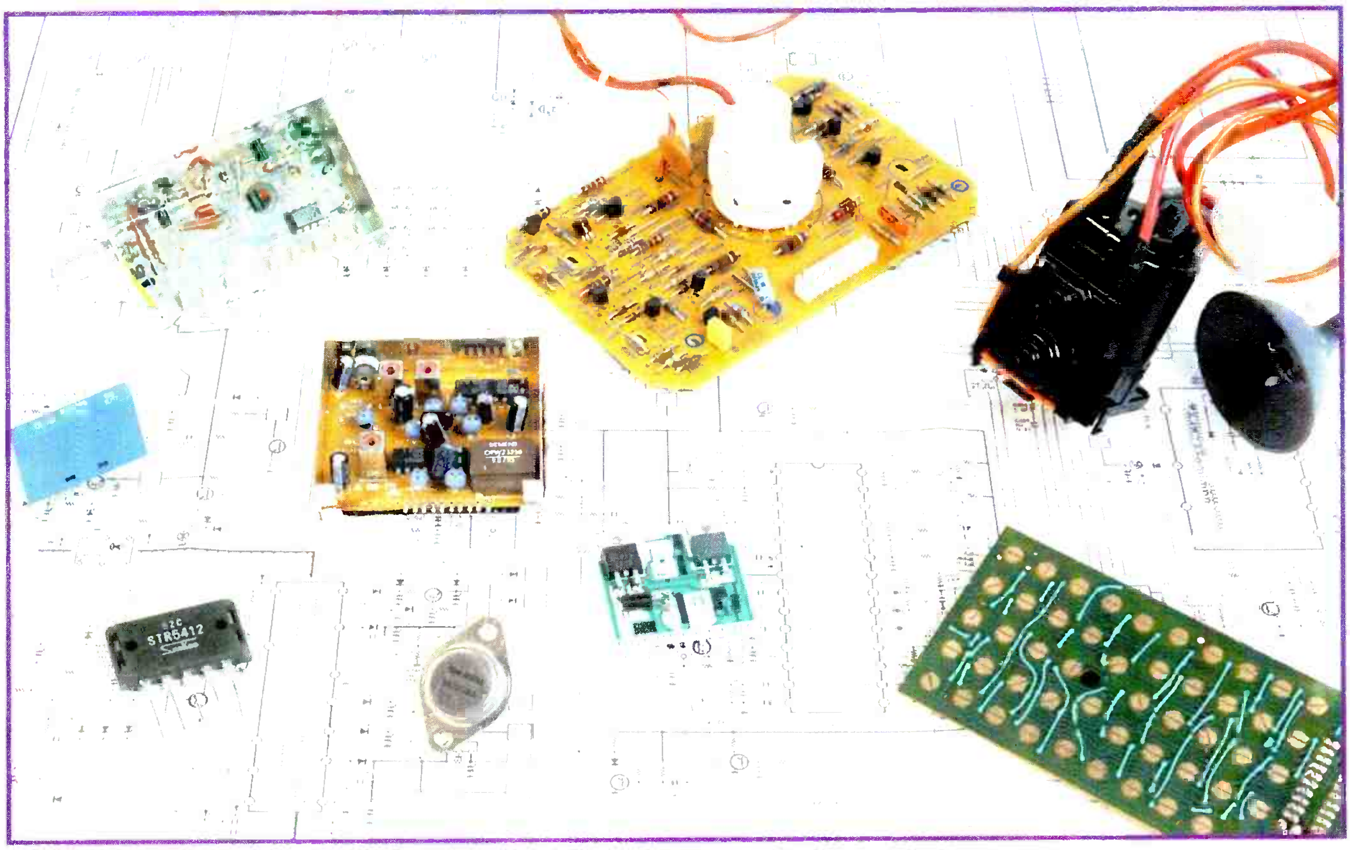
JANUARY 1993 £2.20

TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

FREE 1993 YEAR PLANNER



Modern TV Receiver Techniques

Fault Guide for the BBC B Computer

All about Electrolytics · Camcorner

The Scartbox · DMM Test Report

More on the Philips KT3 · DXTV

VCR Clinic · TV Fault Finding

A REED BUSINESS PUBLICATION

01
9 770032 647047

TELEVISION

January 1993

Vol. 43, No.3
Issue 507

On sale December 15th

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", 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 to Vols. 39 and 40 are available at £2.00 from the Editorial office (address above) Indexes to Vols. 37 and 38 are available at £1.50 each. Photostats of the indexes to Vols. 31 – 36 can be supplied at £1.00 each. Make cheques etc. payable to Reed Business Publishing Ltd.

Binders that hold twelve issues of **Television** are available for £5 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

SUBSCRIPTIONS
An annual subscription costs £23 in the UK, £28 overseas (by surface mail – airmail quote on request). Send orders with payment to Quadrant Subscription Services Ltd., Oakfield House, Perrymount Road, Haywards Heath, Sussex, RH16 3DH.

Subscription hotline for 24-hour ordering with Credit Card. Telephone number 0622 72166 quoting reference INJ.

BACK NUMBERS
Some back issues are available at £2.75 each from Television Back Issues, Room L323, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Make cheques/postal orders payable to Reed Business Publishing Ltd. See box on page 214.

OUR NEXT ISSUE DATEDFEBRUARY WILL BE PUBLISHED ON JANUARY 20th

BC107	8p
BC108	8p
BC109	8p
BC109C	10p
BC140	20p
BC141	20p
BC142	20p
BC143	20p
BC147	8p
BC148	8p
BC149	8p
BC157	8p
BC159	8p
BC160	30p
BC171	10p
BC172	10p
BC177	14p
BC178	14p
BC179	14p
BC182	7p
BC182L	7p
BC183	7p
BC183L	7p
BC184	7p
BC184L	7p
BC212	7p
BC212L	7p
BC213	7p
BC213L	7p
BC214	7p
BC214L	7p
BC237	7p
BC238	7p
BC239	7p
BC300	20p
BC301	20p
BC302	20p
BC303	20p
BC304	25p
BC327	7p
BC328	7p
BC337	7p
BC338	7p
BC441	28p
BC446	8p
BC449	15p
BC461	28p
BC477	18p
BC478	18p
BC516	22p
BC537	25p
BC546	8p
BC547	8p
BC548	8p
BC549	8p
BC550	8p
BC556	8p
BC557	7p
BC558	8p
BC559	8p
BC560	8p
BC637	20p
BC638	20p
BC639	20p
BC640	20p
BCY70	16p
BCY71	16p
BCY72	16p
BD115	30p
BD124P	50p
BD131	25p
BD132	25p
BD133	50p
BD135	20p
BD136	20p
BD137	20p
BD138	20p
BD139	20p
BD140	20p
BD144	90p
BD157	38p
BD166	30p
BD175	30p
BD177	30p
BD179	32p
BD181	45p
BD182	60p
BD184	60p
BD187	30p
BD201	33p
BD202	38p
BD203	42p
BD204	42p
BD222	31p
BD225	31p
BD232	31p
BD233	30p
BD234	32p
BD235	28p
BD236	30p
BD237	21p
BD238	24p
BD239	30p
BD240	40p
BD241A	40p
BD243A	50p
BD244	50p
BD245	50p
BD246A	50p
BD265	45p
BD267	45p
BD269	45p
BD278	50p
BD311	100p
BD314	100p
BD315	150p
BD317	150p
BD331	40p
BD332	40p
BD361	60p
BD362	60p
BD370	30p
BD371	30p
BD410	50p
BD433	28p
BD434	30p
BD435	31p
BD436	30p
BD437	28p
BD438	30p
BD439	36p
BD440	40p
BD441	40p
BD533	40p
BD534	38p
BD535	38p
BD536	38p
BD537	40p
BD538	40p
BD643	50p
BD645	50p
BD647	50p
BD649	60p
BD675	40p
BD676	38p
BD677	38p
BD678	40p
BD679	40p
BD680	40p
BD681	45p
BD682	45p
BD705	50p
BD707	50p
BD709	50p
BD711	50p
BD736	50p
BD826	50p

