portable)	£800
Tektronix 2335 – 100MHz dual ch (portable)	£750
Tektronix 464/466 – 100MHz, storage	from £350
Tektronix 465/465B – 100MHz dual ch	from £350
Tektronix 7313, 7603, 7613, 7623, 7633 – 100MHz 4 ch	from £300
Tektronix 7704 – 250MHz 4 ch	from £650
Tektronix 7904 – 500MHz	from £850
Tektronix 475 – 200MHz dual trace	£475
Tektronix 455 – 50MHz dual trace	£350
Telequipment D68 – 50MHz dual ch	£200
Telequipment DM63 – 4 channel – 50MHz	£150
Phillips 3211, 3217, 3240, 3243, 3261, 3262 – (2 ch – 4 ch)	from £125 to £350
Philips PM3295A – 400MHz dual channel	£1950
Philips PM3295 – 350MHz dual channel	£1800
HAMEG 203/203-4/203-5/203-6 – 20MHz dual trace	from £175
Kikushul COS6100 – 100MHz – 5 channel, 12 trace	£475

OTHER SCOPES AVAILABLE TOO

SPECTRUM ANALYSERS

Advantest 4133B – 10KHz-20GHz (60GHz with ext mixers)	£8995
Anritsu MS2610A – 9KHz-2.2GHz	£5250
Hewlett Packard 3580A – 5Hz-50KHz	£995
Hewlett Packard 3582A – 25KHz analyser, dual channel	£2500
Hewlett Packard 182T with 8559A – (10MHz-21GHz)	£3750
Hewlett Packard 8590A – 10KHz-1.5GHz	£4250
Hewlett Packard 141T + 8552B + 8555A – (10MHz-18GHz)	£1600
Hewlett Packard 853A with 855A – (0.1-1500MHz)	£3500
Hewlett Packard 853A with 8559A – (0.01-21GHz)	£4250
Hewlett Packard 8565A – (0.01-22GHz)	£4000
Marconi 2370 – 110MHz	£995
Marconi 2371 – 30Hz-200MHz	£1250
Rohde & Schwarz – SWOB 5 Polyskop 0.1-1300MHz	£2500
Altech 727 – 22.4GHz	
Altech 70727 – Tracking Generator for 727 (10KHz-12.4GHz)	£2000
Texscan AL51A – 1GHz	£850
Polrad 641-1 – 10MHz-18GHz	£1500
Tektronix 2710 – 10KHz – 1.8GHz spectrum analyser	£4995
Tektronix 496P – 1KHz-1.8GHz	4500
Gaton/Alitech 757 – 10KHz-22GHz	£2750

MISCELLANEOUS

E.I.P. 548A – frequency counter (26.5GHz)	£3500
Ferrograph RTS2 Audio test set with ATU1	£500
Hewlett Packard 3325A – 21MHz synthesiser/ function gen	£1500
Hewlett Packard 3438A Digital multimeter	£200
Hewlett Packard 3490A Digital multimeter	£250
Hewlett Packard 5316B – Universal counter HPIB	£750
Hewlett Packard 5385A – Frequency counter 1GHz (HPIB) with Opts 001/003/004/005	£995
Hewlett Packard 8640B – AM/FM Signal Gen. (512MHz)	£850
Hewlett Packard 5314A (New) – 100MHz universal counter	£250
Hewlett Packard 8901B – Modulation analyser	£4250
Hewlett Packard 8903B – Audio Analyser	£3250
Hewlett Packard 8116A – Pulse/Function generator (50MHz)	£2750
Hewlett Packard 4192A – LF impedance analyser (5Hz-13MHz)	£8000
Hewlett Packard 4342A – 'Q' meter	£995
Hewlett Packard 4261A – LCR meter (digital)	£500
Hewlett Packard 4271B – LCR meter (digital)	£900
Hewlett Packard 8656A – Synth sig. gen (100KHz-990MHz)	£1750
Hewlett Packard 3326A – Two channel synthesiser (DC-13MHz)	£3750
Marconi 2019A – 80KHz – 1040MHz synth sig. gen	£1950
Marconi 2432A 500MHz digital freq. meter	£200
Marconi 893B A/F power meter	£325
Philips PM5167 10MHz function gen	£400
Philips 5565 Waveform monitor	£200
Philips 5567 Vectorscope	£600
Racal 9301A True RMS R/F millivoltmeter	£300
Racal Dana 1992 – 1300MHz frequency counter opts 4B + 55	£800
Racal Dana 9081 Synth. sig. gen. 520MHz	£550
Racal Dana 9084 Synth. sig. gen. 104MHz	£450
Racal Dana 9921 3GHz frequency counter	£450
Tektronix 576 Curve tracer (with test fixtures	£1250

MANY MORE ITEMS AVAILABLE – SEND
LARGE S.A.E. FOR LIST OF EQUIPMENT ALL EQUIPMENT IS USED – WITH 30 DAYS GUARANTEE. PLEASE CHECK FOR AVAILABILITY BEFORE ORDERING – CARRIAGE & VAT TO BE ADDED TO ALL GOODS

Long-distance Television

A review of DX-TV conditions and reception, with satellite news and sightings. Meteor scatter reception and main shower dates for 1996. Will Remoteless Key Entry be another source of unwanted interference? Roger Bunney reports

November into early December 1995 was again a very quiet period for long-distance signal propagation. The Leonids meteor shower in mid-November failed to produce any reports of signal loggings. It's quite common however for conditions to be quiet at this time of the year.

Something that will bring a chill to TV-DXers is the fact that two blocks of Band I spectrum have been released for mobile radio use, 62·7–63·4MHz for base stations and 55·7-56·4MHz for mobile units. These frequencies coincide with ch. E4 and E3 respectively. Diplomat Communications Systems Ltd., a UK manufacturer, has already produced a full-function 25W radio for use at these frequencies.

A check on the letters I received during the month shows that there were reports of Sporadic E reception on only two days, November 5th when Canal Plus ch. L2 was received mid-morning and the following day when TVE (Spain) chs. E2-4 were received at lunchtime.

A long letter from Stathis Panagiotidis (Thessaloniki, Greece) provides details of Band I activity in his area. His local signals are now all delivered in Band III or at u.h.f., though he can receive weak signals from a ch. E4 transmitter in Macedonia. A private Greek channel, Sky TV, uses ch. E3 in Athens while ET-1 is transmitted on ch. E3 from atop the Akarnanika mountain in the Patrai region. Seven Band III channels are in use in Thessaloniki, where at u.h.f. only chs. E36 and 61 are not in use – all the other channels carry programmes from private operators, satellite channel relays or religious offerings. With the exception of Filmnet on ch. E21 these are all in the clear.

The opening caption for cattle market auctions often seen in the early morning via Eutelsat II F3 at 16°E.

Satellite Sightings

Nicholas Earley reports that Ku band signals from the recently launched Japanese JcSAT-3 craft at 128°E have been received in New South Wales using a 3m dish and a low-threshold Palcom receiver. It seems that a 3·7m dish at least will be required for Ku band reception in eastern Australia. Launch of the AsiaSat-2 craft into orbit at 105·5°E is imminent: it should provide C band signals at 33dBW in New Zealand and at 37dBW in the eastern Mediterranean area. The satellite's Ku band coverage is much more restricted, being aimed at China and Mongolia.

Julian Redwood (Christchurch) watched excellent feeds of the Shuttle landing from satellites "all over the place" on November 20th. He has been busy with modifications to the inductors inside has satellite receiver's tuner to achieve improved C band reception. As a result he now receives signals from Arabsat 1D at 20°E just above the noise, using a 1·8m dish. He says he is unable to pass on his modifications since there is "a fine line between improvement and total disaster"!

The UKI-34 Sky TV team parked outside 25 Cromwell Street, Gloucester at the end of the Rose West case, on November 23rd, its report being sent back via Eutelsat II F3 at 16°E. This satellite has produced other interesting signals. From 1700 onwards on November 18th there was an Algerian offering at 11·634GHz (horizontal) in addition to the usual 11·678GHz network programme. It consisted of a PM5544 test card with the identifications 'ALGERIA' at the top and 'CIP ENTV' at the bottom. There was no programme material. Romanian International was present for several days at 11·575GHz (horizontal) with 'probe tehnice' – I assume that this means a technical probe or test. The signal, transmitted during the evening, was very strong. Nag and pony-trap racing continue at 12·560GHz (horizontal) during the daytime and early evening – some of the events are scrambled.

Alan Smith has recently returned to Thailand, where he found that band C signals are now available from PAS-4 at 68·5°E. He's seen no Ku band signals, though these are received in Europe from the satellite's western

spot beam. Presumably the beam is too well defined, with few sidelobes.

The 11·131, 11·170 and 11·470GHz (horizontal) transponders aboard Eutelsat I F4 at 25·5°E were used for the remote-studio links during the live Police Action programme on November 18th.

John Locker (Wirral) was perhaps the first person to have received signals from Astra 1E, while it was parked at 14·5°E on test. He received the 60dBW DBS output at 11·750 and 12GHz on November 4th. John has also been monitoring Ku band signals from the PAS-4 satellite at 68·5°E. PAS-4 is only about two degrees above the horizon at his location and is between trees – signal levels have improved since the leaves fell.

Intelsat 601 at 27·5°W often carries French horse racing on Saturdays, continuing well into the evening. Check at 11·053GHz (horizontal), the French commentary being at 6·6MHz.

News Items

UK: Residents of the Isle of Dogs, London have lost their case at the court of appeal against the developers of Canary Wharf. They were claiming compensation for loss of quality TV reception as a result of the construction of the building. The matter may be taken to the House of Lords.

Hungary: A new broadcasting bill will release all channels previously used by the Russian army. They will be used for a third independent commercial network. The MTV-2 network is to be leased for independent operation for a franchise period of ten years.

USA: A high-definition TV station, location at present unknown, is expected to open later this year, providing picture quality similar to 35mm cinema film. The consortium backing it includes NAB and other broadcasting organisations, also equipment manufacturers.

France: ARTE is now transmitting Nicam stereo sound in the Paris and Strasbourg areas, with French and German audio subcarriers. The service is being extended to other areas.

RKE Interference

The December 1995 issue of the RSGB magazine *Radcom* contained interesting information on interference from the Remote Keyless Entry (RKE) systems used to control vehicle central locking/alarms. These systems use either infra red or u.h.f. for transmission. Units that use u.h.f. transmit at 433·92MHz, with no more than 2nW, though in practice three times this level has been measured. This is sufficient to swamp amateur radio equipment operating at 70cm, while the transmitters can saturate, immobilising the RKE function. RKE receiver input selectivity is often minimal, the bandwidth approaching several MHz. This presents a problem where amateur repeaters operate across the RKE channel. There are many diverse and subtle sources of interference these days!

MS Reception

Random meteor activity is experienced throughout each day, when small particles of space debris burn up in the E layer. The burn up produces an ionised trail that can reflect Band I signals for a brief period – seldom more than a few seconds. If you are lucky enough to be tuned to a Band I channel exactly you may see a TV picture flash. When test cards were transmitted for most of the day identification of the signal source was relatively simple. Now, with 24-hour programming in so many countries, identification of the

A test pattern transmitted via Orion Atlantic at 37·5°W prior to a news feed.

1996 Meteor Showers

Our thanks to Neil Bone, director of the Meteor Section of the British Astronomical Association, for the following meteor shower list for the year:

Lyrids	April 15-25th, peaking on the 21-22nd.
May Aquarids	April 24th-May 20th, peaking on May 4th.
Cetids	May 7th-June 9th, peaking on May 14-25th.
Delta Aquarids	July 15th-August 20th, peaking on July 28-29th and August 6-7th.
Perseids	July 23rd-August 20th, peaking on August 11-13th.
Orionids	October 16-27th, peaking on the 20-22nd.
Taurids	October 20th-November 30th, peaking on October 31st-November 5th.
Leonids	November 15-20th, peaking on the 17-18th.
Geminids	December 7-16th, peaking on the 13-14th.

Those with long memories may recall the very intense Leonids meteor shower back in 1966. I experienced part of this event late one November morning, when the signals present across Band I resembled the conditions during a summertime SpE opening! Another major storm is expected in either 1998 or 1999. Leonids activity could increase considerably over the next two years: it might be worthwhile checking on November 17th this year at 1000 hours give or take a few hours.

A Romanian International TV service test transmission seen via Eutelsat II F3 at 16°E.

signal source can be extremely difficult – if not impossible. The ionisation can last for up to thirty seconds with an intense trail, sufficient to produce signal reflection as high as Band III.

At predicted times – see box on previous page – clouds of space debris are encountered by the earth. These meteor showers can produce quite dramatic reception across the Band I channels. Single-hop signal reflection distances are similar to those with SpE propagation in mid-summer, i.e. 500-1,200 miles. Double-hop reflection via MS has never been reported.

Advances in low-noise tuner front-end design make Band III MS reception possible, given an efficient aerial, a low-noise head amplifier and a receiver with a narrow i.f. bandwidth, tuned in accurately and with quick-synchronising timebases. MS DXing requires time and great patience however!

Satellite TV News

Good news for UK satellite enthusiasts: the Orion Satellite Corporation has been given permission to position Orion 2 at 12°W. It will provide transatlantic communications between the US mid-West and Europe as far as Moscow and beyond, also Africa. Thirty two Ku band transponders will be available during the satellite's prospective thirteen-year life. One user of Orion 2 could be Associated Newspapers, for its Channel One and Performance cable TV channels – negotiations are currently being held with both Orion and Eutelsat.