BD828	50p
BD897	50p
BD899	50p
BD901	50p
BD977	50p
BDX32	100p
BDX33	60p
BDX65	80p
BDW23	55p
BDW24	55p
BDW93	60p
BDW94	80p
BDY92	100p
BF137	35p
BF167	30p
BF180	16p
BF181	18p
BF183	20p
BF195	7p
BF199	8p
BF200	16p
BF225	30p
BF240	16p
BF245	28p
BF254	15p
BF255	12p
BF256	18p
BF257	18p
BF258	18p
BF259	18p
BF262	25p
BF263	25p
BF270	18p
BF273	15p
BF311	21p
BF336	28p
BF337	20p
BF338	20p
BF362	30p
BF367	13p
BF371	17p
BFR40	25p
BFR90	52p
BFR91	99p
BFT43	30p
BFX29	20p
BFX84	20p
BFX85	20p
BFX87	16p
BFX88	15p
BFX89	60p
BFY17	30p
BFY18	40p
BFY50	14p
BFY51	14p
BFY52	14p
BFY56	25p
BFY64	25p
BFY90	45p
BLY48	85p
BR100	14p
BR103	37p
BR303	85p
BRY49	38p
BSS74	33p
BSX20	15p
BSX26	18p
BT100A	80p
BT106	180p
BT109	90p
BT119	100p
BT146	99p
BT151	58p
BTY79	140p
BU100A	110p
BU104	80p
BU105	80p
BU108	100p
BU109	80p
BU110	110p
BU111	140p
BU124	60p
BU126	65p
BU180	150p
BU184	100p
BU204	75p
BU205	70p
BU206	100p
BU208	70p
BU208A	60p
BU208AT	90p
BU208D	80p
BU209	140p
BU225	180p
BU226	190p
BU312	120p
BU325	55p
BU326	75p
BU406	70p
BU406D	88p
BU407	55p
BU407D	80p
BU408	78p
BU408D	85p
BU409	95p
BU426A	70p
BU500	100p
BU508A	70p
BU508AF	95p
BU508D	80p
BU508DF	115p
BU526	75p
BU536	100p
BU546	140p
BU608	150p
BU626	150p
BU636	150p
BU801	80p
BU806	75p
BU807	70p
BU902	130p
BU903	130p
BU920	130p
BU922	130p
BU930	130p
BUT11AF	70p
BUT12	80p
BUT56A	150p
BUX80	180p
BUX84	50p
BUX85	50p
BUY69A	200p
BUY71	300p
BUZ71	78p
C106D	28p
MJ1000	200p
MJ1001	200p
MJ10012	300p
MJ15001	250p
MJ15002	300p
MJ15003	325p
MJ15004	370p
MJ2501	110p
MJ2955	85p
MJ3000	115p
MJ3001	115p
MJE29A	30p
MJE30A	30p
MJE340	28p
MJE350	80p
MJE520	30p
OC28	350p
OC29	250p
OC35	350p
OC36	250p
OC45	50p
OC72	50p
OC200	180p

R2008B	100p
R2010B	100p
S2800D	82p
S2800M	72p
T2800D	82p
T2800M	72p
TIP29	15p
TIP29A	22p
TIP29C	25p
TIP30	28p
TIP30C	30p
TIP31A	22p
TIP31C	30p
TIP32	24p
TIP32A	21p
TIP32C	28p
TIP33	50p
TIP33C	60p
TIP34	50p
TIP34C	60p
TIP35C	65p
TIP36C	68p
TIP41A	20p
TIP41C	22p
TIP42A	20p
TIP42C	22p
TIP47	40p
TIP48	40p
TIP50	60p
TIP51	120p
TIP52	120p
TIP53	120p
TIP54	140p
TIP105	65p
TIP106	65p
TIP107	68p
TIP110	40p
TIP111	50p
TIP112	40p
TIP115	45p
TIP116	45p
TIP117	50p
TIP120	37p
TIP121	46p
TIP122	47p
TIP125	47p
TIP126	56p
TIP127	56p
TIP130	30p
TIP131	30p
TIP141	30p
TIP142	90p
TIP145	65p
TIP146	90p
TIP147	100p
TIP150	90p
TIP151	90p
TIP2955	42p
TIP3054	45p
TIP3055	42p
TIS44	40p
TIS61	15p
TIS90	15p
TIS91	18p
TIS93	20p
VK1010	88p
VN10KM	60p
VN66AF	100p
VN88AF	115p
ZTX107	11p
ZTX108	11p
ZTX109	12p
ZTX212	27p
ZTX300	13p
ZTX301	16p
ZTX302	16p
ZTX303	24p
ZTX304	17p
ZTX320	29p
ZTX500	13p
ZTX501	13p
ZTX502	18p
ZTX503	18p
ZTX504	25p
ZTX550	24p
2N696	26p
2N697	22p
2N698	40p
2N706	22p
2N708	22p
2N914	28p
2N930	18p
2N1131	28p
2N1132	28p
2N1613	24p
2N1711	24p
2N1893	30p
2N2102	50p
2N2218A	24p
2N2219	24p
2N2221	23p
2N2222	23p
2N2369	15p
2N2484	20p
2N2646	40p
2N2904	20p
2N2905	20p
2N2906	16p
2N2907	18p
2N2926	8p
2N3019	28p
2N3053	18p
2N3054	40p
2N3055	38p
2N3055H	50p
2N3440	58p
2N3442	85p
2N3585	120p
2N3702	9p
2N3703	9p
2N3704	9p
2N3705	9p
2N3706	9p
2N3707	9p
2N3708	9p
2N3710	12p
2N3711	12p
2N3771	85p
2N3772	90p
2N3773	100p
2N3799	18p
2N3819	29p
2N3866	88p
2N3903	11p
2N3904	11p
2N3905	11p
2N3906	11p
2N4031	25p
2N4036	28p
2N4062	12p
2N4064	100p
2N4401	12p
2N4403	12p
2N4443	76p
2N5061	20p
2N5088	20p
2N5192	60p
2N5241	500p
2N5245	30p
2N5294	30p
2N5296	30p
2N5366	28p
2N5401	12p
2N5448	12p
2N5496	80p
2N6107	40p
2N6292	40p

2N6385	120p
2N6403	160p
3N143	65p
DIODES	
Rectifier Diodes	
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	11p
BY210	22p
BY225	120p
BY227	19p
BY228	28p
BY296	20p
BY298	23p
BY299	22p
BYX10	15p
BYX55350	30p
BYX55600	25p
BYX70500	32p
OA47	10p
OA90	10p
OA91	10p
OA200	10p
OA202	10p
IN914	2p
IN4001	3p
IN4002	3p
IN4003	3p
IN4004	3p
IN4005	3p
IN4006	3p
IN4007	4p
IN4148	2p
IN5400	9p
IN5401	8p
IN5402	8p
IN5403	8p
IN5404	8p
IN5405	11p
IN5406	12p
IN5407	12p
IN5408	12p
RGP15	15p
RGP30	16p
SKE4F206	60p
SKE4F208	80p
SKE4F210	100p
SR2M	60p
I.C. SOCKETS	
8PIN	5p
14PIN	6p
16PIN	7p
18PIN	10p
20PIN	12p
22PIN	13p
24PIN	14p
28PIN	16p
40PIN	18p
ZENERS	
400 MW	
BZY88 RANGE	
2V7 to 39V	5p
1.3W	
BZX61 RANGE	
2V7 to 39V	9p
CRYSTALS	
Freq in MHz	
1.0	260p
2.4576	180p
3.276	115p
4.0	110p
4.194	130p
4.43	95p
5.0	130p
6.0	115p
10.0	140p
11.0	250p
12.0	120p
14.756	200p
15.0	160p
18.0	130p
18.432	130p
24.0	250p
48.0	160p
VOLTAGE REGULATORS	
7805	25p
7806	25p
7808	25p
7812	25p
7815	25p
7818	25p
7824	25p
7905	25p
7906	30p
7908	30p
7912	30p
7915	30p
7918	30p
7924	30p
78L05	24p
78L08	24p
78L12	24p
78L15	24p
78L18	24p
78L24	24p
79L05	35p
79L08	35p
79L12	35p
79L15	35p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	200p
LM317T	100p
LM323K	350p
LM723	35p
78H08KC	800p
78H12KC	700p
79HGKC	800p
VALVES	
DAF96	100p
DY87	80p
EB91	50p
EBF80	60p
EBF89	60p
ECC84	80p
ECH83	100p
ECH84	90p
ECL80	65p
ECL82	80p
ECL84	100p
ECL85	80p
EF85	80p
EF183	75p
EF184	85p
EL34	300p
EL95	85p
EL500	100p

EY86	70p
EY87	70p
EY88	80p
PC97	100p
PCC85	60p
PCF80	100p
PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	65p
PCL82	80p
PCL84	60p
PCL85	80p
PCL805	80p
PFL200	110p
PL36	120p
PL83	60p
PL84	80p
PL95	180p
PL504	120p
PL508	200p
PL519	430p
PY81	100p
PY88	100p
PY500A	190p
LED's	
3mm	
RED	5p
YELLOW	8p
GREEN	8p
5mm	
RED	5p
YELLOW	8p
GREEN	8p
RECTANG. LED's	
5mm · 2.5mm	
RED	5p
YELLOW	8p
GREEN	8p
LINEAR IC's	
AN203	210p
AN210	165p
AN214Q	170p
AN228	280p
AN240P	130p
AN252	150p
AN259	250p
AN262	140p
AN271	230p
AN274	250p
AN301	330p
AN303	250p
AN304	360p
AN315	210p
AN316	350p
AN360	100p
AN362	140p
AN366	150p
AN610	160p
AN612	160p
AN3312	350p
AN3320K	800p
AN3331K	900p
AN3792	400p
AN3794	450p
AN3795	500p
AN3821	800p
AN3821K	600p
AN3822K	700p
AN3830K	800p
AN3990K	300p
AN3991K	400p
AN5010	450p
AN5011	400p
AN5015	350p
AN5020	200p
AN5025	250p
AN5030	550p
AN5033	400p
AN5034	500p
AN5111	650p
AN5132	250p
AN5135	600p
AN5138	450p
AN5150	600p
AN5151	600p
AN5215	100p
AN5250	150p
AN5256	150p
AN5260	350p
AN5262	175p
AN5265	150p
AN5352	600p
AN5355	450p
AN5410	375p
AN5411	450p
AN5421	150p
AN5429	420p
AN5431	300p
AN5440	400p
AN5510	400p
AN5512	250p
AN5515	200p
AN5520	650p
AN5521	250p
AN5612	400p
AN5613	200p
AN5615	300p
AN5620	330p
AN5622	350p
AN5625	400p
AN5712	350p
AN5722	140p
AN5730	160p
AN5732	160p
AN5753	170p
AN5763	450p
AN5790	300p
AN5791	350p
AN5836	450p
AN5862	300p
AN6135	150p
AN6238	400p
AN6247	200p
AN6270	400p
AN6300	600p
AN6306	550p
AN6307	250p
AN6320	300p
AN6328	400p
AN6332	390p
AN6337	420p
AN6341	250p
AN6344	440p
AN6350	610p
AN6359	500p
AN6360	320p
AN6362	480p
AN6371	470p
AN6387	580p
AN6811	130p
AN6884	240p
AN7105	210p
AN7110	130p
AN7114	150p
AN7115	150p
AN7116	90p
AN7120	130p
AN7130	110p
AN7140	450p

AN7145	195p
AN7146	210p
AN7154	180p
AN7156	240p
AN7168	260p
AN7178	270p
AN7222	180p
AN7254	150p
AN7256	250p
AN7310	90p
AN7311	90p
AN7410	250p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
BA301	65p
BA311	80p
BA313	60p
BA333	100p
BA340	150p
BA401	60p
BA402	60p
BA511	160p
BA514	160p
BA516	150p
BA521	160p
BA524	240p
BA526	180p
BA527	95p
BA532	140p
BA534	290p
BA536	180p
BA546	180p
BA612	160p
BA656	150p
BA658	380p
BA684	400p
BA685	400p
BA1310	160p
BA1320	110p
BA1330	160p
BA1360	160p
BA4403	220p
BA5101	400p
BA5102	220p
BA5204	200p
BA5402	180p
BA5406	180p
BA5408	180p
BA6104	250p
BA6208	250p
BA6209	260p
BA6304	120p
BA6305	140p
BA6410	220p
BA6411	260p
BA6993	150p
BA7001	150p
BA7004	200p
BA7007	200p
BA7021	180p
BA7022	350p
BA7751LS	150p
BA7752	250p
BA7755	150p
BA7767AS	200p
CX108	950p
CX134A	950p
CX136	600p
CX139	1450p
CX139A	750p
CX141	750p
CX143	800p
CX143A	1250p
CX145	725p
CX150B	325p
CX158	825p
CX175	325p
CX186	750p
CX187	825p
CX804A	775p
CX832	825p
CX867	575p
CX868	525p
CX877	300p
HA1125	150p
HA1137W	135p
HA1197	150p
HA1199	145p
HA1319	240p
HA1338	300p
HA1339A	350p
HA1377	160p
HA1388	320p
HA1389	210p
HA1392	200p
HA1394	280p
HA1397	250p
HA1398	240p
HA11219	280p
HA11221	180p
HA11225	150p
HA11235	145p
HA11251	240p
HA11423	210p
HA11724	800p
HA12002	300p
HA12003	250p
HA12005	320p
HA12017	130p
HA13001	170p
HA13002	250p
HA13006	400p
HA13007	400p
HA13108	350p
HA13412	600p
HA13432	400p
HA17524	250p
HA17805	100p
ICL7106	650p
ICL7611	90p
ICL7660	240p
ICM7555	60p
ICM75556	80p
KA2101	100p
KA2102	150p
KA2130	150p
KA2206	150p
KA2209	125p
KA2210	230p
KA2212	80p
KA2213	130p
KA2214	150p
KA2261	100p
KA2263	100p
KA2264	100p
KA2284	100p
KA2401	150p
KA2412	350p
KA2912	125p
KA2914A	300p
LA1130	240p
LA1150	160p
LA1185	150p
LA1201	75p
LA1210	140p
LA1222	80p
LA1230	130p
LA1231	210p
LA1364	200p
LA1365	120p
LA1368	220p
LA1385	170p
LA1460	220p

LA2000	160p
LA2101	270p
LA2200	190p
LA3160	120p
LA3201	80p
LA3210	65p
LA3220	100p
LA3300	140p
LA3301	110p
LA3350	110p
LA3361	100p
LA3375	300p
LA4030	180p
LA4031	140p
LA4032	140p
LA4051	160p
LA4100	85p
LA4101	80p
LA4102	100p
LA4110	120p
LA4112	120p
LA4120	270p
LA4125	200p
LA4126	240p
LA4137	180p
LA4140	60p
LA4160	100p
LA4180	300p
LA4182	180p
LA4190	300p
LA4192	140p
LA4200	130p
LA4201	120p
LA4220	120p
LA4260	230p
LA4261	300p
LA4270	300p
LA4420	140p
LA4422	130p
LA4430	130p
LA4440	230p
LA4445	200p
LA4460	130p
LA4461	130p
LA4500	200p
LA4505	220p
LA4507	360p
LA4508	260p
LA4510	160p
LA4520	230p
LA4550	200p
LA4555	190p
LA4570	150p
LA5112	120p
LA5523	150p
LA5527	150p
LA5700	300p
LA6324	200p
LA7011	220p
LA7031	250p
LA7033	400p
LA7040	280p
LA7042	280p
LA7046	300p
LA7224	150p
LA7505	250p
LA7507	260p
LA7520	200p
LA7620	500p
LA7800	180p
LA7801	100p
LA7802	300p
LA7806	260p
LA7808	250p
LA7820	150p
LA7823	280p
LA7910	150p
LA7940	200p
LC7131	260p
LC7132	400p
LC7137	450p
LF347	110p
LF351	45p
LF353	48p
LF355	60p
LF357	70p
LF398	300p
LM301	26p
LM311	35p
LM319	165p
LM324	30p
LM335Z	120p
LM339	35p
LM348	50p
LM358	45p
LM380	80p
LM381	150p
LM382	130p
LM386	60p
LM387	100p
LM393	45p
LM709DIL	30p
LM710	45p
LM723	40p
LM741DIL	18p
LM741MET	45p
LM747	55p
LM748	30p
LM1458	30p
LM1889	300p
LM3900	40p
LM3909	80p
LM3911	160p
LM3914	160p
LM3915	160p
LM3916	270p
M50115P	320p
M50117P	500p
M50119P	525p
M50784	300p
M50786	500p
M50790	600p
M51161	300p
M51381P	200p
M51387P	900p
M51544	150p
M51848	150p
M54523P	200p
M54563P	200p
M58484	500p
M58655P	400p
M51516	260p
M51518	200p
MB3614	180p
MB3712	140p
MB3713	130p
MB3714	270p
MB3715	250p
MB3722	280p
MB3730	160p
MB3731	300p
MB3756	230p
MB3759	200p
MB8719	360p
MC1455	45p
MC1458	30p
MC1488	50p
MC1489	50p
MC1496	65p
MC3302	70p
MC3401	45p
MC3403	60p

NE555	20p
NE556	40p
NE565	110p
NE566	130p
NE567	115p
NE571	290p
NE592	85p
NE5532P	140p
SAS560	110p
SAA1006	300p
SAA1008	450p
SAA1010	400p
SAA1024	250p
SAA1025	250p
SAA1961	400p
SAA1075	350p
SAA1124	200p
SAA1220	400p
SAA1250	280p
SAA1251	380p
SAA1272	280p
SAA1274	280p
SAA3004	400p
SAA5000	200p
SAA5010	220p
SAA5012	400p
SAA5020	350p
SAA5030	440p
SAA5040A	280p
SAA5040B	400p
SAA5050	650p
SAB3013	200p
SAB3035	600p
STA301A	200p
STA401A	220p
STA403A	270p
STA404	290p
STA405A	280p
STA431A	250p
STA432A	220p
STA434A	270p
STA435A	270p
STA441C	220p
STA456C	240p
STA471	210p
STA901M	280p
STA8012	260p
STK0025	420p
STK0029	360p
STK0039	380p
STK0040	520p
STK0049	510p
STK0050	440p
STK0059	620p
STK0060	820p
STK0070	1100p
STK0080	580p
STK011	370p
STK015	490p
STK016	800p
STK025	700p
STK043	900p
STK050	2200p
STK056	820p
STK077	600p
STK078	620p
STK080	600p
STK082	580p
STK084	660p
STK085	1050p
STK086	870p
STK420	400p
STK430	500p
STK433	490p
STK435	400p
STK436	490p
STK437	500p
STK439	550p
STK441	680p
STK443	740p
STK457	500p
STK459	560p
STK460	720p
STK461	620p
STK463	780p
STK465	720p
STK501	580p
STK561	550p
STK563	480p
STK583	600p
STK734B	510p
STK745	600p
STK760	600p
STK770	750p
STK772B	480p
STK780	650p
STK1039	500p
STK1040	700p
STK1049	800p
STK1050	750p
STK1060	760p
STK1070	940p
STK1080	990p
STK2025	700p
STK2028	560p
STK2029	480p
STK2038	900p
STK2048	950p
STK2110	680p
STK2120	820p
STK2125	650p
STK2129	610p
STK2139	800p
STK2155	950p
STK2230	470p
STK2240	820p
STK2250	760p
STK3041	460p
STK3042	425p
STK3044	525p
STK3062	600p
STK3082	700p
STK3083	550p
STK3102II	600p
STK3152II	990p
STK3156	560p
STK4017	450p
STK4019	600p
STK4021	425p
STK4025	600p
STK4026	600p
STK4028	620p
STK4032II	650p
STK4036	500p
STK4038	680p
STK4042II	900p
STK4044	1000p
STK4046	1100p
STK4048	1280p
STK4060	580p
STK4101	650p
STK4111	660p
STK4112	950p
STK4121	600p
STK4122	560p
STK4131	650p
STK4132II	750p
STK4141II	420p
STK4142	800p
STK4151	680p
STK4152	750p
STK4161	700p
STK4162	650p
STK4171	850p
STK4172II	800p
STK4181	820p