Italian Pay-TV operator Telepiu is now transmitting MPEG-2 digital TV via Eutelsat II F1 at 12·542GHz (vertical) for demonstration purposes. It has reserved four transponders aboard Hot Bird 2, which is due for launch in August.

France Telecom is to adopt Wegener audio for the TF1 and France 2 services via Telecom 2B at 5°W (7·02/7·20MHz), dropping the J17 standard.

The Indian Insat 2C satellite should now be operational, following its end-November launch, with twelve C band transponders giving coverage across SE Asia and the Middle East.

The South African Broadcasting Corporation (SABC) plans to launch fourteen digital satellite TV channels via four transponders aboard the PAS-4 satellite. Services could start this summer.

There have been receiving equipment problems with the Australian Galaxy direct-to-home pay-TV service. Although many people have installed dishes and other hardware over the last ten months, there has been a lack of MPEG decoders. According to a newspaper report most of the decoders in the first consignment were returned, one problem being a very long lock-up time – in excess of ten seconds. This would be no good for channel hopping!

European hackers claim to have cracked the AFRTS B-MAC encryption system after gaining access to ex-Gulf war surplus decoders. Strange to relate, while I was reading through a surplus broadcast equipment sales list from a London company last August I noticed a Scientific Atlanta B-MAC decoder at £50 plus VAT! ■

Answer to Test Case 398

– see page 259 –

The serviceman's lot is not a happy one! By the time that Ray, with a little help from his friends, had got to the bottom of the trouble with the Sharp VC787 it had been on his bench for nearly three unpaid hours. But such is life at the bench.

The culprit was found on the opposite side of the deck from where all the testing and investigation had taken place. Close inspection of the tape motion in the LP mode revealed that it juddered somewhat during its passage between the drum exit guide and the audio head. These fluctuations corresponded with that of the sound. The LP playback picture also had a slight wobble/judder effect at the same rate and – this was the vital clue – the back-tension regulator arm and lever were juddering in the same way. A back-tension gauge then produced a high and fluctuating reading of about 60g/cm.

This was obviously the source of the trouble, with repercussions all the way round the tape path. While still high, the excessive back tension settled down at the faster SP-mode rotation rate, with no tension regulator lever oscillation. The cure was quite easy. The supply spool's centre-bearing hole and shaft were cleaned and lubricated and a new tension-regulator band was fitted. This, with the back-tension setting adjusted correctly, cured the fault – leaving Cathode Ray to battle with the repair jobs that had come in meanwhile. . .

BOOKS TO BUY BOOKS TO BUY

Radio Engineer's Pocket Book

by John Davies, 240pp, hardback

Order – ISBN 0 7506 1738 1
Price £12 99

Contains: Propagation; decibel scale; transmission lines; antennas; resonant circuits; oscillators; piezo-electric devices; bandwidth requirements and modulation; frequency planning; radio equipment; Microwave communications; information privacy and encryption; multiplexing; speech digitisation and synthesis; vhf and uhf mobile communication; signalling; channel occupancy, availability and trunking; mobile radio systems; base station management; instrumentation; Batteries; satellite communications; connectors and interfaces; broadcasting; abbreviations and symbols; tables and data; glossary

Covers all aspects of radio and communications engineering from very low frequencies to microwaves, with particular emphasis on mobile communications. Wave principles and the decibel scale, instrumentation and power supplies, equipment types and encryption methods, connectors and interfaces, are all included in this book.

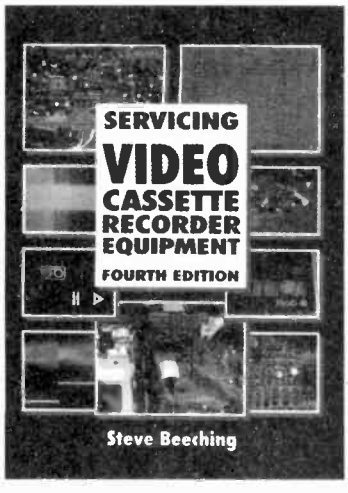
Servicing Video Cassette Recorders

by Steve Beeching, 250pp, hardback

Order – ISBN 0 7506 0935 4
Price £25 00

Contains: Vcr systems; azimuth tilt;.Frequency modulkation; servomechanisms; colour systems; systems control; long play; VHS-C & camcorders; a-v sockets.

Covers Written for students and people involved with vcr servicing, this book is an invaluable guide and reference covering all aspects of modern vcrs. Contains new material on basic magnetic theory to C&G 224.



Servicing Personal Computers

by Michael Tooley, 304pp, hardback

Order – ISBN 0 7506 1757 8
Price £25.00

Contains: Microcomputyer systems; test equipment; fault diagnosis; tape and disk drives; printers and monitors; servicing IBM pc compatibles and 68000-based computers.

Covers: this completely rewritten fourth edition still covers the whole range of microcomputer equipment but now also includes a guide to developments and trends such as the new generation of diagnostic software – code included in the book – and applications such as serial communication, and memory and hard disk management..

Build Your Own PC

by Ian Sinclair, 256pp, paperback

Order – ISBN 0 7506 2006 4
Price £16 95

Contains: Assembly from scratch – mainly for masochists; fundamentals and buying guide; case, motherboard and keyboard; disk-drive details; imporovers and modifiers for graphics and i/o; DOS operation and hints; Windows; connecting printers; glossary.

Covers Building your own pc from scratch or from modules. Written at a level suitable for beginners *and* those with experience of computers or electronics. In addition, this work provides a useful guide for anyone wanting to save money by upgrading their pc themselves.

EMC for Product Designers

by Tim Williams, 304pp, hardback

Order – ISBN 0 7506 1264 9,
Price £25 00

Contains: What is EMC? standards; EMC measurements; interference coupling mechanisms; circuits; layout and grounding; interfaces; filtering and shielding.

Covers: 'This book is likely to become essential reading for those designing electronic products for the European market,' according to *New Electronics*. Widely regarded as the standard text on EMC, providing all the information needed to meet requirements of the EMC Directive.

Servicing Audio and Hi-Fi Equipment

by Nick Beer, 304pp, hardback

Order – 0 7506 2117 6
Price £25 00

Contents: Introduction; tools and test equipment; radio receivers; amplifiers; power supply circuits; portable audio; cassette deck mechanics; cassette electronics; turntables: system control; motors and servo circuits; compact disc; mini disc; digital audio tape; digital compact cassette; speakers, headphones and microphones; repair techniques, addresses.

As a bench-side companion and guide, this work has no equal. Its purpose is to ease and speed up the processes of fault diagnosis, repair and testing of all classes of home audio equipment: receivers, amplifiers, recorders and playback machines.

Troubleshooting Analog Circuits

Robert A Pease, 217pp, paperback
Order – 0 7506 9499 8
Price £17 95

Contents: Introduction; Troubleshooting linear circuits - the beginning; choosing the right equipment; getting down to the component level; solving capacitor-based troubles; preventing material and assembly problems; solving active-component problems; identifying transistor troubles; operational amplifiers - the supreme activators; quashing spurious oscillations; the analog-digital boundary; troubleshooting charts.

Bob Pease is one of the legends of analog design. Based on his popular series in EDN Magazine, the book contains advice on using simple equipment to troubleshoot. Numerous tables summarising troubleshooting approaches are included. Shows where problems are likely to show up and how to positively identify them.

Masts, Antennas and Service Planning

by Geoff Wiskin, 256pp, hardback

Order – ISBN 0 240 51336 3,
Price £49 50

Contains: Antennas; antenna support structures; service planning.

Covers: All aspects of information conveyance via radio-wave transmission. Invaluable to anyone planning for broadcast and mobile-radio coverage, or designing. installing and maintaining antenna systems

Audio Engineer's Reference Book

by Michael Talbot-Smith, 600pp, hardback
Order – 0 7506 0386 0
Price £60 00

Contents: Basic principles; acoustics and acoustic devices; recording and reproduction; digital equipment; studios and their facilities; distribution and audio signals; miscellaneous topics.

Readable, fully comprehensive book written by acknowledged experts in audio engineering. Provides authoritative accounts and explanations of almost all aspects of audio engineering and technology.

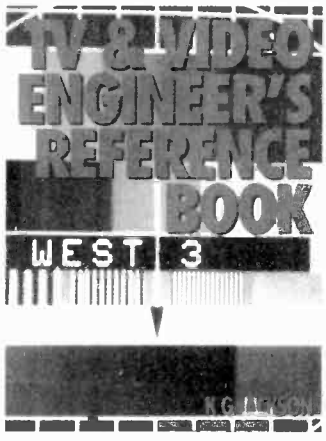
TV & Video Engineer's Reference Book

by Boris Twonsend, 876pp, paperback

Order – ISBN 0 7506 1953 8
Price £40 00

Contains: Materials; components and construction; colour tv fundamentals; bradcast transmission; distributing broadband; DBS; tv studios; mobile and portable equipment; tv sound; tv receivers; servicing tvs; video recorders; teletext etc; HDTV; other applications of tv; performance measurements.

Covers Information on every aspect o fmodern broadcast technology. Of value to all practicing engineers and managers involved with broadcast, cable and satyellite services.



Return to Jackie Lowe, Room L333, Quadrant House, The Quadrant, Sutton, Surrey, SM2 5AS

Please supply the following titles:

Qty	Title or ISBN	Price

PLEASE ADD FOR POSTAGE £2.50 UK £5.00
Europe £7.50 Rest of World Total_____

Name _____

Address _____

_____

Postcode _____ Telephone _____

Method of payment *(please circle)*

Access/Mastercard/Visa/Cheque/PO

Cheques should be made payable to Reed Business Publishing

Credit card no _____

Card expiry date

Signed TV1

Servicing
the Tatung 190 Chassis

John Coombes

The Tatung 190/195 series chassis is designed to drive 90° standard- or min-neck tubes with screen sizes from 14 to 21 inches. Production started in early 1989. Models that use it have 9 as the second digit in the model number, e.g. TT8906. The various versions of the chassis are as follows: 190 14in. without remote control; 191 20in. without remote control; 195 14in. with remote control; 196 20in. with remote control; 197 21in. with remote control.

Fig. 1 shows the power supply circuit, which features an FET chopper transistor (TR801). In most versions the h.t. is 115V. In the 197 however it's 109·5V. This version also uses a different line output transformer.

Power Supply Faults

If the set is dead with a blown mains fuse (F801, 1·25AT), check the mains filter capacitor C801, the BY133 mains bridge rectifier diodes D801-4 the the BUK454-800 chopper transistor TR801 for shorts. The TDA4605 chopper control chip IC801 is another possibility. It's best to replace TR801 and IC801 as a pair. Whenever you find TR801 short-circuit, check the value of R811 (470kΩ) – it can go high. It may be worth checking TR801's heatsink insulation. You may find that the surge limiter resistor R801 has gone open-circuit as well at F801.

If the set is dead and F801 is intact it's likely that the fault is with the start-up resistors R802 and R803 (15kΩ, 0·5W). Check them both for being high in value or open-circuit. In later production sets 16kΩ, 0·6W metal-film resistors were used in these positions. Other possibilities are TR801 going short-circuit gate-to-source, C803 being low in value or open-circuit and IC801. If there's no h.t. on the primary side of the chopper transformer T801, check for dry-jointed connections. The connections can also go high-resistance, the result being intermittent loss of the sound and picture.

If there's no h.t., disconnect L403 and connect a 60W bulb as a dummy load across C814 to ascertain whether the fault is in the power supply or the line timebase. If the bulb lights, the fault is in the line timebase. If it doesn't, check whether the BA159 h.t. rectifier diode D809 is open- or short-circuit. Alternatively its reservoir capacitor C814 (47µF) could be short-circuit.

Tripping is likely to mean a short across one of the power supply's outputs.

No results can also be caused by failure of the components in the 10V rectifier circuit, D810 and C812. The 10V output supplies the 78M05CV 5V regulator IC804. This provides the 5V supply for the HD401220 microcontroller chip.

If necessary check the components in the 17V rectifier circuit, D811 and C813. The output from this circuit is used by the audio output chip and the line driver stage, and also goes to the LM317T 12V regulator IC803 which in turn feeds the TDA4505 multi-function chip IC101.

Line Timebase Faults

The first check to make in the line output stage is for h.t. at the collector of the S2000AF line output transistor TR403. This transistor, the BY133 efficiency diode D401 or C407 (47µF, 250V) could be short-circuit. The cause of line output stage failure could be shorted turns in the line output transformer T402. Also check for open-circuit or dry joints at pins 3 and 5 of the scan coil connector PL401

If there's no line drive, check for 17V at the collector of the BC337 line driver transistor TR402. If this voltage is missing, check whether R413 (18Ω metal film) is open-circuit and the driver transformer T401 for open-circuit or more likely dry joints. Alternatively TR402 could be short-circuit or leaky.

If R413 is open-circuit, check whether its associated smoothing capacitor C412 (470µF) is short-circuit. R413 can also go high in value. This can result in loss of line drive, lack of width or ragged verticals.

Returning to loss of line drive, if TR402 and its associated components are o.k. check for the presence of line drive pulses at the base of the preceding BC547 emitter-follower transistor TR401. If these are present, check TR401 by replacement. If they are missing, check back to pin 26 of the TDA4505 multi-function chip IC101. Before replacing this chip, make sure that its 12V supply is present at pin 7 and that R114, R115 (both 2·7kΩ), C116 (22nF) and C111 (2·7nF, 1 per cent) are o.k.

Field Timebase Faults

Field collapse is the most common field timebase fault. The usual cause is failure of the TDA3653B field output chip IC301. If it has gone short-circuit, R411 (10Ω) will be open-circuit. If IC301 is dry-jointed the result may be intermittent field collapse.