STK4182II	800p
STK4191	850p
STK4192	800p
STK4231II	990p
STK4272	720p
STK4273	650p
STK4301	700p
STK4311	800p
STK4332	410p
STK4352	640p
STK4362	600p
STK4372	570p
STK4392	690p
STK4432	900p
STK4773	900p
STK4793	1100p
STK4803	720p
STK4813	950p
STK4833	810p
STK4843	720p
STK4853	900p
STK4863	850p
STK4873	990p
STK4893	1400p
STK4913	1180p
STK5314	550p
STK5315	600p
STK5322	620p
STK5324	520p
STK5325	450p
STK5331	400p
STK5332	220p
STK5333	275p
STK5335	450p
STK5337	600p
STK5338	350p
STK5339	500p
STK5342	300p
STK5361	420p
STK5372	300p
STK5412	400p
STK5421	525p
STK5422	500p
STK5431	650p
STK5434	650p
STK5436	600p
STK5441	500p
STK5451	480p
STK5457	425p
STK5461	700p
STK5462	675p
STK5466	675p
STK5467	500p
STK5471	400p
STK5473	600p
STK5476	500p
STK5478	500p
STK5479	350p
STK5481	420p
STK5482	300p
STK5483	550p
STK5488	600p
STK5490	500p
STK5725	600p
STK5730	600p
STK6431	850p
STK6722	900p
STK6732	1500p
STK6822	1200p
STK6922	600p
STK6932	600p
STK6962	320p
STK6972	630p
STK6981B	850p
STK6982	800p
STK7216	500p
STK7217	560p
STK7226	800p
STK7308	410p
STK7309	450p
STK7310	550p
STK7348	410p
STK7356	500p
STK7358	500p
STK7402	660p
STK7404	400p
STK7406	800p
STK7408	880p
STK7410	1200p
STK7554	1000p
STK7561	700p
STK7563	950p
STK8050	880p
STK8250	550p
STK8260	1600p
STK8280	1850p
STK73410	550p
STR370	400p
STR371	450p
STR380	400p
STR381	450p
STR383	475p
STR384	400p
STR440	475p
STR441	440p
STR450	520p
STR541	350p
STR452	600p
STR453	600p
STR454	450p
STR455	500p
STR456	600p
STR457	600p
STR470	600p
STR1096	380p
STR1195	450p
STR1229	450p
STR2005	500p
STR2012	500p
STR2013	400p
STR2024	650p
STR2105	600p
STR3113	300p
STR3115	500p
STR3123	490p
STR3125	580p
STR3135	300p
STR3212	330p
STR3214	330p
STR3215	330p
STR3315	330p
STR4142	550p
STR4211	370p
STR4512	450p
STR5015	600p
STR5100	650p
STR5214	550p
STR5315	700p
STR5412	400p
STR6020	400p
STR9005	600p
STR9012	550p
STR10006	550p
STR11006	550p
STR12006	600p
STR13006	650p
STR15006	650p
STR16006	650p
STR20005	550p
STR20012	600p
STR20015	600p
STR30113	400p
STR30115	350p
STR30123	600p
STR30130	400p
STR30134	320p
STR40090	450p

STR41090	500p
STR44111	650p
STR44115	650p
STR45111	700p
STR50020	550p
STR50092	650p
STR50100	650p
STR50103A	300p
STR50113	650p
STR50115	650p
STR51041	660p
STR52041	650p
STR50213	650p
STR53041	650p
STR53043	650p
STR54041	400p
STR55041	650p
STR58041	400p
STR59041	600p
STR60001	650p
STR61001	750p
STR80145	700p
STRD1806	475p
STRD1816	475p
T2800D	82p
TA7054	190p
TA7061	115p
TA7063	70p
TA7066	120p
TA7089	300p
TA7119	150p
TA7120	55p
TA7130	80p
TA7137	83p
TA7140	130p
TA7157	140p
TA7176	200p
TA7193	320p
TA7200	200p
TA7205	80p
TA7207	150p
TA7208	145p
TA7214	260p
TA7217	145p
TA7220	220p
TA7222	120p
TA7223	210p
TA7225	300p
TA7226	290p
TA7227	190p
TA7229	300p
TA7230	120p
TA7232	120p
TA7233	150p
TA7237	400p
TA7238	400p
TA7240	180p
TA7241	190p
TA7242	250p
TA7243	320p
TA7245	350p
TA7267	290p
TA7269	600p
TA7270	200p
TA7271	250p
TA7272	260p
TA7273	350p
TA7274	260p
TA7280	250p
TA7281	220p
TA7282	200p
TA7283	200p
TA7288	220p
TA7299	300p
TA7310	100p
TA7312	120p
TA7313	110p
TA7314	210p
TA7315	200p
TA7317P	240p
TA7324	200p
TA7325	90p
TA7328	150p
TA7335	110p
TA7336	250p
TA7341	250p
TA7343	120p
TA7357	400p
TA7358	120p
TA7401	300p
TA7607	200p
TA7608	360p
TA7609	210p
TA7611	280p
TA7612	360p
TA7614	200p
TA7616	400p
TA7621	520p
TA7622	420p
TA7628	150p
TA7629	220p
TA7630	200p
TA7632	400p
TA7640	150p
TA7641	170p
TA7658	130p
TA7668	160p
TA7680	300p
TA7688	250p
TA7698	500p
TA7699	800p
TA7705	300p
TA7750	200p
TA7757	250p
TA7769	200p
TA7784	250p
TA8205	400p
TA8210	400p
TA8215	400p
TAA550	25p
TBA120S	40p
TBA396	70p
TBA520	120p
TBA530	120p
TBA540	100p
TBA560	120p
TBA800	40p
TBA810AS	60p
TBA820	65p
TBA820M	40p
TBA920	120p
TBA950	100p
TBA990	60p
TC5020	200p
TC5081AP	180p
TC9106	500p
TC9109	450p
TC9122P	430p
TC9125BP	410p
TC9132	400p
TC9134	750p
TC9142	320p
TC9143	300p
TC9145	150p
TC9148	200p
TC9149	225p
TC9150	425p
TC9152	425p
TC9153	300p
TC9156	300p
TC9163	375p
TC9164	400p
TC9172P	300p
TC9176P	500p
TCA740	130p
TCA940	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	220p
TDA1010A	100p
TDA1011	120p
TDA1012	120p
TDA1013A	120p
TDA1015	100p
TDA1016	200p
TDA1020	150p
TDA1022	350p
TDA1023	200p
TDA1024	200p
TDA1025	320p
TDA1028	220p
TDA1029	250p
TDA1035	120p
TDA1037	190p
TDA1044	250p
TDA1048	225p
TDA1053	400p
TDA1054	200p
TDA1060	190p
TDA1062	200p
TDA1072	300p
TDA1074	420p
TDA1082	290p
TDA1083	200p
TDA1085	400p
TDA1097	550p
TDA1151	60p
TDA1154	50p
TDA1170	85p
TDA1180	140p
TDA1190	90p
TDA1200B	80p
TDA1220	150p
TDA1235	350p
TDA1236	295p
TDA1270	150p
TDA1327	250p
TDA1410	219p
TDA1412	100p
TDA1510	380p
TDA1512	200p
TDA1514A	450p
TDA1515A	200p
TDA1516Q	350p
TDA1518	300p
TDA1520	350p
TDA1521	300p
TDA1522	200p
TDA1524	350p
TDA1540	420p
TDA1541	1600p
TDA1596	260p
TDA1670A	300p
TDA1675	250p
TDA1701	320p
TDA1770A	300p
TDA1870A	300p
TDA1872A	450p
TDA1904	120p
TDA1905	150p
TDA1908A	90p
TDA1940	280p
TDA1941	300p
TDA1950	280p
TDA2002	70p
TDA2003	80p
TDA2004	90p
TDA2005	90p
TDA2006	70p
TDA2007	180p
TDA2008	175p
TDA2009	160p
TDA2020	140p
TDA2030	80p
TDA2040	200p
TDA2048	750p
TDA2054M	120p
TDA2151	300p
TDA2170	300p
TDA2270	340p
TDA2320	80p
TDA2510	450p
TDA2532	120p
TDA2540	100p
TDA2541	120p
TDA2542	150p
TDA2543	300p
TDA2545	200p
TDA2556	350p
TDA2575A	100p
TDA2577A	160p
TDA2578A	200p
TDA2579	250p
TDA2582	200p
TDA2590	170p
TDA2593	150p
TDA2594	300p
TDA2595	300p
TDA2600	350p
TDA2611A	100p
TDA2630	300p
TDA2640	220p
TDA2653A	250p
TDA2654	250p
TDA2670	150p
TDA2690	100p
TDA2730	250p
TDA2760	400p
TDA2780	600p
TDA2791	270p
TDA2795	250p
TDA2822M	60p
TDA3047	200p
TDA3048	150p
TDA3082	300p
TDA3083	250p
TDA3190	100p
TDA3300B	480p
TDA3301B	380p
TDA3310	120p
TDA3330	500p
TDA3410	170p
TDA3420	250p
TDA3501	400p
TDA3502	600p
TDA3505	300p
TDA3506	300p
TDA3507	500p
TDA3540	300p
TDA3541	200p
TDA3560	260p
TDA3561	200p
TDA3561A	220p
TDA3562	260p
TDA3563	350p
TDA3565	300p
TDA3566	330p
TDA3580	500p
TDA3586	750p
TDA3590	320p
TDA3591	450p

LINEAR IC's – Cont.	
TDA3592A	350p
TDA3640	350p
TDA3651	200p
TDA3652	500p
TDA3653	150p
TDA3654	150p
TDA3710	320p
TDA3730	550p
TDA3740	600p
TDA3750	400p
TDA3760	470p
TDA3771	460p
TDA3791	400p
TDA3800	350p
TDA3803A	500p
TDA3810	300p
TDA3950	300p
TDA4050	250p
TDA4180	400p
TDA4190	250p
TDA4200	380p
TDA4280	400p
TDA4282	400p
TDA4290	250p
TDA4400	350p
TDA4420	180p
TDA4421	400p
TDA4426	250p
TDA4427	500p
TDA4431	200p
TDA4437	450p
TDA4439	300p
TDA4440	250p
TDA4442	320p
TDA4445	250p
TDA4480	280p
TDA4500	360p
TDA4501	450p
TDA4502	900p
TDA4503	300p
TDA4505	300p
TDA4510	300p
TDA4555	600p
TDA4556	650p
TDA4560	450p
TDA4600	160p
TDA4600 2	200p
TDA4601	160p
TDA4605	300p
TDA4610	400p
TDA4660	480p
TDA4950	180p
TDA5330T	380p
TDA5600	450p
TDA5660P	260p
TDA5700	200p
TDA5708	560p
TDA5709	560p
TDA5800	600p
TDA5820	480p
TDA5850	225p
TDA7000	200p
TDA7010T	120p
TDA7050	200p
TDA7052	150p
TDA7211	150p
TDA7220	150p
TDA7240	300p
TDA7241	250p
TDA7250	600p
TDA7255	600p
TDA7273	100p
TDA7274	100p
TDA7275	75p
TDA7284	100p
TDA8115	300p
TDA8140	300p
TDA8145	150p
TDA8153	370p
TDA8160	150p
TDA8170	300p
TDA8173	325p
TDA8190	280p
TDA8191	425p
TDA8196	150p
TDA8440	380p
TDA8442	280p
TDA8443	400p
TDA8451	600p
TDA8452	280p
TDA9403	250p
TDA9503	200p
TDA9513	360p
TEA1002	650p
TL061	40p
TL064	80p
TL071	38p
TL072	55p
TL074	80p
TL081	40p
TL082	46p
TL083	55p
TL084	70p
ULN2002	70p
ULN2003	69p
ULN2068	270p
ULN2804	170p
UPC20C	220p
UPC554	130p
UPC555	60p
UPC556H	80p
UPC571	220p
UPC574	60p
UPC575C2	90p
UPC576	200p
UPC577	64p
UPC580	300p
UPC592	95p
UPC595	190p
UPC596	190p
UPC1001	120p
UPC1018	170p
UPC1020	200p
UPC1023	60p
UPC1025	230p
UPC1026	95p
UPC1028	90p
UPC1031H	150p
UPC1032	60p
UPC1158H	70p
UPC1177H	250p
UPC1180C	200p
UPC1183	200p
UPC1186	80p
UPC1187	160p
UPC1188H	350p
UPC1197	140p
UPC1198H	200p
UPC1222	130p
UPC1225H	220p
UPC1230	210p
UPC1238	120p
UPC1252H	220p
UPC1263	230p
UPC1270H	250p
UPC1274V	250p
UPC1277	240p
UPC1278	240p
UPC1288V	230p
UPC1298V	320p
UPC1318	300p
UPC1335V	320p
UPC1350	115p
UPC1352	400p
UPC1358H	250p

LINEAR ICs – Cont.

UPC1363	190p
UPC1363C	300p
UPC1364C	350p
UPC1365	250p
UPC1367	500p
UPC1370C	300p
UPC1373	85p
UPC1377C	200p
UPC1378	180p
UPC1382	110p
UPC1384	425p
UPC1387C	250p
UPC1394	170p
UPC1397	350p
UPC-1403CA	650p
UPC-1420CA	450p
UPC-1421CA	650p
UPC-1423CA	550p
UPC1470	200p
UPC1504C	400p
UPC1505C	400p
UPC-1514CA	200p
UPC-1515CA	250p
UPC1520CA	250p
UPC1536C	550p
ZN423	100p
ZN424	100p
ZN425	320p
ZN426	260p
ZN427	560p
ZN429	215p
ZN435	340p
ZN448	510p
ZN459	190p
ZN1040	640p
ZNA134H	2150p
ZNA234E	1250p