If IC301 is o.k., check whether D403 (BA157), R411 (10Ω) or R119 (3·9kΩ) is open-circuit. Check for open-circuit or dry joints at pins 1 and 2 of the scan coil connector L401. Then check for a field drive output at pin 3 of the TDA4505 multi-function chip IC101. If this is missing, check IC101 by replacement.

C306 (100µF, 50V) in the flyback boost network can go open-circuit to cause field collapse. In this case there will probably be intermittent failure of the field output chip. It may be necessary to replace IC301, IC101 and C306 to restore normal operation.

IC101 can also be responsible for top foldover with exces-

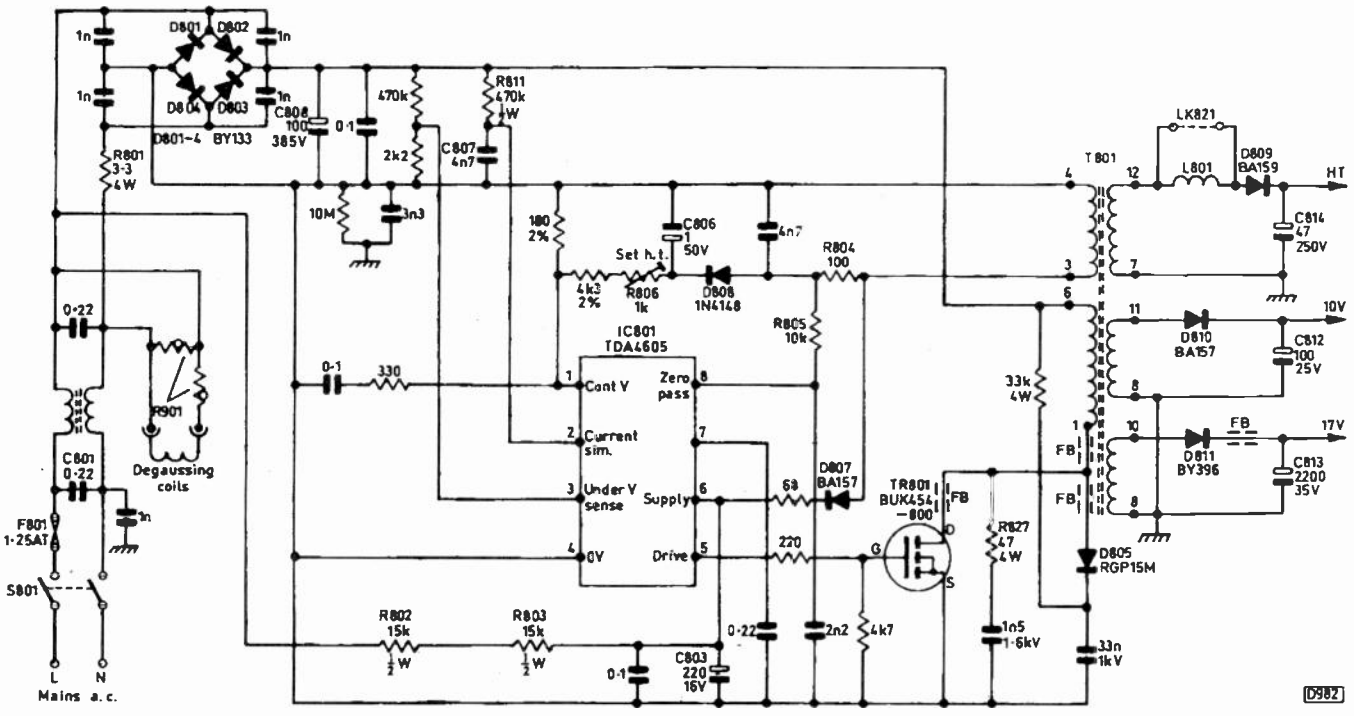


Fig. 1: The chopper power supply circuit used in the Tatung 190 series chassis. In remote control versions the on/off switch S801 has an extra, momentary-make contact. The h.t. is 115V with most versions of the chassis: the exception is the 197, where the h.t. is 109·5V.

sive height. Before condemning it, make sure that its 12V supply is correct at pin 7. If this voltage has risen the 12V regulator chip IC803 is probably faulty. If the supply is low there will be reduced height.

Top foldover can also be caused by C409 (1,000µF, 35V). This is the reservoir capacitor in IC301's supply circuit.

No Sound

The first check when there is no sound should be for 17V at pin 14 of the LM380M audio output chip IC601. If this supply is missing, check whether L602 (if fitted) is open-circuit or dry-jointed, or C606 (470µF, 25V) is short-circuit. The loudspeaker LS601 or the audio output coupling capacitor C610 (220µF, 25V) could be open-circuit. If these things are all o.k., check IC601 by replacement.

IC601's input comes from pin 12 of IC101 via C603 (0·1µF). Either of these items can cause loss of the sound.

No Colour

For no colour, first check that the TDA3565 colour decoder chip IC501 is receiving its 12V supply at pin 1. If this voltage is missing, check whether L501 is open-circuit. If not, check IC501 by replacement.

Other possible causes of no colour are the 8·8MHz crystal XL501 being faulty or dry-jointed, or the reference oscillator preset R521 (10kΩ) faulty or misadjusted.

Grey Scale and Brightness Faults

Grey-scale faults are likely to be caused by the load resistors in the RGB output stages. Each transistor has three 47kΩ load resistors which are connected in parallel. They can change value or go open-circuit, and the outcome can look like a poor tube.

For uncontrollable brightness check whether R201 (8·2Ω) in the h.t. feed to the RGB output stages is open-circuit. Alternatively the sandcastle pulses at pin 7 of IC501 could be incorrect. They come from pin 27 of IC101, which also receives a pulse feed from the line output transformer.

The Tuner and IF Strip

If there are no signals, check that the tuner is receiving its 12V supply at pin 2.

The TAA550 33V regulator chip IC001 can be responsible for a snowy display, no vision or drifting. Check it by replacement.

If there is no picture, just a snow storm, check whether IC001 is short-circuit or R009, R010 (both 6·8kΩ, 0·5W), R004 or R771 (both 18kΩ) is open-circuit.

If there is a halo effect on the picture, check the SAWF (FL101) for dry-joints.

IC101 can also be responsible for signal faults.

Remote Control Faults

If there is no remote control operation, check first whether the handset's batteries are low or the connections are corroded or broken. Then check for dry-joints at the LED (D790) or a faulty or dry-jointed crystal (XL790, 455kHz). If necessary check the SAA3008 remote control transmitter chip IC790 by replacement.

If only one handset function operates incorrectly it may be necessary to replace the unit.

If the remote control handset is operating correctly but there is no remote control, the TFMP2380 IR receiver chip IC703 (labelled C1703 on the circuit diagram) is suspect. Check it by replacement. Before doing so, ensure that there is 5V at the junction of R767 and R768 and that neither R767 (3·3kΩ) nor R768 (220Ω) is open-circuit, also that C715 (22µF, 25V) is not short-circuit. ■

Published on the third Wednesday of each month by Reed Business Publishing Ltd., Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. **Filmsetting** by Wace Publication Imaging, 2-4 Powerscroft Road, Sidcup, Kent DA14 5DT. **Printed** in England by BPCC Magazines Division, Carlisle Web Offset, Cumbria. **Distributed** by Marketforce (UK) Ltd., 247 Tottenham Court Road, London W1P 0AU (0171 261 5555). **Sole Agents** for Australia and New Zealand, Gordon and Gotch (Asia) Ltd.; South Africa, Central News Agency Ltd.

AMSTRAD HANDSETS

VCR4600, 4600 MkII	7.05
VCR4700	17.63
VCR5200	11.75
VCR6100 (Barcode Indexer)	32.44
VCR6200 Barcode	32.44
TVR 2	8.46
TVR 3 (Equivalent)	10.70
SRD400	18.15
SRD400 (Equivalent)	11.05
SRD500	11.75
SRD510/520	13.81

AMSTRAD TUNERS/IF

UE33-B01 VCR4600/4700	9.40
TPS7-B0005 VCR4600/4700	9.40
TPS7-L0002	14.10

AMSTRAD MODULATORS

18108221 VCR5200	7.05
4600 MkII, 4700	16.45

AMSTRAD SERVICE MANUALS

VCR3000/9500	14.85
VCR4600 MkII, 4700	9.00
VCR6000/6100	11.50
VCR7000	9.00
VCR8700	8.00
VCR8800	9.75
VCR9000/9004	9.00

TVR3	23.15
VMC100	16.50
SRX100/200	4.70
SRX100/200 SRD400	13.25
SRD510/520	6.50
SRD550	3.85
SRD600	20.65
PPC512/640	11.50
PC2086	12.00
PC2286	19.50
PC2386	15.00
PC3086	11.00
PC4386	POA
PC5086	15.00
PC7486SLC	7.00
ALT286	8.50
PC14M28/29	3.25
FX9600 FAX	20.15

AMSTRAD COMPUTER OPERATORS MANUAL

PC1640	11.75
PC2286/2386	11.75
PPC512/640	11.75
ZX SPECTRUM +2	5.50
PC1512 (Tech. Ref.)	6.00
PC1640 (Tech. Ref.)	8.00

AMSTRAD SOFTWARE

ACCOUNTSMASTER (Full accounts program for running small business on any PC)	19.98

AMSTRAD FAX PCB

FX9600 FAX PSU	29.38

AMSTRAD VCR 4600 4700, TVR1,2,3

HEAD BASE ASSY. (Audio)	5.88
FRICTION GEAR 779	2.06
TAPE CREASING KIT	5.88

AMSTRAD MOTORS

Capstan Motor LLA4B02	10.28
Capstan Motor LLN4B21	10.28
Tape Loading MCF9B02	9.99

AMSTRAD LOPTS

CTV1400 FB165KA		23.50
TVR3	181297	14.69

AMSTRAD PCBs

(Complete, fully populated)

4600 Systems Control/Servo, Display & Control PCBs	31.73
4600 Video & Audio	19.98
4600MkII Head Amp	5.88
4600MkII Power Supply	6.46
4600MkII Hybrid, Luminance	9.40
4700 Main PCB Assy.	43.17
4700 Head Amp Assy.	5.88
4700 Power Supply	6.46
6100 Main PCB	31.73
6100 Hybrid, Chrominance	9.40
6100 Hybrid, Luminance	9.40
CTV1400 MkII Main TV PCB	31.73
TVR2 Main TV PCB	41.13
TVR2 Video Front Display PCB	15.88
TVR3 Main TV PCB	47.00
TVR3 Head Amp Assy.	5.88
TVR3 Video Power Supply	6:46

AMSTRAD COMPUTER MONITOR/PARTS

12" HRCD (Daewoo)	32.32
PC/ECD Monitor Tube	56.40
CRT 3701B22	29.38
PPC512/640 Modern PCB	18.80
AMSTRAD MOUSE	7.64
51/4"-31/2" FDD KIT	7.05
PCW9512 Armature	4.70

Many AMSTRAD COMPUTER & PRINTER SPARES available, please phone for price.

PRICES INCLUDE VAT.

ALL ITEMS ARE BRAND NEW AND GUARANTEED

★★ SAME DAY DESPATCH ★★

Write or Phone for FULL LIST.

****POST & PACKING****

****£1.18****

Harrison Electronics

CENTURY WAY, MARCH, CAMBS PE15 8QW.

FAX: (01354) 51416. TEL: (01354) 51289

mikro

COMPATIBLE VIDEO HEADS

Highest Quality Components

IMPORTED AND DISTRIBUTED BY:

Harrison Electronics

LARGE RANGE AVAILABLE TO FIT MOST MODELS

HIGH QUALITY AT COMPETITIVE PRICES

WRITE OR PHONE FOR CATALOGUE

WE HAVE THE WIDEST CHOICE OF USED OSCILLOSCOPES IN THE COUNTRY

Tektronix TAS475 4 Channel 100MHz Delay/Cursors	£1300
Tektronix TAS455 Dual Trace 60MHz Delay/Cursors	£900
Tektronix 2335 Dual Trace 100MHz Delay	£750
Tektronix 485 Dual Trace 350MHz Delay Sweep	£750
Tektronix 475 Dual Trace 200MHz Delay Sweep	£500
Tektronix 465 Dual Trace 100MHz Delay Sweep	£400
Tektronix SC504 Dual Trace 80MHz in TM503	£400
H.P. 1740A Dual Trace 100MHz Delay Sweep	£350
Tektronix 2225 Dual Trace 50MHz A/t TB Magnification	£450
Tektronix 2215 Dual Trace 60MHz Delay Sweep	£400
Tektronix 2213 Dual Trace 60MHz	£350
Philips PM3217 Dual Trace 50MHz Delay Sweep	£400
Hitachi V423 Dual Trace 40MHz Delay Sweep	£350
Gould OS1100 Dual Trace 30MHz Delay Sweep	£240
Hameg HM204 Dual Trace 20MHz Delay Sweep Component Tester	£300
Hitachi V223 Dual Trace 20MHz Delay Sweep	£250
Beckman 9020 Dual Trace 20MHz Delay Sweep	£240
Hameg 412 Dual Trace 20MHz Delay Sweep	£225
Kikusui 5530A Dual Trace 35MHz	£220
Iwatsu SS5702 Dual Trace 20MHz	£200
Gould OS300 Dual Trace 20MHz (No handle)	£180
Tektronix 2230 Dual Trace 100MHz Digital Storage: Cursors	P.O.A.
Tektronix 468 Dual Trace 100MHz Delay Sweep Digital Storage	£750
Philips PM3305 4 Channel 35MHz Digital Storage	£650
Gould OS4040 Dual Trace 10MHz Digital Storage	£300
H.P. 1741A Dual Trace 100MHz Analogue Storage	£400

THIS IS JUST A SAMPLE – MANY OTHERS AVAILABLE

Eaton/Aitech 380K11 Syn Sig Gen 1-2000MHz with PM3602 AM/FM Phase Mod.	P.O.A
Marconi 2019A Syn AM/FM Sig Gen 80KHz-1040MHz	£2000
Marconi 2019 Syn AM/FM Sig Gen 80KHz-1040MHz	£1250
Marconi 2018 Syn AM/FM Sig Gen 80KHz-520MHz	£800
Wavetex 501 Pulse Generator 50Mhz	£300
Racal 9081 Syn AM/FM Sig Gen 5-520MHz	£900
Philips PM5134 Sweep Con Gen 0.001Hz 20MHz/So/Tr/ Thandar TG501 Fun Gem 0.005MHz Sine/Sq/Tri/Ramp/Pulse etc	£175
Thandar TG502 as TG501 with Sweep Facilitates	£275
H.P. 8160A Programmable Precision Pulse Gen 50MHz	£POA
H.P. 3336B Synthesized Level Gen 10Hz-21MHz	£800
H.P. 5006 Signature Analyser	£150
H.P. 50904A Signature Analyser	£100
R&S Video Noise Meter UPSF2 with UPSF2E2	£1800
H.P. 5041A Frequency Counter 50MHz 1.5GHz	£500

BRUEL & KJOER EQUIPMENT AVAILABLE PLEASE ENQUIRE

SPECTRUM ANALYSERS

H.P. 8565A 0.01-22GHz	£4000
Polarad 641-1 10MHz-18GHz	£1000
H.P. 182 with 8558B 100KHz-1500MHz	from £1500
H.P. 141T with 8555A & 8552B 10MHz-18GHz	£1700
H.P. 141T with 8554B & 8552B 500KHz-1250MHz	£1200
H.P. 141T with 8553B & 8552A 1KHz-110MHz	£800
H.P. 141T with 8553L & 8552A 1KHz-110KHz	£700
H.P. 141T Main Frames Only. Good Tubes	£225
Marconi TF2370 30Hz-110MHz	£1000
H.P. 3580A 5Hz-50KHz	£1000

Racal 1988 Freq. Counter 1.3GHz (Options GPIB & High Stab)	£900
Racal/Dana 1991 Nanosecond Universal Counter	£800
Marconi 2437 Universal Counter/Timer DC – 100MHz 8 digit	£175
Racal 9916 Frequency Counter 10Hz-520MHz	£175
Racal 9906A Universal Counter Timer 10Hz-200MHz	£250
Solartron 7085 6 1/2 digit Microprocessor VM AC/DC/Ohms/ Auto	£400
Solartron 7150 6 1/2-3 1/2 digit DMM with IEEE	£400
Solartron 7045 4 1/2 digit Multimeter Volts/Amps/Ohms	£80
Fluke 77 Hand Held DVM 3 1/2 digit with ?????	£100
Fluke 8050A Bench/Portable 4 1/2 digit. True RMS	£225
Wavetek 182A Fun Gen. 0.0004Hz-4MNz Sine/Sq/Tri/DC TTL Pulse etc	£225
Feedback FG600 Sine/Sq/Tri 0.01Hz-100KHz	£60
Gould J3B Sine/Square Oscillator 10Hz-100KHz	£150
Racal/Dana 9104 RF Power Meter 1MHz-1GHz. 10mW-300V	£400
Philips PM5585 Waveform Monitor	£300
Philips PM8917 Video Line Selector	£200
Ferrograph RTS2 Recorder Test Set	£250
Unaohm EPS01 Audio Analyser	£350
Kemo Dual Variable Filter VBF/3 0.1Hz-10KHz	£200
Marconi TF2700 Universal Bridge. Battery Operated	from £150
Wayne Kerr B424 Digital LCR Meter	£200
H.P. 1630D Logic Analyser 43ch	£750
Marconi TF2337 Automatic Distortion Meter	£378
Marconi TF2331A Distortion Factor Meter 20Hz 20KHz 0.05% Unused	£225
Marconi TF893B Audio Power Meter	£350
Marconi TF2163 Attenuator DC 1GHz	£100
H.P. 94952 Attenuator DC 18GHz 0.70dB 10dB steps	£380
Hatfield 3105 Attenuator 500hm	£75
Sorensen DCR600-4.5B 0-600 Volts 0-4.5Amps	£700
H.P. 6268 0-40 Volts; 0-30Amps	£500
Farnell H30/100 0-30 Volts, 0-100Amps Metered	£800
Thurlby Thander TSP3222 Prog. 30V 2A Twice GPIB Digital	£500
Thurlby PL320QMD 30V 2A Twice Digital	£225
Farnell B30/10 30 Volts, 10 Amps Variable	£150
Farnell L30/5 0-30 Volts; 0-5 Amps 2 Meters	£150
Farnell L30E 0-30 Volts, 0-5 Amps Metered	£100
Farnell L30/2 0-30 Volts; 0-2 Amps Twice	£160
Farnell L30/2 0-30 Volts; 0-1 Amps Metered	£80
Farnell LT30 1.0 30 Volts; 0-1 Amps Twice	£130
Farnell L30/1 0-30 Volts; 0-1 Amps. Metered	£65
Farnell B350 0.350 Volts; 200MA Metered	£100
Brandenburg Model 472R + PSO 2KV	£200
Leader LSG216 Standard Signal Generator	£800
AWA Distortion & Noise Meter F242A	£400
Racal Instrumentation Recorder type store 4DN	from £380
Nagra IV-SJ Tape Recorder	£360
H.R. Smith Antenna Test Set type 12-602-4	£2000

NEW EQUIPMENT

Hameg O/Scope HM1005 Triple Trace 100MHz Delay T/base	£847
Hameg O/Scope HM604 Dual Trace 60MHz Delay Sweep	£613
Hameg O/Scope HM303 Dual Trace 30MHz Comp Tester	£422
Hameg O/Scope HM205. 3 Dual Trace 20MHz Digital Storage	£653

All other models available – all oscilloscopes supplied with 2 probes

BLACK STAR EQUIPMENT (P&P all units £5)

Apollo 10 – 100MHz Counter Timer Ratio/Period/Time interval etc	£234
Apollo 100 – 100MHz (As above with more functions)	£332
Meteor 100 Frequency Counter 100MHz	£119
Meteor 600 Frequency Counter 600MHz	£145
Meteor 1000 Frequency Counter 1GHz	£189
Jupiter 500 Function Gen 0.1Hz-500kHz Sine/Sq/Tri	£125
Orion Colour Bar Generator Pal/TV/Video	£243

All other Black Star Equipment available

OSCILLOSCOPE PROBES

Switchable × 1 × 10 (P&P £3)	£13

Used Equipment – Guaranteed. Manuals supplied if possible.

This is a VERY SMALL SAMPLE OF STOCK. SAE or Telephone for list. Please check availability before ordering

CARRIAGE all units £16. VAT to be added to Total of Goods and Carriage

STEWART of READING

110 WYKEHAM ROAD, READING, BERKS RG6 1PL

Telephone: 01734 268041 Fax: (01734) 351696

Callers Welcome 9am-5.30pm Mon-Fri (until 8pm Thurs)

P.V. TUBES

104 ABBEY STREET, ACCRINGTON
LANCS BB5 1EE
Tel: 01254 236521/390936
Fax: 01254 395361
SEND LARGE S.A.E. FOR TRADE CATALOGUE

CALLERS WELCOME BUT TRADE COUNTER CLOSED ALL DAY WED OPEN MON-FRI 9-5pm SAT 9-12 noon

ASK US FIRST FOR ALL YOUR COMPONENT NEEDS AS WELL AS FOR:

Satellite Dish Packs with LNB (60cm)	£45.00
Enhanced LNB (for Astra ID)	£22.95
ADX Converters (for Astra ID)	£19.99
Pace 900 repair kits	£6.99
Pace 9000 repair kits	£5.50
60cm dish, only	£20.00
80cm dish only	£38.95
Listener plug-in monitor, no wiring	£18.50
Doorman two station intercom	£11.95
Portable PIR alarm	£19.95
Two band AM/FM clock radio	£9.95
CCTV monitor/camera	£165.00
10" AC/DC CTV with scart. Ideal for caravan or computer use	£165.00

OUR FAMOUS DEGAUSSING COIL:

£27.50

VALVES

NEW – Branded Boxes – full range – (matched pairs available)

ECC81	£3.50	ECC82	£4.50
ECC83	£4.90	ECC85	£3.50
ECC88	£4.50	ECL82	£3.50
ECL86	£4.75	EL34	£7.00
EL84	£3.00	EL519	£6.50
GZ34	£6.00	KT66	£9.75
KT88	£18.00	PCL805	£4.50
PCL86	£3.40	PL504	£3.00
PL519	£5.90	PY500A	£2.95
12BY7A	£6.95	6L6GC	£5.31
6L6GT	£5.31	6KD6	£35.00

Ask for other types

SATELLITE SYSTEMS

Muliti 2NB Holders	£15.95
A/B Switches	£9.95
Tone Switches	£14.95

HOT BIRD SPECIAL

Grundig GRD 280 80cm Dish, 2 x LNB, 1 x Multi Holder £215 + VAT

HAPPY CHRISTMAS + NEW YEAR TO ALL OUR CUSTOMERS XXX

NEW TVs/VIDEOs/HI-FI

20" Remote control	£170.00
21" Remote control, text	£184.00
25" stereo Nicam text	£350.00
28" stereo Nicam text	£385.00
Twin speed r/c video	£149.00
Twin speed r/c video with Video Plus	£165.00
AC/DC video player	£159.00
Midi CD system (including CD, turntable, twin cassette, remote control)	£249.00

WE CAN'T LIST EVERYTHING THAT WE STOCK. OUR RANGE IS EXTENSIVE. WE HAVE A TRADE CATALOGUE. WE SELL- AERIALS, BRACKETS, BATTERIES, CABLE CONNECTORS, CMOS CAPACITORS, DISCS, DIODES, ELECTRICAL ACCESS, FUSES ICs, LOPTX, LEADS, MANUALS, PUSH BUTTON LIGHTS, PHONES, PHONE ACCESS, POTENTIOMETERS, RELAYS, SEMICONDUCTORS, STRIPBOARD, SWITCHES, TUNERS, TV BATTERY LEADS, TV WALL BRACKETS, TOOLS, TEST EQUIPMENT, VALVES AND EVERYTHING YOU NEED FOR VIDEO REPAIRS - HEADS, IDLERS, TYRES, PINCH ROLLERS, CLEANERS, TEST CASSETTES, VIDEO TAPE (and V2000)! etc.

P.V. TUBES

HOW TO ORDER: Up to 1K ADD £2.00 per order P+P (U.K.). Heavier parcels, e.g. cables, service aids, degausing coils please allow £4.00 P+P (U.K.). Export orders charged at cost. First Class Mail is used whenever possible. Add 17.5% VAT to total except where it states zero rate. Over 3K will be sent by carrier £12.00 + VAT up to 15K (except tubes). We do not despatch on Saturdays.

Goods are despatched on the day we receive your order. If for any reason we are out of stock we will try to inform you as quickly as possible. We try our best to give a speedy, fair and efficient service. VAT invoice on request. Give us a ring – we'll give you service. Please ask if what you need is not listed – we will try to help. Prices are subject to change without notice. In some cases we may have to supply an equivalent. We need expiry dates for credit card orders. MIN. ORDER £5.

TELEPRICE LIMITED

Leaders in the supply of:

Ex-rental, End-of-line, Customer returns and Surplus stocks of Televisions, Video and Audio Equipment, and Domestic Washing Machines, Dryers, Refrigerators, etc.

to the Trade

Contact your nearest Area Manager for latest prices:

Area	Contact:	Mobile:	Fax/Tel:
South East	Colin Gordon	0374 738701	01227 741312
South West	Tony Lewis	0374 732784	01291 425018
North/N.I.	Ian McClelland	0831 597331	01244 400602

Head Office: Baird House, Arlington Business Park, Theale, Reading, Berks RG7 4SA.
Tel: 01734 309933 Fax: 01734 309934

GRANADA EX RENTAL TELEVISIONS

£15

MIXED LOTS
(W/YEAR CODE UPWARDS)

LORRY LOADS
FREE DELIVERY

PHONE

0181 838 5009

APPROVED TELEPRICE DISTRIBUTOR

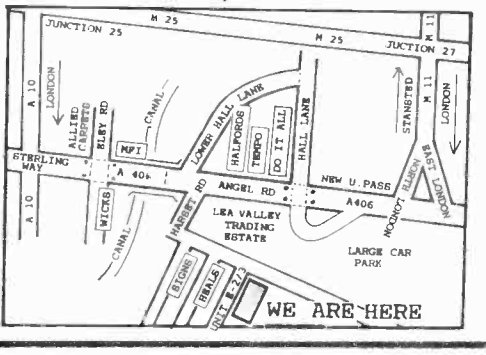
HST DISTRIBUTORS LONDON

Suppliers of high quality
THORN EX-RENTAL STOCK
Direct from source

PHONE FOR DELIVERY DAYS ON

0181 803 0505

UNIT E2/3, Stonehill Business Park, Lea Valley Trading Estate,
ANGEL ROAD, LONDON N18 3LD



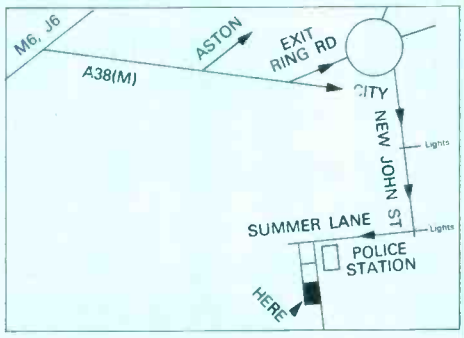
COLOURTRADE

ESTABLISHED 1973 – WHOLESALE ONLY

NEW 'B' GRADE

Major Brands ONLY TV's – Video – Audio.
Microwaves, Satellite Receivers, Decoders

COMPLETE BOXED – WITH STAND – HANDSET – BOOK ETC
MINT LATEST NICAM FASTEXT F.S.T.