JAPANESE TRANSISTORS

2SA473	35p
2SA490	60p
2SA505	120p
2SA509	120p
2SA550	150p
2SA562	50p
2SA603	100p
2SA606	300p
2SA608	15p
2SA634	50p
2SA636	50p
2SA640	80p
2SA673	20p
2SA684	60p
2SA699	100p
2SA708	300p
2SA715	60p
2SA720	20p
2SA725	80p
2SA726	25p
2SA733	30p
2SA747A	600p
2SA748	90p
2SA769	130p
2SA770	200p
2SA771	130p
2SA781	150p
2SA798	55p
2SA814	170p
2SA844	30p
2SA872	40p
2SA872A	50p
2SA886	90p
2SA899	60p
2SA907	650p
2SA909	500p
2SA913	120p
2SA916	30p
2SA921	50p
2SA933	40p
2SA934	40p
2SA935	40p
2SA937	40p
2SA939	140p
2SA940	50p
2SA950	25p
2SA952	50p
2SA953	60p
2SA954	75p
2SA958	70p
2SA965	60p
2SA966	70p
2SA968	70p
2SA970	50p
2SA979	85p
2SA984	50p
2SA992	30p
2SA1006	120p
2SA1008	125p
2SA1009	200p
2SA1010	225p
2SA1011	140p
2SA1012	100p
2SA1013	100p
2SA1015	20p
2SA1016	40p
2SA1018	100p
2SA1020	50p
2SA1021	80p
2SA1023	60p
2SA1026	90p
2SA1029	60p
2SA1036	60p
2SA1037	50p
2SA1038	40p
2SA1048	30p
2SA1051	300p
2SA1052	40p
2SA1060	150p
2SA1069	150p
2SA1076	280p
2SA1077	300p
2SA1081	80p
2SA1082	80p
2SA1084	100p
2SA1085	75p
2SA1091	100p
2SA1093	300p
2SA1094	190p
2SA1095	300p
2SA1096	80p
2SA1102	180p
2SA1103	200p
2SA1104	250p
2SA1105	250p
2SA1106	160p
2SA1111	120p
2SA1112	150p
2SA1115	40p
2SA1123	70p
2SA1124	80p
2SA1127	50p
2SA1133	200p
2SA1141	350p
2SA1142	150p
2SA1143	40p
2SA1145	60p
2SA1152	150p
2SA1156	150p
2SA1162	30p
2SA1169	500p
2SA1170	500p
2SA1175	40p
2SA1184	120p
2SA1186	500p
2SA1198	70p
2SA1206	100p
2SA1208	70p
2SA1209	100p
2SA1210	120p
2SA1215	600p
2SA1216	550p
2SA1217	100p
2SA1220	120p
2SA1227A	300p
2SA1232	250p
2SA1242	80p
2SA1244	120p
2SA1246	80p
2SA1249	100p
2SA1261	150p
2SA1262	150p
2SA1263	280p
2SA1264	280p
2SA1265	280p
2SA1283	60p
2SA1284	60p
2SA1285	60p
2SA1286	60p
2SA1290	150p
2SA1294	450p
2SA1295	500p
2SA1301	350p
2SA1302	300p
2SA1303	400p
2SA1304	110p
2SA1306	110p
2SA1307	150p
2SA1309	50p
2SA1315	100p
2SA1316	80p
2SA1317	30p
2SA1318	30p
2SA1321	80p
2SA1329	200p
2SA1346	30p
2SA1352	100p
2SA1353	100p
2SA1356	100p
2SA1358	130p
2SA1362	100p
2SA1370	100p
2SA1371	100p
2SA1380	100p
2SA1381	100p
2SA1382	120p
2SA1385	180p
2SA1386	400p
2SA1423	30p
2SA1442	200p
2SA1443	250p
2SA1489	300p
2SA1491	300p
2SA1493	500p
2SA1516	380p
2SA1535	175p
2SA1538	80p
2SA483	175p
2SA495	100p
2SA496	100p
2SA537	170p
2SA544	650p
2SA571	650p
2SA614	150p
2SA639	150p
2SA642	50p
2SA677	80p
2SA678	60p
2SA683	70p
2SA706	250p
2SA711	280p
2SA719	50p
2SA764	200p
2SA777	80p
2SA778	100p
2SA786	100p
2SA794	120p
2SA816	150p
2SA817	50p
2SA836	60p
2SA837	270p
2SA839	150p
2SA900	100p
2SA942	60p
2SA949	80p
2SA957	250p
2SA963	120p
2SA985	150p
2SA988	150p
2SA993	50p
2SA999	50p
2SB324	55p
2SB370	45p
2SB546	70p
2SB560	35p
2SB561	50p
2SB562	35p
2SB566	110p
2SB595	80p
2SB596	75p
2SB598	60p
2SB600	500p
2SB646A	90p
2SB647	30p
2SB648	55p
2SB649	40p
2SB688	120p
2SB703	125p
2SB705	200p
2SB707	200p
2SB716	30p
2SB718	70p
2SB727	200p
2SB754	80p
2SB755	310p
2SB772	45p
2SB774	50p
2SB775	160p
2SB791	280p
2SB795	60p
2SB825	135p
2SB861	160p
2SB882	180p
2SB886	225p
2SB950	180p
2SB951	190p
2SB1009	110p
2SB1077	180p
2SB1109	100p
2SC182	75p
2SC369	80p
2SC372	80p
2SC380	20p
2SC382	120p
2SC388A	60p
2SC394	80p
2SC403	60p
2SC454	45p
2SC458	15p
2SC460	10p
2SC461	30p
2SC491	200p
2SC495	60p
2SC496	80p
2SC497	150p
2SC515A	100p
2SC535	50p
2SC536	20p
2SC558	275p
2SC563	120p
2SC603	40p
2SC605	100p
2SC619	100p
2SC641	80p
2SC643	500p
2SC644	25p
2SC647	300p
2SC681	340p
2SC683	120p
2SC708	100p
2SC710	20p
2SC711	40p
2SC717	50p
2SC730	450p
2SC732	40p
2SC733	25p
2SC735	40p
2SC738	40p
2SC739	150p
2SC761	150p
2SC762	150p
2SC783	105p
2SC790	80p
2SC792	380p
2SC805	225p
2SC805A	250p
2SC828	25p
2SC829	20p
2SC839	25p
2SC869	120p
2SC870	100p
2SC898	275p
2SC900B	300p
2SC930	20p
2SC941	25p
2SC943	150p
2SC944	140p
2SC945	20p
2SC950	40p
2SC959	225p
2SC980	120p
2SC982	60p
2SC983	120p
2SC998	600p
2SC1000	60p
2SC1001	950p
2SC1008	60p
2SC1010	225p
2SC1012	75p
2SC1013	170p
2SC1014	140p
2SC1030	190p
2SC1047	60p
2SC1050	280p
2SC1060	90p
2SC1061	85p
2SC1070	65p
2SC1079	250p
2SC1096	60p
2SC1098	120p
2SC1103A	130p
2SC1106	180p
2SC1114	415p
2SC1115	280p
2SC1116	290p
2SC1124	270p
2SC1128	120p
2SC1150	400p
2SC1160	150p
2SC1161	110p
2SC1162	35p
2SC1164	600p
2SC1165	750p
2SC1166	100p
2SC1167	120p
2SC1170	300p
2SC1172	150p
2SC1173	45p
2SC1195	210p
2SC1212	120p
2SC1213	50p
2SC1214	40p
2SC1215	60p
2SC1216	200p
2SC1222	50p
2SC1226	75p
2SC1252	550p
2SC1275	700p
2SC1278	110p
2SC1279	30p
2SC1306	90p
2SC1308K	350p
2SC1312	40p
2SC1317	25p
2SC1318	25p
2SC1325	400p
2SC1327	20p
2SC1328	40p
2SC1342	90p
2SC1343	225p
2SC1345	60p
2SC1346	100p
2SC1358	350p
2SC1359	60p
2SC1360	70p
2SC1364	50p
2SC1383	35p
2SC1384	35p
2SC1390	55p
2SC1393	80p
2SC1394	80p
2SC1398	70p
2SC1400	50p
2SC1403	500p
2SC1407	550p
2SC1413	240p
2SC1419	150p
2SC1424	450p
2SC1426	700p
2SC1429	100p
2SC1444	275p
2SC1446	100p
2SC1447	130p
2SC1448	100p
2SC1449	120p
2SC1450	200p
2SC1454	320p
2SC1470	120p
2SC1471A	400p
2SC1472	40p
2SC1473	70p
2SC1474	125p
2SC1475	60p
2SC1505	80p
2SC1506	75p
2SC1507	140p
2SC1509	45p
2SC1514	65p
2SC1515	60p
2SC1520	120p
2SC1541	150p
2SC1545	120p
2SC1567	140p
2SC1568	75p
2SC1569	140p
2SC1570	40p
2SC1571	50p
2SC1573	80p
2SC1576	450p
2SC1580	600p
2SC1583	30p
2SC1585	270p
2SC1586	540p
2SC1617	340p
2SC1623	50p
2SC1624	140p
2SC1625	150p
2SC1626	75p
2SC1627	60p
2SC1628	75p
2SC1634	50p
2SC1664	300p
2SC1669	100p
2SC1674	50p
2SC1675	200p
2SC1678	120p
2SC1683	100p
2SC1684	45p
2SC1685	60p
2SC1729	900p
2SC1730	40p
2SC1735	70p
2SC1740	40p
2SC1741	45p
2SC1752	70p
2SC1755	90p
2SC1756	40p
2SC1758	30p
2SC1765	1000p
2SC1775	20p
2SC1781	65p
2SC1789	100p
2SC1809	40p
2SC1810	250p
2SC1815	15p
2SC1819	140p
2SC1826	60p
2SC1827	120p
2SC1829	500p
2SC1832	400p
2SC1833	40p
2SC1834	50p
2SC1844	50p
2SC1845	20p
2SC1846	100p