FERGUSON

FULL RANGE – ALL CURRENT MODELS OF TV-VIDEO IN STOCK
No minimum quantity

NATION-WIDE NEXT DAY DELIVERY SERVICE – VISITORS BY APPOINTMENT

Phone 0121-359 7020

FAX 0121-359 6344

221-222 BRIDGE ST WEST, HOCKLEY,
BIRMINGHAM B19 2HU – JUST OFF M6-J6

AMERICAN EXPRESS VISA Access

AERIALS

FOR TV & FM RADIO, PLUS 1000's OF MASTS, BRACKETS, LASHING KITS, CLAMPS, PLUGS, CABLES, OUTLETS, DIPLEXERS ETC

AMPLIFIERS

FOR DISTRIBUTION SYSTEMS AND DOMESTIC, MAST HEAD OR SET BACK. WE HAVE ONE OF THE LARGEST RANGES, AVAILABLE FROM STOCK

MAIN DISTRIBUTORS

FOR ANTIFERENCE, LABGEAR, WOLSEY, FRINGE, IKUZI, MAXVIEW, VOLEX-RAYDEX, KUBLER + MANY MORE

COASTAL AERIAL SUPPLIES

UNIT X2, Rudford Industrial Estate, Ford, Arundel

01903 723726

NO MINIMUM ORDER VALUE
NEXT DAY DELIVERY ACROSS UK
CARRIAGE FREE ON ORDERS £250+

Access BARCLAYCARD VISA

SWITCH ON TO 'B' GRADE AT PRICES SECOND TO NONE

	1+	10+
Twin Speed Video's	95	90
14" Remote Portables	85	80
14" Fastext Portables	105	95
20" Nicam Text	140	130
25" Nicam Fastext	235	225
28" Nicam Fastext	260	250
21" Nicam Fastext	150	140
CD Microsystem	50	45
C.D. Radio Twin Cassette	45	40
Stereo Twin Cassette	15	14

All stock tested & working and boxed with remote & instructions

Also 7000 sq ft of returned TV, Video and Hi-Fi
Example Radio Cassette £5.00 CD Midi and Micro £25.
Basic Midi £11 Colour Portable £30 VHS Video £35

GOGGLEBOX

DISCOUNT ELECTRICAL WAREHOUSE

TEL: LEEDS (0113) 2310359
ASK FOR ROBERT

ALL ABOVE PRICES PLUS VAT AT 17.5%

FAX: 0274 722229

BESCO LTD

YOUR PREMIER SUPPLIER FOR OVER 30 YEARS

Have a great '96 with Besco

ENTIRE RANGE OF EX RENTAL TVs, VIDEO, B GRADE HIFI, PORTABLE CD, GHETTO BLASTERS ETC.

F.S.T. remote working **from only £60**
F.S.T. text working **from only £70**
complete with handset, makes inc' Solara, Philips, Sanyo, Hitachi etc.

Over 200 working video recorders in stock **from £40** (slim front loaders)
100s of front loading videos off the pile **from £12** – Philips, Hitachi, Sanyo, Sharp, etc.

Good quality working TVs standard **only £25** Teletext **from £40**
Makes in stock – Hitachi, Ferguson, Pye, Philips, GEC etc, **RING OUR HOTLINE *NOW!***

HiFi SPECIAL

Boxed HiFi with C.D., Twin tape, radio etc.
from £35 (MIN 3 UNITS)
Car radio/cass, Personal stereo, Personal C.D., Ghetto Blasters, etc.

BASEMENT CLEARANCE

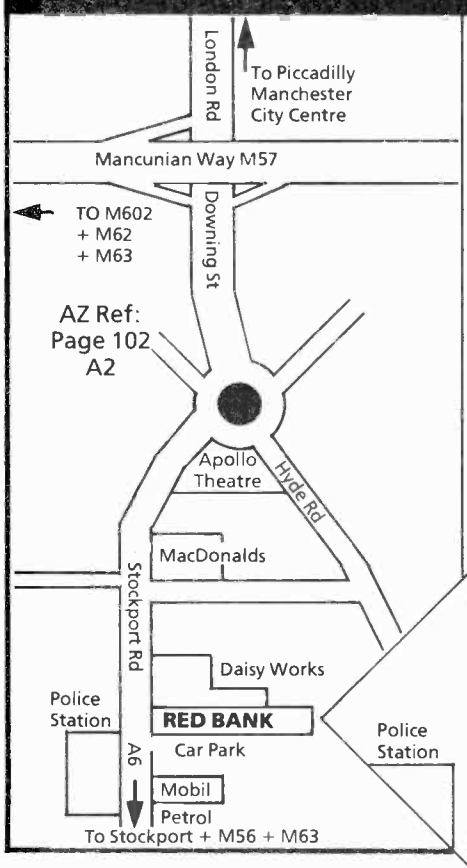
300 ex rent colour TVs, mixed std and text, makes include Pye/Philips KT3/K30, Hitachi, GEC series 90, Ferguson TX etc. – **ONLY £2,400.00 THE LOT!**
(DELIVERY ARRANGED)

By special request return of our sensational Cabaret, also our new menu FREE Hamburgers, Pizza, soup, sausage/egg, bacon sandwiches etc. *All this and rock bottom prices too!* Where else? Bring money!

Visa Welcome | **Prices are plus VAT and based on quantity** | Cheques accepted

Walker House, 16 Bottomley Street, Bradford BD5 7LJ
Ring Tony 01274 308186 – Open 6 days – 9am-5pm

RED BANK



MANCHESTER'S No. 1 WHOLESALER

HAS MOVED!!

BIGGER PREMISES, MORE CHOICE

WORKING TELETEXT FROM £25

Televisions from £5. Videos from £25
Portables from £30, FST from £40

ALL STOCK SOLD WORKING

New Hand Sets from £6
Open Mon to Fri 10am till 5pm
Saturday By Appointment
CHEQUE — ACCESS — VISA — SWITCH

345 Stockport Road
Ground Floor
South Area
Daisy Works
Longsight
Manchester

Phone: 0161 273 8343
Fax: 0161 834 6368
Prices subject to VAT

REPO WHOLESALE

DAISY WORKS, 345 STOCKPORT ROAD
LONGSIGHT, MANCHESTER M13 0LF
0161-273-2854/274-3409/Fax 273-4486

TOP QUALITY CLEAN WORKING FST

GOOD QUALITY "TOP RANGE" WORKING VIDEOS

COMPETITIVE PRICES

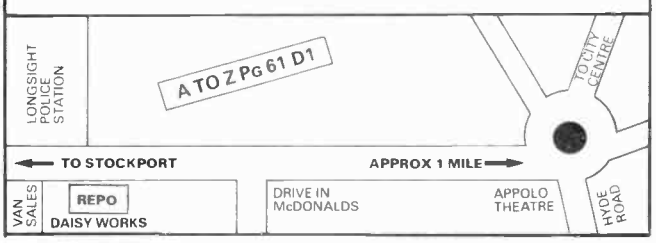
★ REGULAR SUPPLIES ★

PLEASE PHONE FOR CURRENT STOCK POSITION

★ NEW HANDSETS IN STOCK ★

No order too small – If you are new to the business call in and let us help you

CHEQUE/CASH/ACCESS/VISA/AMEX ETC.



C.T.V.

UNIT 5, THE PHOENIX BUILDING, RUSHOCK TRADING ESTATE, DROITWICH ROAD, DROITWICH WR9 0NR
TELEPHONE: 01299-251522
0589-888021/0850 486147 (24HR)

SUPPLIERS OF HIGH QUALITY
GRANADA AND THORN
EX-RENTAL TELEVISIONS AND VIDEOS
LARGE STOCKS ALWAYS AVAILABLE
ALL AT COMPETITIVE PRICES
Satellite Receivers
Complete Range of Hand Sets
EXPORT ENQUIRIES WELCOME
OPEN: MON-FRI – 9.30-5.30

TEL: 01299-251522

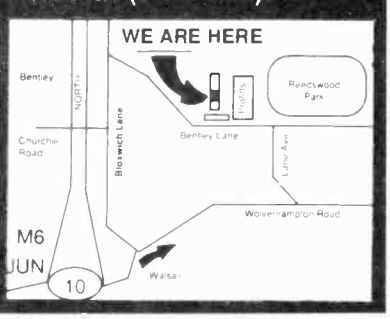
Fax: 01299-251543

W.M.T.V.

THE LARGEST INDEPENDENT WHOLESALERS IN WALSALL
– SUPPLIERS OF HIGH QUALITY EX-RENTAL TVs AND VIDEOS TO THE TRADE AT COMPETITIVE PRICES
ALSO AVAILABLE: NEW B-GRADE PRODUCTS – TVs, VIDEOS, AUDIO & MICROWAVES – ALL TESTED & BOXED
Satellite Receivers and Export Enquiries Welcome
½ Mile off Junction 10 M6. *Easy Parking Facilities*

UNIT 3, BENTLEY LANE BUSINESS PARK
BENTLEY LANE, WALSALL WS2 8TL
Tel: 01922-724542. Fax: 01922-722208
Mobile: 0831-246622 (24 Hours)

OPEN:
MON-FRI,
9-6pm
SAT 9-2pm
SUNDAY BY APPOINTMENT
DELIVERY SERVICE THROUGHOUT THE COUNTRY



CAMPION WHOLESALE LTD.

QUALITY USED TV & VIDEO

COMPLETE RANGE OF TV's AND VIDEOS MOST MAKES AND MODELS AVAILABLE

STOCK ARRIVING DAILY
TV's from £3.00 · Videos from £18.00
Prices Ex-VAT

Free Delivery Service to most areas of the UK

UNIT 75, BARRACKS ROAD,
SANDY LANE INDUSTRIAL ESTATE,
STOURPORT-ON-SEVERN,
WORCESTERSHIRE DY13 9QB
Just 10 Mins from M5 Junct. 6 Worcs North

UK's LARGEST EXPORT WHOLESALER. CONVERSIONS TO MOST COUNTRIES

01299-879642 (3 lines)
FAX: 01299 827984

CENTRAL TV WHOLESALE DISTRIBUTOR LTD

Large selection of FST TVs from £45

Thorn TX9, TX10, TX100 FST only. Please ring now for best prices

Direct loads from source. Ring now

For best deals on Dorics Mk4, MK4a Basics. Ring now

Working videos now from only £30.00

Graded TVs and Videos P.O.A.

Philips K35 K40 Teletext TVs from £40 working

For all export enquiries TV and Videos call our Birmingham Office now

Working portables from only £35.00

Now Camcorders in stock P.O.A.

New Grade B 14″ Portables £85.80
20″ Nican TVs £165.00 28″ Nicam TVs £275

Ex Rental Satellites – £5.00

Ferguson Surround Sound Speakers Type 51LS – P.O.A.

Attention All Bulk Buyers

If you are in Business of disposing large quantities of TVs and Videos – Ring Now

CENTRAL TV WHOLESALE DISTRIBUTION LTD

Birmingham contact: Mick
369 Stratford Road, Sparkhill, Birmingham B11
Tel: 0121 772 1591 Fax: 0121 766 6383

London contact: Joshi
Eley Estate, Nobel Road, Edmonton N18
Tel: 0181 807 4090 Fax: 0181 884 1314

Large stock of B Grade T/Vs

Top Brand Names Boxed & Working
20″ R/C £99
Portables £89
25″ Fastext £225
Videos from £99

THIS MONTH'S SPECIAL

Camcorders
Boxed – Working – from £219
Walkmans £4.50

EX RENTAL TVs
Direct from source. Untouched
Basic TVs £5, £10 and £15, R/C £20
Teletext £30. Videos from £25

Mini Micro Systems with CD from £25 various makes.
Hi-fi Midi System from £12 Boxed.
Stereo Radio Cassettes. Boxed £10.

W TREE WAREHOUSE
UNIT 1, SUNSHINE MILLS, WORTLEY RD, LEEDS 12
TEL: 0113 2638804 FAX: 0113 2310275

BSMART (CRAWLEY) LTD

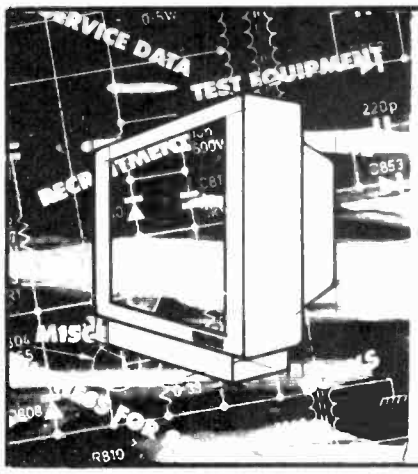
Largest selection of

MAJOR MANUFACTURERS
NEW "B"
GRADE PRODUCTS

T.V. VIDEO AUDIO
MICROWAVE OVENS

Contact Fred Bean

BSMART (CRAWLEY) LTD.
10/11 LLOYDS COURT, MANOR ROYAL,
CRAWLEY, SUSSEX RH10 2QX
Tel (01293) 618000
Fax (01293) 400133



TELEVISION CLASSIFIED

No other consumer magazine in the country can reach so effectively those readers who are wholly engaged in the television and affiliated electronic industries. They have a need to know of your products and services.

The prepaid rate for semi display setting is £13.50 per single column centimetre (minimum 4 cm). Classified advertisements £2.00 per word (minimum 20 words), box number £22.00 extra. All prices plus 17½% VAT. All cheques, postal orders etc., to be made payable to Reed Business Publishing. Advertisements, together with remittance, should to sent to The Television Classified, 11th Floor, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

Access

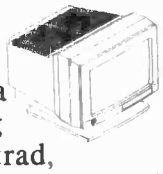
PHONE 0181-652 8339 FAX 0181-652 8931

BARCLAYCARD VISA

SERVICE MANUALS & TECHNICAL BOOKS

NEW

COMPUTER MONITOR CIRCUITS *VOLUME 2*



This new volume carries on from our previous MP-286 and covers a further range of monitor Servicing and Circuits for makes such as Amstrad, AOC, Atari, Comcen, Commodore, Decca, Dell, Digital, Electrohome, Epson, Galaxy, Goldstar, Hitachi, Hantarex, Hewlett Packard, IBM, JVC, Mitsubishi, Melford, Microvitec, NEC, Olivetti, Opus, Panasonic, Philips, Qume, Research Machines, Samsung, Samtron, Sharp, Sony, Schneider, Sinclair, Tatung, Taxan, Telford & Wyse.

Normal Price £45.00. Order now for just £40.00 plus £2.94 p/p. Order MP-327.

Volume 1 (MP-286) Still available at the current price of £45.00 plus £2.94 p/p.

Special Offer:- Order both (MP-328) for £80.00 inclusive.

We have the largest range of Service Information and Technical Data obtainable anywhere. For Televisions, Video Recorders, Test Equipment, Computer Monitors, Vintage Wireless, Domestic Equipment etc etc. In fact practically anything electronic. Originals or Photostats as available.

Also available. Our catalogue detailing Hundreds of Technical Books and Repair Guides. Return coupon for your FREE copy. Also available, our entire Index of Service Manuals available on PC Disc. (Code MP-285) Just £3.50 + VAT (Total £4.11) with FREE updates.

MAURITRON TECHNICAL SERVICES (TV)

Access

8 Cherry Tree Road, Chinnor, Oxfordshire, OX9 4QY

Tel:- 01844-351694. Fax:- 01844 352554.

VISA

Please forward your latest catalogue for which I enclose 2 x 1st Class Stamps. I enclose payment for MP-327 (£42.94). MP-285 (£47.94). or Both for £80.00 Please supply Index on PC Disc for £4.11 inclusive. ***Circle items required***

NAME _____

ADDRESS _____

_____

POSTCODE _____ You may pay by Cheque, PO or Visa, Access, Delta, Electron, JCB, Mastercard, Eurocard etc

☐☐☐☐ ☐☐☐☐ ☐☐☐☐ ☐☐☐☐

EXPIRES_____ SIGNATURE_____

SERVICE MANUALS

Thousands of different models available

For most U.K. European, Far East & USA makes

Prices (Stock Items):–

VCR	–	£13.00
CTV	–	£8.00
MTV	–	£6.00

Other items, prices on request
P/P etc. (any quantity) add £2.00
Do not add any VAT

Cheque/PO with order only please.

D-TEC

PO BOX 1171, FERNDOWN, DORSET BH22 9YG

Tel: 01202 870656

Davenham Satellite Systems

Satellite Receiver upgrades

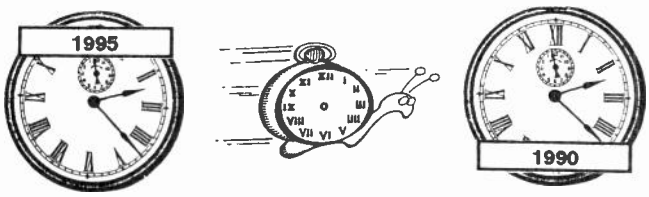
Pace PRD800/Grundig STR1 → 199 chans
Pace SS9000/Ferguson SRV1 → 90 chans
Pace PRD upgrade for Astra 1D

"Satellite Secrets Revealed" £19.95
256 pages of repair & installation tips

We Repair receivers/decoders.
Trade enquiries welcome (0589 355411)
We specialise in Satellite Accessories
Send for free catalogue NOW!
Credit Cards welcome

DAVENHAM SATELLITE SYSTEMS, 1 Firths Fields
Davenham, Northwich, Cheshire CW9 9JB 01606 49085
email: david@davenham.u-net.com

!TIMEWARP!



ALL VCR & CTV MANUALS REDUCED TO *1990 PRICES*

THIS ISN'T A SALE, THIS IS A LONG-TERM REDUCTION

Helping you to fight rising costs

SERVICE MANUALS SERVICE SHEETS CIRCUITS FAULT GUIDES TECHNICAL BOOKS

We Have the World's Largest Selection of

SERVICE MANUALS

...Repair-Manuals-Circuits-Fault Guides Etc...

SERVICE MANUALS SERVICE SHEETS CIRCUITS FAULT GUIDES TECHNICAL BOOKS

CTV CIRCUIT COLLECTIONS

A3 SIZE / ALL POPULAR SETS / UPTO 1995

Alba	£22	Amst'd/Fid	£21	Baird/Ferg	£45
Decca	£22	GEC	£28	Goldstar	£12
Grundig	£38	Hinari	£14	Hitachi	£45
ITT	£22	JVC	£30	Mitsubishi	£38
Pansic	£30	Philips	£40	Sanyo	£28
Sharp	£14	Sony	£49	Toshiba	£38

Top Selling Titles

PRACTICAL TV / VCR REPAIRS
£16.95 Each / £30.00 for both

Buy,Sell,Service, Used CD's/VCR's/CTV's
£9.95 Each, or all for £25.00

Euro' Scrambling Systems/Satellite Book
Only £32.00 Each / £62.00 for both

MICROWAVES: Energy & Ovens
Still only £12.95

Principals of CD/VHS Video Heads/CD Jig
Only £3.95 Each

VCR Servicing by Beeching
Still £25.00

SPECIAL MANUAL OFFERS

ANY 20 MANUALS FOR £200 (Inc p&p)

All at once, or phone as you need them

OR

JOIN THE STREE LIBRARY FOR £75

(£20 yearly renewal) AND BUY ALL MANUALS FOR **£10 EACH**, OR SWAP AT **£5 A TIME** (Add £2.50 p&p)

PHONE OUR *HOTLINES* ON:

(01698) 883334/884585 Fax: 884825

Technical Information Services

76 CHURCH ST, LARKHALL, LANARKS, ML9 1HE

SEND AN SAE FOR YOUR *FREE* QUOTE & CATALOGUE

PROFIT BOOSTERS

Efficiency in the busy workshop is more important than ever, Increase **your** productivity with our latest range of **Technical publications.**

FAULT INDEXES: Edition 15 now available, Over **11,600** references listed in 12 years of Television. **covers Tv, video, camcorder, satellite & CD**
Thousands of copies sold worldwide - **complete set £14.75**

INDEXES ON DISK: PC version 1.1 Now available Covers **15 Years** & over **14,000** references - Complete Program, Data & manual, A **lot** of information **£17.50**
Requires IBM PC or compatible, 8086 upwards, Mono, CGA, EGA, VGA
Please specify disk size (3.5 or 5.25 inch HD) when placing your order.

OTHER TITLES AVAILABLE INCLUDE :

KWIK TIPS TELEVISION covering a wide range of makes, models & chassis, Contains over **2500** faults & solutions. ISBN 1 898394 00 8 First edition - **£13.95**

KWIK TIPS VIDEO an excellent collection of over **2000** video faults & solutions, Highly recommended. ISBN 1 898394 01 6 First edition - **£10.95**

Chassis & equivalent identification made easy with the **E.C.S. Television & video equivalents, TV model to chassis guide & camcorder equivalents** A massive **4500** entries in 1 book. First edition - **only £4.95**

E.C.S.
Technical publishing

31, PRENTON ROAD WEST, PRENTON, BIRKENHEAD, MERSEYSIDE. L42 9PY.

Please add **£1.75** P & P to total (europe **£2.75**, r.o.w please enquire).

TV/VIDEO/SATELLITE/HI-FI FAULT GUIDES & SERVICE SHEETS

FRYERNS

Most makes covered Old and New.
This Service offers Workshop Service Sheets and Technical Advice Fault Guidance.
Prices from £3.50 plus £2.50 P/P & handling.
On 2 items or more P/P free,
but add £1.50 per item handling charge.
i.e. 1 item – total £6. 2 items – total £10.
3 items – £15. 4 items – £20.

PAYMENT BY CREDIT CARD OR POSTAL ORDER.
NEXT DAY DELIVERY. PLEASE PHONE FOR AVAILABILITY.

Telephone 01268 558938 Fax 01268 558938
Phone anytime, 7 days a week.
4 PINCEY MEAD, BASILDON, ESSEX SS13 3EW.

Fryerns wishes to thank all its regular users for their custom and support in the launch of the business and hope they continue to be profitable in the future (James).

FOR SALE

J. W. OZELTON & SON

Secondhand car radio cassette for sale prices from £40.00 plus post and package.
(Most Makes Available)
Car radios decoded, repaired and serviced

100 Church Road, Stockton On Tees, Cleveland TS18 1TW
Tel: 01642 614172

WANTED

BILLINGTON EXPORT LIMITED
Billingshurst, West Sussex RH14 9EZ

VALVES WANTED FOR CASH

(KT88 £48, PX4 £50, PX25 £80, CA100 £90, EL34 £10, EL37 £9, CV4004, ECC83 £2.50)
Valves must be Mullard/GEC West European to achieve the prices mentioned. • We will always equal any genuine rival offer on the above valves •
Ask for our free Wanted List.

WE SUPPLY VALVES, C.R.T., VIDICONS ETC

Visitors, please phone for an appointment, we're a very busy export warehouse.

Tel: (01403) 784 961
Fax: (01403) 783 519

Trade Only

Televisions	from £5.00
Teletext	from £20.00
Videos	from £20.00
Twin Speed Stereo	from £25.00

Minimum quantity – 10 units

BOURNEMOUTH WHOLESALERS
01202 470443

SPARES & COMPS

SURPLUS/REDUNDANT ELECTRONIC COMPONENTS WANTED

I/Cs – Tuners – Transistors – Valves – Diodes etc. any quantity considered – immediate payment.

ADM General Trading
Tel: 01827 873311 Fax: 01827 874835

LINEAGE

DECODER TO COMPUTER Interface card with smart card connectors and diagram £9.00. E.M.O. 62 Bridge Street, Ramsbottom, Lans, BL0 9AG. Tel: 01706 823036.

AVO MULTIMETER Model 8, £45.00. 500 volt meters £30.00. Prices plus VAT and p & p. Send SAE for lists of Surplus Instruments & Scopes etc. A. C. Electronics, 17 Apleton Grove, Leeds LS9 9EN. Tel: 0113 2496048.

GRUNDIG TELEVISION always wanted, any quality. Tel: 01229 582557.

OCHRE MILL Technical Services, Grundig TV spares for most models to 1985, fast, friendly, helpful, sensible prices. Gt Lype Farm, Charlton Nr, Malmesbury, Wilts SN16 9DR. Tel: 01666 823228.

PRIVATE RETAILER has excellent part exchange colour televisions and videos to clear. Tel: 01494 814317.

FOR SALE Pye video 2000 23VR24 in working order with forty re-usable reversible tapes. £50.00. Tel: 01364 652159.

BUSINESS FOR SALE

JAMES WOOTTON
RETIREMENT SALE

Transistors + I.Cs + Audio spares + Transformers + 1000's Service manuals + Capacitors + Video Idlers + Motors + Belts + Leads + Tools + Electrical spares + 1000 Lin Bins & Back Plates + Fixtures & Fittings + Counters + Computer Syst. etc. Carriage + VAT. No Lists.

All Must Go regardless of cost or buy the complete business.

Stuart House, Arnold Street, Nantwich, Cheshire CW5 5QB
Tel: 01270 628096

ROFFCO TV CENTRE
TV & Electrical Trade Warehouse

CHRISTCHURCH, CAMBS
Tel: 01354 638304. Fax: 01354 638488
OPEN TO THE TRADE AND EXPORT.
FOR THE BEST PRICES IN WORKING & OFF PILE.
TVS, VIDEOS, FRIDGES, FREEZERS, COOKERS, WASHERS, MICROWAVES, COMPUTERS, etc, etc
OPEN: MON/FRI. 9am to 5pm

RECRUITMENT

We're looking for people who really stand out!

AUDIO/VISUAL BENCH AND FIELD ENGINEERS

Nationwide

You will use your technical skills to ensure that all customer and stock repairs are carried out quickly, accurately and with the minimum of fuss. However this is only part of the story: a lot of your time will be spent with customers, talking over any A/V problems they may be experiencing and offering advice and reassurance in a friendly and sympathetic manner. Therefore your role is crucial to maintaining our current high standards of customer service.

To fill this role to its full potential demands a special blend of experience and skills. You will need to be a fully qualified engineer with well developed communication skills and the motivation and enthusiasm to deliver your best at all times.