2SC1847	120p
2SC1855	85p
2SC1856	50p
2SC1861	400p
2SC1865	700p
2SC1870	700p
2SC1871	600p
2SC1875	260p
2SC1881	210p
2SC1890	45p
2SC1904	125p
2SC1906	30p
2SC1907	75p
2SC1909	250p
2SC1913	190p
2SC1921	60p
2SC1923	25p
2SC1929	100p
2SC1938	150p
2SC1940	110p
2SC1941	40p
2SC1942	190p
2SC1944	350p
2SC1945	350p
2SC1946	1500p
2SC1947	450p
2SC1955	900p
2SC1957	70p
2SC1959	20p
2SC1962	200p
2SC1966	1150p
2SC1967	1300p
2SC1969	160p
2SC1970	200p
2SC1971	400p
2SC1972	600p
2SC1973	150p
2SC1983	130p
2SC1984	150p
2SC1985	120p
2SC1986	160p
2SC2001	60p
2SC2002	40p
2SC2003	25p
2SC2004	60p
2SC2021	40p
2SC2022	200p
2SC2023	180p
2SC2026	60p
2SC2027	250p
2SC2028	75p
2SC2029	120p
2SC2037	100p
2SC2053	120p
2SC2055	150p
2SC2056	450p
2SC2058	40p
2SC2060	60p
2SC2061	75p
2SC2068	90p
2SC2071	140p
2SC2073	70p
2SC2075	80p
2SC2078	95p
2SC2081	950p
2SC2085	100p
2SC2086	60p
2SC2092	100p
2SC2094	1200p
2SC2097	2300p
2SC2098	600p
2SC2099	2500p
2SC2102	1900p
2SC2118	1100p
2SC2120	50p
2SC2131	550p
2SC2139	350p
2SC2141	150p
2SC2149	500p
2SC2150	400p
2SC2153	70p
2SC2166	70p
2SC2168	175p
2SC2181	2100p
2SC2188	70p
2SC2199	600p
2SC2200	250p
2SC2221	650p
2SC2222	1350p
2SC2228A	60p
2SC2229	25p
2SC2230	80p
2SC2233	100p
2SC2235	60p
2SC2236	30p
2SC2237	600p
2SC2238	70p
2SC2240	25p
2SC2245	1050p
2SC2258	120p
2SC2259	80p
2SC2270	75p
2SC2271	60p
2SC2274	40p
2SC2275	50p
2SC2278	120p
2SC2283	800p
2SC2284	1200p
2SC2287	900p
2SC2290	1800p
2SC2291	125p
2SC2295	80p
2SC2298	120p
2SC2307	500p
2SC2308	40p
2SC2310	50p
2SC2312	300p
2SC2314	70p
2SC2316	150p
2SC2320	40p
2SC2324	120p
2SC2329	480p
2SC2331	150p
2SC2333	200p
2SC2334	240p
2SC2335	120p
2SC2344	150p
2SC2347	60p
2SC2353	120p
2SC2360	120p
2SC2361	150p
2SC2362	50p
2SC2365	500p
2SC2366	6000p
2SC2369	100p
2SC2371	45p
2SC2373	210p
2SC2383	50p
2SC2389	45p
2SC2407	110p
2SC2408	120p
2SC2412K	50p
2SC2413	50p
2SC2429	900p
2SC2431	900p
2SC2437	1000p
2SC2440	350p
2SC2458	40p
2SC2459	50p
2SC2461	400p
2SC2462	60p
2SC2470	65p
2SC2481	120p
2SC2482	40p
2SC2483	120p
2SC2484	240p
2SC2491	200p
2SC2495	1900p
2SC2498	50p
2SC2500	80p
2SC2502	200p
2SC2509	800p
2SC2516	125p
2SC2519	60p
2SC2523	500p
2SC2527	300p
2SC2534	150p
2SC2535	300p
2SC2538	100p
2SC2539	1000p
2SC2540	1900p
2SC2542	300p
2SC2545	55p
2SC2546	75p
2SC2547	65p
2SC2550	70p
2SC2551	70p
2SC2552	150p
2SC2553	200p
2SC2555	150p
2SC2562	90p
2SC2563	200p
2SC2564	230p
2SC2565	250p
2SC2568	120p
2SC2570	60p
2SC2571	350p
2SC2577	125p
2SC2578	220p
2SC2579	130p
2SC2580	240p
2SC2581	290p
2SC2588	600p
2SC2590	75p
2SC2591	140p
2SC2592	200p
2SC2603	40p
2SC2608	800p
2SC2610	85p
2SC2611	40p
2SC2613	250p
2SC2615	400p
2SC2621	90p
2SC2625	380p
2SC2626	600p
2SC2630	1900p
2SC2631	65p
2SC2634	45p
2SC2635	450p
2SC2636	50p
2SC2637	120p
2SC2640	1800p
2SC2653	100p
2SC2654	180p
2SC2655	75p
2SC2656	550p
2SC2660	150p
2SC2665	200p
2SC2668	50p
2SC2671	270p
2SC2681	120p
2SC2682	120p
2SC2688	70p
2SC2690	110p
2SC2694	3200p
2SC2695	2600p
2SC2705	70p
2SC2710	50p
2SC2712	50p
2SC2716	50p
2SC2719	80p
2SC2721	120p
2SC2738	200p
2SC2740	450p
2SC2749	350p
2SC2750	300p
2SC2751	400p
2SC2752	140p
2SC2753	100p
2SC2767	300p
2SC2769	400p
2SC2773	700p
2SC2774	600p
2SC2785	50p
2SC2786	50p
2SC2787	50p
2SC2791	650p
2SC2792	550p
2SC2793	700p
2SC2808	40p
2SC2810	380p
2SC2812	40p
2SC2814	40p
2SC2824	75p
2SC2825	900p
2SC2826	200p
2SC2827	200p
2SC2832	300p
2SC2834	400p
2SC2837	360p
2SC2839	40p
2SC2853	70p
2SC2876	120p
2SC2877	120p
2SC2878	40p
2SC2879	3200p
2SC2883	60p
2SC2898	350p
2SC2899	120p
2SC2901	60p
2SC2909	60p
2SC2911	120p
2SC2912	120p
2SC2915	8200p
2SC2921	650p
2SC2922	610p
2SC2928	550p
2SC2929	280p
2SC2934	75p
2SC2937	250p
2SC2938	400p
2SC2939	400p
2SC2944	620p
2SC2958	75p
2SC2960	80p
2SC2962	800p
2SC2979	250p
2SC2987	325p
2SC2988	250p
2SC2995	60p
2SC2999	50p
2SC3001	1400p
2SC3012	300p
2SC3019	320p
2SC3021	1250p
2SC3025	500p
2SC3026	550p
2SC3030	750p
2SC3037	125p
2SC3038	125p
2SC3039	140p
2SC3040	260p
2SC3042	300p
2SC3057	150p
2SC3058	2500p
2SC3059	900p
2SC3060	1100p
2SC3061	1600p
2SC3068	60p
2SC3070	120p
2SC3074	200p
2SC3075	150p
2SC3077	120p
2SC3086	150p
2SC3089	250p
2SC3098	100p
2SC3099	100p
2SC3101	750p
2SC3102	2800p
2SC3104	1650p
2SC3105	3600p
2SC3112	35p
2SC3114	40p
2SC3116	75p
2SC3117	120p
2SC3122	50p
2SC3130	100p
2SC3133	600p
2SC3148	410p
2SC3149	180p
2SC3150	200p
2SC3151	230p
2SC3152	200p
2SC3153	250p
2SC3156	400p
2SC3157	200p
2SC3158	260p
2SC3159	200p
2SC3164	350p
2SC3169	200p
2SC3170	300p
2SC3173	180p
2SC3175	200p
2SC3178	340p
2SC3179	160p
2SC3181	240p
2SC3182	250p
2SC3199	50p
2SC3209	120p
2SC3210	850p
2SC3211	300p
2SC3212	350p
2SC3225	100p
2SC3244	80p
2SC3246	70p
2SC3257	275p
2SC3259	350p
2SC3260	320p
2SC3261	400p
2SC3262	400p
2SC3263	350p
2SC3264	510p
2SC3266	50p
2SC3268	110p
2SC3269	50p
2SC3270	50p
2SC3277	280p
2SC3280	250p
2SC3281	250p
2SC3284	600p
2SC3293	85p
2SC3296	125p
2SC3298	120p
2SC3299	120p
2SC3300	140p
2SC3303	120p
2SC3306	150p
2SC3307	600p
2SC3309	150p
2SC3316	280p
2SC3317	350p
2SC3318	400p
2SC3320	480p
2SC3327	60p
2SC3331	40p
2SC3333	120p
2SC3336	850p
2SC3345	170p
2SC3346	200p
2SC3352	200p
2SC3353	400p
2SC3355	90p
2SC3356	120p
2SC3358	80p
2SC3361	50p
2SC3376	300p
2SC3377	50p
2SC3378	120p
2SC3383	80p
2SC3387	850p
2SC3393	80p
2SC3399	50p
2SC3400	40p
2SC3401	50p
2SC3402	50p
2SC3409	400p
2SC3412	800p
2SC3416	80p
2SC3417	90p
2SC3419	120p
2SC3420	120p
2SC3422	110p
2SC3423	100p
2SC3446	150p
2SC3447	200p
2SC3450	350p
2SC3456	200p
2SC3457	200p
2SC3459	250p
2SC3460	250p
2SC3461	350p
2SC3466	300p
2SC3467	70p
2SC3468	70p
2SC3481	600p
2SC3482	300p
2SC3486	350p
2SC3502	120p
2SC3503	90p
2SC3504	120p
2SC3505	600p
2SC3506	600p
2SC3507	650p
2SC3509	750p
2SC3518	120p
2SC3519	550p
2SC3526	120p
2SC3531	225p
2SC3547	100p
2SC3549	200p
2SC3552	300p
2SC3568	200p
2SC3583	170p
2SC3584	200p