You will work a 39 hour, five day week spread over six days, which includes every Saturday and two late evenings. Because we value highly the skills and commitment you will bring to the role, we offer a competitive salary, excellent holiday allowance and a generous staff discount on our goods. You would expect nothing less from NORWEB Retail, one of the country's leading electrical retailers.

If you are interested in this post, please send a full CV outlining your experience and current salary and stating preference for Bench or Field, to: NORWEB Retail Personnel, PO Box 148, Manchester Road, Bolton BL3 2SW no later than Monday 5th February 1996.

Applications will only be acknowledged on receipt of an S.A.E. If you have not heard from us within three weeks of the closing date, please assume that you have been unsuccessful.

Equal consideration will be given to all applications, irrespective of sex, race, creed or disability. To support a healthy working environment NORWEB operates a No Smoking policy.

NORWEB
ELECTRICAL SUPERSTORES

T14010

TRANSFORMERS

TV LINE OUTPUT TRANSFORMERS

PHONE: 0181-948 3702 FAX: 0181-332 0583

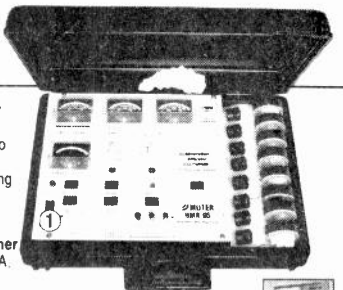
ALBA · AMSTRAD · BUSH · DECCA · DORIC · BLAUPUNKT · FERGUSON · FIDELITY · GEC · GRUNDIG · GRANADA · HITACHI · HINARI · INDESIT · ITT · KIMARA · NIKKAI · MATSUI · MURPHY · OSAKI · NORDMENDE · LOEWE-OPTA · PANASONIC · PYE · PHILIPS · SANYO · SAISHO · SHARP · SONY · SOLOVOX · SUSUMU · TANDBERG · TELEFUNKEN · THORN · TRIUMPH · THOMSON · GOLDSTAR · BINATONE ·

FULL RANGE OF KONIG: VIDEO HEADS, BELT KITS, IDLERS, PINCH ROLLERS, TENSION BANDS.
LARGE RANGE OF REMOTE CONTROLS IN STOCK

TIDMAN MAIL ORDER LTD · 236 SANDYCOMBE ROAD · RICHMOND · SURREY · TW9 2EQ
Approx. 1 mile from Kew Bridge.
Mon-Fri 9 am to 12.30 pm & 1.30-4.30 pm

TEST EQUIPMENT

MÜTER



❶ **BMR 95 unique Regenerating-Computer and Analyser** for CRTs, regenerates picture tubes even better, also if all other machines do not suceed, removes short filament-cathode-grid 1-gric 2, with FLASH-EX against remaining gas, 162 adapters available, list with 12.500 tubes-types, pays itself within 4 weeks.

❷ **RTT 3 Safety isolated variable Transformer** input 220-230 V, output 0-270 V / 4 A, 1100 VA.

❸ **AT 2 audio multi-function tester**, substitutes 16 devices, has all usual sockets, cuts down repair time, takes you through all necessary test-steps by button controls.

❹ **CBE Screen-Demagnetiser** with strongest field for screens up to 110 cm, 220/230 V, 2.7 A, 600 VA.

Ask for free catalogue

S.E.M.E. Ltd. Melton Mowbray, Leicester
Phone (0 16 64) 6 53 93, Fax 48 18 18

IRL: Dönberg Electronics, Ranafst, CO Donegal
Phone (0 75) 4 82 75, Fax 7 10 31

ADVERTISERS' INDEX

TA8691N	£3.00	BUX84AF	£0.50	HGA1124A	£0.50
TDA1510	£2.00	BY187	£0.05	HA11440	£1.00
TDA1521A	£2.00	BY228	£0.10	HA11485	£1.00
TDA1543	£1.00	BY229	£0.06	HA11485ANT	£1.50
TDA2460	£2.00	BY255	£0.05	HA118041NT	£1.50
TDA2582	£1.00	BY299/200	£0.15	HA1196	£0.50
TDA2541	£1.00	BY299/800	£0.30	HA51338SP-1	£2.00
TDA2600	£2.00	BYT71/800	£0.15	HA51338SP-3	£2.00
TDA2611A	£1.00	BYV19-30	£0.15	HCF4520	£0.50
TDA2613	£1.00	BYV28-200	£0.15	HCF4520BE	£0.50
TDA3048	£1.00	BYV95	£0.03	HD6140425 J11	£0.50
TDA3564	£3.00	BYV95B	£0.04	HEF4029BP	£0.20
TDA3565	£3.00	BZW – C110	£0.05	HEF4093	£0.20
TDA4650	£3.00	BZW83 – C20	£0.03	HE4528BP	£0.15
TDA8417-3	£3.00	CA3123Q	£0.50	HM6264ALP-15	£3.50
BU801	£0.50	CD4555BE	£0.20	IN5401	£0.03
BUK454/600	£0.40	FE3B – General Inst		IR106A	£0.10
BUW11	£0.40	Diode	£0.04		

AN5551	£1.00
CF72303	£1.00
ST6385BB 1/BFY	£2.00
SN96551 NL	£3.00
SAA1061	£3.00
SAA3018	£1.00
STR58041	£4.00
BF870	£0.20
BF869s	£0.20
UPD6376CS	£3.00
BC550C	£0.20
M58658P	£1.00
M708 ABI	£1.50
M708 LBI	£1.50
BY208-800	£0.10
BYV28/200	£0.10
2435121	£10.00
2436792	£10.00
2436797	£10.00

STK5481 £4

STR4211	£5
STK4793	£5
LA7830	£1
LA7831	£1
ST6391B1/BC	£2

FERGUSON ICC7 T/V Amplifier 2 way Gain 7DB £8

VT130 Head & Motor	£15.00
Phono Plugs	£0.10
Tower 7mm Plastic clips 100 off box	£0.50
Infra-red TX100 Receiver ICSL486	£0.50
Hitachi 68P Issue 6 Teletext PWB F.S.T.	£15.00
Hitachi PC315-11 Issue 7 Teletext Panel	£15.00
Hitachi PC232A5 Issue 4 Teletext Decoder	£15.00

2435063 / 2435085 L.O.P.T. £10

Focus Pots K40 £2

Etri 240v fan 6in	£8.00
DL701 Delay	50p
DL711 Line	50p

TMP47C634N/2685 £1

Matsui VX3000 Hand Set	£3.00
VCR Head VX3000	£10.00

TMP47C634N £1

Matsui VSR1500 Head	£10.00
Hand Set	£5.00
Power Supply	£6.00
Main Panel	£5.00
Captan Motor IC No M56730 ASP	£10.00
Hitachi Capstan Motor ACE G4-B to ACE G40-B	£10.00
Hitachi Video Hand Set RM933E	£30.00
VT530 Pre-Amp	£10.00
Amstrad VS1000-VS1100 Power Supply	£6.00

4MHz XTALS
6MHz XTALS
10MHz XTALS
18.432MHz XTALS
24MHz XTALS
30p Each

Text Panel No. T1228B for Ferguson TX89-TX98-TX100

4.4 T/V XTALS	each £0.30
8.8MHz T/V XTALS	each £0.30
Mitsubishi RMM35 Hand Set Video	£5.00
Nokia RC202 Hand Set	£4.00
Sanyo A09801 Hand Set Video L.C.D.	£7.00
Siemens Hand Set 1994 Model T/V Video	£5.00
Tuner Env-57459GI UHF-VHF	£3.00
UF754B UHF Tuner	£3.00

NEW BLUE CAP LNBS £5
OK TESTED 10.7 to 11.7 GHz

FV31R FERGUSON
64 pin Main IC HD6140815 £1

Rohde & Schwarz T.V. Generator
D/D2 Mac SGDF £2,500

Digital Test Pattern Generator
Model 588A Shibasoku Co. Ltd

J.V.C., Ferguson and Philips Cassette Adapter
VHSC/VHS, also for S-VHS £10

TX89 Tubase Panel	£5.00
TX98 Tubase Panel	£5.00
TX99 Tubase Panel	£5.00

Orion Motor **50p each**

2NZ/2KV
4N7/4KV
5N6/2KV
6N2/2KV
9N1/2KV
1IN/2KV
PULS **15p EACH**

Capstan Motor £4
Mitsubishi HSE41
IC on Motor M51782ASP

35V/3300 Can	25p
U412 Tuner	£5.00

8 Way Tuning Pots 50p

UHF Small Tuner UE30 and UE33 £3.00

Power Supply 12V – 3amp
for Ferguson Video Star Camera £4.00

24V Sub Min Relays £0.25

Positor 2322 662 98009	50p
Positor 2322 662 98012	50p

3 Pin PO5. PTH451 Black Type 70p

PERISWITCH £6.00

LOPT – 3216001	£5.00
LOPT – 3714016	£5.00
LOPT – AT2071/25 – TOSHIBA	£10.00
LOPT – AT2077/81	£12.00
LOPT – DST85B243 401-532-00 – IK2 FERGUSON	£10.00
LOPT – DST85B243 401-532-00NC – FERGUSON	£10.00
LOPT – DST85B243 472-359-01NC – ICCS	£10.00
LOPT – DST85B243 473-197-00NC – FERGUSON	£15.00
LOPT – DST88B243 400-086-AONC – FERGUSON	£10.00
LOPT – DST85B243 400-086-AONC – IK2	£10.00
LOPT – DST88B243 400-086-AONC – TOSHIBA	£10.00
LOPT – DST88N243 478-052-OOO – TOSHIBA	£12.00
LOPT – DST88N243 478-052-OOC – IK2 FERGUSON	£10.00
LOPT – DST88N243 478-052-OOC – TOSHIBA	£10.00
LOPT – DT2076/78	£10.00
LOPT – FCC2015DE	£12.00
LOPT – FERGUSON – GREEN SPOT	£12.00
LOPT – FERGUSON – WHITE SPOT	£12.00
LOPT – T6045L – FERGUSON	£10.00
LOPT – TC2203 – NATIONAL PANASONIC	£15.00
LOPT – TFB3035D	£10.00
LOPT – TFB3089D – TOSHIBA	£8.00
LOPT – TFB4023AD – TOSHIBA	£10.00
LOPT – TFB4032BD – TOSHIBA	£10.00
LOPT – TFB4038AD	£10.00
LOPT – TFB4088AD – TOSHIBA	£8.00
LOPT – TFB4110AD – TOSHIBA	£10.00
LOPT – TLF1456B – NATIONAL PANASONIC	£15.00
LOPT – TLF1457B – NATIONAL PANASONIC	£15.00
LOPT – TLF701/6 – NATIONAL PANASONIC	£15.00
LOPT – TX89	£12.00
LOPT – TX98	£12.00
LOPT – TX99	£12.00
LOPT – Y260781 – FERGUSON	£8.00
MOTOR – CASSETTE TYPE – 12V WITH SPEED CONTROL	£0.50
PANEL – CMC115 – TTT FRONT PANEL – ITT	£6.00
PANEL – CVC80 POWER PANEL	£5.00
PANEL – ICC5 CHROME BOARD – IC No. ON BOARD U4647 TKE OR HA11498	£6.00
PANEL – ICC5 – TUBE BASE PANEL	£5.00
PANEL – IK2 – FM2211 STEREO	£5.00
PANEL – SEL 69112407 – TTT FRONT PANEL – SAME AS CMC303	£6.00
PANEL – SEL 1FB 194P – TTT FRONT PANEL – ITT	£6.00
PANEL – SEL 1FB150 U/K – TTT FRONT PANEL – ITT	£10.00
PANEL – SEL 1FB300 – TTT FRONT PANEL – ITT	£10.00
PANEL – TX9, TX10 – TUNING PANEL 1599G	£5.00
PANEL – TX10 – REMOTE PANEL 540/01	£5.00
PANEL – TX89	£10.00
PANEL – TX90 – THORN FRONT PANEL – 8 PUSH BUTTONS 01M4-515-002	£10.00
PANEL – TX98 – TI353E FRONT PANEL W/INFRA-RED RECEIVER	£5.00
PANEL – TX98 – TUBE BASE PANEL	£5.00
PANEL – TX98, TX99, TX100 – REMOTE – M494B1 – 01V6/223/104	£10.00
PANEL – TX98, TX99, TX100 – REMOTE – M494B1 – 01V6/682/003	£10.00
PANEL – TX99	£5.00
Tripod shoulder pod for camcorder	£5
Ferguson VA super 218 cardioid camera microphone telescopic boom and stand	£12.50
Ferguson camcorder battery VA366 6v–1400 M/A	£5
Mitsubishi video hand set r.m.m. 45	£7
Ferguson lens for camcorder 2 off tele conversion lens x 1.4 and x 0.7	
Ferguson TX98, TX99 Text Panel T1228B	£15
RC Matsui hand set £5. Equivelant models Pace 900, hand set Ferguson, Sony, Grundig	£8
6 VA RS Encapsulated main transformer 0-120v-0-120v Pri 0-9v-0-9v Sec	
Burglar alarm kit main control panel. Send for data	£12.50

Bullet Type L.N.B.S. New £3
Not Tested 10.7 to 11.7 GHz

P.S.U. AC 12v 500MA £1.00
P.S.U. AC 9v 1A £1.50

ITT CMC201 Panel £10

£10 each FERGUSON Line Transformers

TX9 LOPT	£4
TX10 LOPT	£6
Green Spot	£14
White Spot	£8
Blue Spot	£10
Yellow Spot	£8
Red Spot	£6

DECCA LCD

NICAM HAND SET £4

RECEIVER

PHILIP INFRA RED £1
Ideal for Hand Set Tester

2435013
2436771
2436773
2435012
2435085
2436795
2436792
2435066
2435063
2435016
2435064
2434002
2435062
2436797
2433752
2433952
2434141
2434451
2434494 - £12
2434492 - £12
2434274
2434393
2432981
2435372
2435701
2432351
2432211
2432984
2432491
2432871
2432851
3220029
3714016
3216001
47003481

36761
36061
36162
36362
36383
36481
36482
36831
36832
36922
36943
36962
AT 2078/25
AT 2076/78
AT 2077/81 - £15
AT 2076/88
TFB 3035D
TFB 3069D
TFB 4023AD
TFB 4039AD
TFB 4066AD
FCC 2115BE
TLF 14567F
TLF 14568F

LOPTS £10 EACH

Y260482
2435121

FERGUSON TUNERS TX90/TO100 - £4

DST 85B 235/47328700 40153200
DST 88N 234/4000086 AD 47805200 L
DST 81N 243/472593.00
DST 186N 243/473058.00

£10 each

HITACHI

HM9204A Thick Film	£3.50
2x and 4x Magnifier	£3.50
Samsung & Orion Video Decks with heads	£16.00
TV & Video hand set	£2.00
Orion TV & Video Handset	£2.00
B Sky B VHF to IF Block Converter	£1.00
10 Panels Ferguson Mixed from TX9 to ICC5	£20.00
TV Aerial Ring Type	40p
TX100 Remote Handsets	£6.00
UHF Tuner for ICC5	£5.00
VHF Tuner for ICC5	£5.00
Amstrad-Double Decker Switch Mode POWER SUPPLY	£5.00
Amstrad-Long Chassis and Short Chassis Power Supply Models 1991/1992	£4.00
Ferguson Switch Mode Transformer TX85, TX86, TX100	each £3.50
ICC5 Ferguson Switch Mod Trans 3112-338-32642	£4.00
12v DC and 24v DC Power Supply regulated	£2.00
Ferguson U/V Camcorder Battery VA310	£4.00
Desolder Pump	£2.00
IF Panel for Philips CP90-CP110	£5.00
Philips Solder Iron 25w-240v	£6.00
Portasol Hobby Gas Solder Iron	£10.00
Philips KT3 Text Decoder K40	£7.00 £7.00
ICC5 Tube Base on Panel ICC5 Decoder Panel	each £5.00

KT3/K30 T/Text	£8.00
Handset	£8.00
KT3/K30 Full Remote	£8.00
Pye & Philips Handset KT3/K30 Chassis No. RC5150-RC5176-RC5071-RC5177	Special Price £8.00
RC4001 KT3 and Teletext	£8.00
TX10 Handset Text	£12.50
TX9 with Text	£12.50
TX9 & TX10 Button Print	£1.00
TX10 Focus Pots	£4.00
Mains Stand-by Switch with Coil	£1.00
Nicam Boards Texas Instruments MkII	£10.00
Toshiba Nicam Board	£6.00

TDA3561A	£3.00	BYX55/600	
TDA3566	£3.50	(Bead)	10p
TDA3564	£4.00	BYT71/600	15p
TDA3565	£3.00	BYV95B	10p
TDA3581	£3.00	BYV95C	12p
TDA3590	£3.00	BYV96D	10p
TDA3591	£1.00	BYZ106	10p
TDA3592A	£3.00	BPW41	15p
TDA3650	£7.00	BYW56 2A/	
TDA3651	£3.00	1000v	8p
TDA3651AQ	£3.50	BYW29/50	15p
TDA3652	£3.50	BYW95C	10p
TDA3653AQ	£2.00	2SC3795	30p
TDA3654	£1.00	2SC3973B	30p
TDA3654Q	£2.00	2SC4313	£1.00
TDA3710	£3.50	2SC7350	15p
TDA3800	£4.00	2SD180 TO3	
TDA3803A	£4.00	80v/t	15p
TDA3180	£2.00	2SD200	£2.00
TDA4260	50p	2SD401	£1.00
TDA4501	£3.00	2SD716	£1.00
TDA4505NE	£3.00	2SD787	30p
TDA4420	£2.00	2SD789	30p
TDA4439	£2.00	2SD820	£1.00
TDA4600	£3.00	2SD868	75p
TDA4601	£2.00	2SD880	30p
TDA8190	£3.00	2SD1264	£1.00
TDA8703	£3.00	2SD1266	£1.00
TDA8349	£3.00	2SD1398	£1.00
TDA9403	£1.50	2SD1415	£1.00
TDA9503	£3.00	2SD1427	£1.00
TDB2033	£1.00	2SD1432	£1.00
TDD1610S	50p	2SD1453	£1.00
TD6303P	£2.00	2SD1556	£1.00
TDA1060	£3.00	2SD1576	£1.00
TEA1009	50p	2SD1577	£2.00
TEA1039	£2.00	2SD1878	£1.00
TEA1060	£2.00	TDA3560	£2.00
TEA2029C	£3.00	TDA3654	90p
IK7 ST6391 B1	£3.00	TDA3653AQ	£1.00
ST6393 B1/1M	£3.00	TDA3562A	£0.00
BYX10	10p	STR4211	£6.00
BYX38/300	25p	STR6020	£6.00
BYX55/350	10p	STR6602D	£4.00

REMOTE TX100 Front Panel £4

LEADS Scart to Scart all pin connected £2.00 1½ metres

TX 9 Remote Panels £5
TX 10 Remote Panels £5
TX 90 Remote Panel No. 139-001
IC Nos. M293B1 & TMS 1000 ..... £10 each
TX 100 Remote Panels
IC M293B1-SAA5012 ..... £10
TX 100 Remote Panels with Stand-by Battery and ICs £10
TX 85 – 86 – 89 – 90 – 98 – 99 – 100 Tuners £4
Orion Modulator Video MDLK 6B513A £2.50
Hitachi Mains Switch with Stand-by 50p
Scart to 4 Phone Leads 1½m £2.50
SXT2302234 Sat. Tuner with Base Band Min £4

HITACHI

Handset £5.00 each
CLE 874A CLE 883A
CPT2158 (No Replacement) £5.00

IR3506
CPT1408T
CPT2176
CPT2178
CPT2176
CPT2478

£10 INVERTER 12V IN 24V OUT 9 AMPS

TV DIODES MIXED 100 for £3

All modules £8 each

ITT IF Modules
5827-01-51
5827-02-51
5827-03-51
5828-04-10
5829-02-58
5829-05-52

ITT – NOKIA RF-IF Modules
4828-04-10
5827-01-51
5827-02-51
5827-03-51
5829-01-05
5828-03-41

PANASONIC-TV

Handsets for models: TC1632, TC1642, TC2232, TX2034, TX2044, TX2200, TX2234, TX2244, TX2200, TX2234, TX2244, TX2300, TX2636, TX3300, RC201 replaces TNQ1411 2 £8.00 each

HITACHI sets		HANDSETS	
STR454	£2.00	Amstrad Export	£3.00
STR6020	£6.00	Amstrad U/V	£3.00
SS2000AF		Amstrad 6800	£4.00
line o.p.	£1.00	Amstrad 6000	£15.00
2SC940	£1.00	Amstrad 4700	£5.00
BU105/04	80p	Amstrad 4600	£3.00
BU108	£1.00		
BU124	50p	10081 GEC	£3.00
BU126	80p		
BU180a	65p	FERGUSON Handsets	
BU204	60p		
BU205	75p	BSB	£1.50
BU206	£1.00	ICC5	£5.00
BU207	£1.00	IK2000	£5.00
BU208	80p	IK7000	£5.00
BU208A	£1.50	SRD 2	£1.00
BU208D	90p	SRD 3	£1.00
BU222	£1.00	T780	£2.00
BU326	£1.00	SRD 4	£1.00
BU407	60p		
BU508A	90p	HITACHI Microwave Turntable Motor £10	
BU508AF	£1.00		
BU508D	80p		
BU705	£1.00	SANYO TDO 124EB UHF VHF Tuner £3	
BU806A	£1.00		
BU807	£1.00		
BU808DFI	£1.00		
BU826	£1.00	SUPER HIGH CAPACITY BATTERY VA310 9.6V 700 m/A £3	
BUK454-600	£1.00		
BU824	50p		
BUT11	50p		
BUT11AF	£1.00	VPT ADAPTOR VA354 FERGUSON £5.00 (TEXT)	
BUT13 600V-28A	£1.00		
BUT18AF	£1.00		
BUW84	60p		
BYW20-08-9	£1.00	06D4-025-001 Mains Input Choke for TX9 £4	
BYW95	10P		
BUX39 25A-150V	£1.00		
BUX84	50p		
BUY49	20p		
BUK444-800	£2.00	THORN M494B1 on Remote Panel £5	
BUK445/600	£2.00		
BUK454/600	£2.00		
TDA3047	£1.00		
TDA3048	£3.00		
TDA3083	£2.00		
TDA3190	£1.00		
TDA3301	£3.00		
TDA3505	£3.00		
TDA3506	£3.00		
TDA3561	£3.00		
TDA3560	£4.00		

Text-Type
Replace Handset for Philips KT3/K30, K4 etc £6.00

Thorn Handsets
9000-9600-TX9-TX10-TX100
Text and Non-Text £10.00

Philips RC5171 Handset £8.00

Sanyo Magnatron
Type 2M218H £10.00

1992 to 1993 Mod.
Orion Video handset with LCD £5.00

SATELLITE TUNER UNIT 2427611
with Base Band, Video Out £6.00

AMSTRAD Long Chassis
Display Panel 1992/1993 £4.00

Amstrad Tuner UE33-B01	£3.00
TX10 Focus Units	£6 for £10.00
Conversion Kit ITT Teletext	£8.00
Burglar Alarm Siren 12 Volt	50p
Amstrad 6000 Head with motor LP	£10.00
Good Lower Drum	£3.00
Tuners Nat. Pan. Small. UHF/VHF	£3.00
U321 – U341 – U342 – U343 – U344 – U944 Tuners	each £5.00
U743 – U744	£3.00
Tuner. IF TERC8-022A TBJZ4-00ZA Alps	£7.00
15 Mixed hand set LCD Video T/V	All new £20.00
Keyboard Mains Adaptor 12v/800m/a	£5.00
U411 - U412 Tuners	each £5.00
LNB'S MARCONI Ex Rental Black Cap No Guarantee	£2.00
Bridge Rectifiers	10 for £1.00
Matsumi Miniature Infra Red Receiver	£1.00
Turntable Satellite Modulator TV	£1.00
Sound 5.5 MHz MPM 1000T	£1.00
Sound 6.0 MHz MPM 1040	£1.00
FERGUSON CHASSIS New TX100 Yellow Spot	Post £5.00 £14.00
Ferguson FV31R Remote and Power Supply FV31R Display Panel Post £2	£5.00 £5.00
Quartz Halogen 500w. 200v. For outdoor lamps	£1.00
AMSTRAD Plastic Front with Flap 8.900	£3.00
Clock Display Panel 8.900	£5.00
TX 100 FST Chassis LOPT No. 260482 £5 Post	£20.00
Sharp Tuner & IF 1810587 PA1 UK	£3.00
KT3/K30 Tripler	£5.00
U/V Tripler	£4.00
Grundig Tripler with Focus Pot	£7.00
BG 2087-642-1005 Triplers	£7.00
BG 2032-642-3002	£7.00
PERDIO PV 1188 Handsets	£3.00
BU 208A, BU 508A, BU 508D, BU 508AF, BU 508DF	£1.00 each
BU 801	60p
2SD 1398	£1.00
BUT 11AF eqv	30p
Min Sat Receiver with IC M491 BB1, has tuner modulator etc	£5.00
FERGUSON Sat. Modulator SRD-3-4	£2.00
FERGUSON SRB1 modulator	25p each
Regulated power supply. 500m/a 3-12v	£5.00
HITACHI 620E head and drum	£12.00
AMSTRAD Nicam head and drum	£12.00
AMSTRAD 6000 head and drum	£12.00
TATUNG universal tuner 205, or eqv with aerial socket	£8.00

U/V REMOTE HANDSET
5 IN ONE TV1 - TV2 - VCR £15
SAT - AUX

BURGLAR ALARM
Use Infra Red Detector
Wide or Short Angle
Wall Mount, with Relay £8.00

MODULATOR KIT £5
5v to 12v for all cameras etc.

6251 FRAME O/P THICK FILM
HITACHI GEC £9.00
THICK FILM
HITACHI HM9205A £4.00

PHILIPS NEW TYPE U/V HANDSET £10

06D4-025-001
Mains input choke for TX9 £4

TX100 REMOTE PANEL No. 56413IC M293B/ and SAA5012 £10 etc.

SENDZ COMPONENTS

63 BISHOPSTEIGNTON, SHOEBURYNESS, ESSEX SS3 8AF
NORMALLY SAME DAY SERVICE • SUBJECT TO AVAILABILITY
No accounts • Technical information by telephone only • No credit cards
Unless specified add £1.70 P/P to small orders • Additional charges for heavier items • Specific P/P charges are PER ITEM • For UK addresses please add P/P TO ORDER THEN 17½% VAT TO TOTAL • This applies for the EC unless VAT No. is given • EXPORTS – P/P at cost • Postal Order/Cheque with order.
Callers to shop – 212 London Road, Southend • Open 9.30-1, 2.15-5.
Tel: 01702 332992 • Fax: 01702 338805 •
GVMT/School orders on official headings