2SC3595	220p
2SC3596	280p
2SC3604	650p
2SC3605	60p
2SC3606	100p
2SC3607	150p
2SC3608	120p
2SC3631	130p
2SC3636	280p
2SC3651	600p
2SC3657	400p
2SC3659	600p
2SC3668	120p
2SC3675	160p
2SC3678	280p
2SC3679	200p
2SC3680	380p
2SC3685	450p
2SC3687	650p
2SC3688	750p
2SC3691	150p
2SC3692	150p
2SC3705	120p
2SC3715	480p
2SC3717	120p
2SC3719	150p
2SC3729	450p
2SC3743	270p
2SC3746	120p
2SC3747	120p
2SC3752	250p
2SC3769	700p
2SC3781	150p
2SC3783	600p
2SC3787	100p
2SC3789	75p
2SC3790	120p
2SC3795	200p
2SC3798	220p
2SC3807	120p
2SC3811	80p
2SC3832	200p
2SC3833	250p
2SC3853	220p
2SC3854	250p
2SC3855	280p
2SC3857	500p
2SC3858	550p
2SC3870	200p
2SC3883	280p
2SC3890	150p
2SC3895	400p
2SC3897	650p
2SC3907	420p
2SC3909	450p
2SC3927	550p
2SC3946	120p
2SC3950	120p
2SC3953	120p
2SC3954	150p
2SC3973	275p
2SC3975	275p
2SC3987	100p
2SC3996	1200p
2SC4006	100p
2SC4020	280p
2SC4023	325p
2SC4056	350p
2SC4106	200p
2SC4123	450p
2SC4124	250p
2SC4169	60p
2SC4236	550p
2SC4237	750p
2SC4242	200p
2SC4262	50p
2SC4301	550p
2SD198	180p
2SD199	280p
2SD200	210p
2SD201	260p
2SD257	195p
2SD313	40p
2SD315	75p
2SD325	45p
2SD330	110p
2SD348	460p
2SD357	40p
2SD358	40p
2SD371	240p
2SD380	650p
2SD381	80p
2SD388	170p
2SD389	90p
2SD400	20p
2SD401	50p
2SD402	120p
2SD415	120p
2SD424	400p
2SD426	150p
2SD427	350p
2SD438	45p
2SD467	60p
2SD468	25p
2SD471	75p
2SD525	70p
2SD526	70p
2SD545	60p
2SD549	120p
2SD551	400p
2SD555	500p
2SD560	150p
2SD571	80p
2SD575	530p
2SD600	80p
2SD601	40p
2SD602	60p
2SD612	100p
2SD613	70p
2SD636	30p
2SD637	40p
2SD638	60p
2SD639	60p
2SD640	350p
2SD642	50p
2SD655	60p
2SD661	60p
2SD666	70p
2SD667	70p
2SD668	120p
2SD669	40p
2SD673	350p
2SD676	250p
2SD716	115p
2SD717	180p
2SD718	100p
2SD722	240p
2SD725	350p
2SD734	60p
2SD-741	120p
2SD-743	130p
2SD-756	100p
2SD-757	120p
2SD-758	140p
2SD-762	140p
2SD-763	140p
2SD-768	180p
2SD-772	200p
2SD-773	40p
2SD-774	60p
2SD-777	400p
2SD-784	650p
2SD-786	100p
2SD-787	80p
2SD-788	100p
2SD-789	80p
2SD-792	400p
2SD-794	100p
2SD-795A	140p
2SD-811	450p
2SD-819	400p
2SD-820	450p
2SD-821	550p
2SD-822	400p
2SD-826	100p
2SD-836	150p
2SD-836A	200p
2SD-837	80p
2SD-838	400p
2SD-841	160p
2SD-844	200p
2SD-845	250p
2SD-850	200p
2SD-856	80p
2SD-858	250p
2SD-863	60p
2SD-864	200p
2SD-866	120p
2SD-866A	140p
2SD-868	450p
2SD-870	400p
2SD-871	450p
2SD-879	60p
2SD-880	40p
2SD-882	80p
2SD-892A	100p
2SD-894	120p
2SD-895	200p
2SD-896	200p
2SD-900	400p
2SD-905	450p
2SD-916	130p
2SD-917	300p
2SD-921	320p
2SD-923	360p
2SD-946	120p
2SD-947	100p
2SD-950	300p
2SD-951	350p
2SD-957A	820p
2SD-958	60p
2SD-965	100p
2SD-970	170p
2SD-973	60p
2SD-973A	70p
2SD-985	120p
2SD-986	120p
2SD-1012	60p
2SD-1020	40p
2SD-1021	120p
2SD-1022	400p
2SD-1024	130p
2SD-1030	75p
2SD-1031	130p
2SD-1037	750p
2SD-1046	200p
2SD-1047	225p
2SD-1051	130p
2SD-1060	130p
2SD-1062	150p
2SD-1063	200p
2SD-1064	250p
2SD-1065	200p
2SD-1069	150p
2SD-1071	450p
2SD-1073	350p
2SD-1088	150p
2SD-1094	520p
2SD-1110	225p
2SD-1111	60p
2SD-1113	225p
2SD-1128	200p
2SD-1133	100p
2SD-1135	150p
2SD-1138	80p
2SD-1140	40p
2SD-1142	350p
2SD-1148	175p
2SD-1151	50p
2SD-1159	90p
2SD-1160	150p
2SD-1163A	220p
2SD-1164	120p
2SD-1168	425p
2SD-1169	280p
2SD-1173	350p
2SD-1185	400p
2SD-1186	400p
2SD-1187	250p
2SD-1189	125p
2SD-1190	150p
2SD-1191	120p
2SD-1192	90p
2SD-1196	150p
2SD-1197	150p
2SD-1207	50p
2SD-1210	280p
2SD-1211	120p
2SD-1218	75p
2SD-1223	75p
2SD-1225	120p
2SD-1227	40p
2SD-1229	250p
2SD-1237	300p
2SD-1246	30p
2SD-1247	40p
2SD-1248	270p
2SD-1251	180p
2SD-1263	90p
2SD-1264	120p
2SD-1265	75p
2SD-1266	180p
2SD-1267	100p
2SD-1267A	125p
2SD-1271	200p
2SD-1271A	225p
2SD-1272	200p
2SD-1273	100p
2SD-1275	150p
2SD-1276	200p
2SD-1277	190p
2SD-1279	600p
2SD-1288	175p
2SD-1289	300p
2SD-1291	400p
2SD-1292	60p
2SD-1297	425p
2SD-1302	40p
2SD-1308	140p
2SD-1309	140p
2SD-1310	140p
2SD-1313	1000p
2SD-1326	200p
2SD-1328	60p
2SD-1347	70p
2SD-1348	85p
2SD-1350	150p
2SD-1376	125p
2SD-1379	100p
2SD-1380	100p
2SD-1383	100p
2SD-1384	80p
2SD-1389	200p
2SD-1390	350p
2SD-1391	450p
2SD-1392	150p
2SD-1395	150p
2SD-1396	240p
2SD-1397	175p
2SD-1398	120p
2SD-1399	300p
2SD-1400	280p
2SD-1402	280p
2SD-1404	125p
2SD-1406	80p
2SD-1407	160p
2SD-1408	125p
2SD-1409	170p
2SD-1412	100p
2SD-1413	175p
2SD-1414	700p
2SD-1415	190p
2SD-1417	125p
2SD-1425	360p
2SD-1426	350p
2SD-1427	380p
2SD-1428	360p
2SD-1429	410p
2SD-1430	280p
2SD-1431	400p
2SD-1432	400p
2SD-1433	750p
2SD-1438	140p
2SD-1439	270p
2SD-1441	380p
2SD-1445	200p
2SD-1448	140p
2SD-1450	60p
2SD-1451	260p
2SD-1452	350p
2SD-1453	140p
2SD-1455	250p
2SD-1457	220p
2SD-1459	120p
2SD-1468	60p
2SD-1479	200p
2SD-1487	225p
2SD-1491	100p
2SD-1494	300p
2SD-1496	450p
2SD-1497	350p
2SD-1505	120p
2SD-1507	60p
2SD-1509	100p
2SD-1511	100p
2SD-1519	250p
2SD-1521	70p
2SD-1541	360p
2SD-1548	260p
2SD-1554	500p
2SD-1555	380p
2SD-1556	700p
2SD-1564	100p
2SD-1565	75p
2SD-1571	200p
2SD-1572	100p
2SD-1576	450p
2SD-1577	480p
2SD-1579	120p
2SD-1589	100p
2SD-1590	100p
2SD-1591	310p
2SD-1593	125p
2SD-1595	160p
2SD-1596	200p
2SD-1608	210p
2SD-1609	70p
2SD-1630	50p
2SD-1632	500p
2SD-1633	125p
2SD-1637	50p
2SD-1647	50p
2SD-1649	260p
2SD-1650	300p
2SD-1651	270p
2SD-1663	450p
2SD-1664	40p
2SD-1666	120p
2SD-1667	120p
2SD-1668	120p
2SD-1677	300p
2SD-1730	350p
2SD-1732	400p
2SD-1739	350p
2SD-1740	125p
2SD-1748	90p
2SD-1760	80p
2SD-1762	70p
2SD-1773	160p
2SD-1783	100p
2SD-1796	180p
2SD-1815	100p
2SD-1825	120p
2SD-1843	100p
2SD-1846	350p
2SD-1849	325p
2SD-1850	325p
2SD-1858	40p
2SD-1877	250p
2SD-1878	300p
2SD-1879	275p
2SD-1884	300p
2SD-1886	450p
2SD-1887	450p
2SD-1896	300p
2SD-1910	280p
2SD-1911	400p
2SD-1913	50p
2SD-1929	60p
2SD-1939	75p
2SD-1941	500p
2SD-1959	280p
2SD-1961	50p
2SD-1978	50p
2SD-1984	150p
2SD-2012	50p
2SD 2046	60p
2SJ-48	425p
2SJ-49	425p
2SJ-50	425p
2SJ-56	700p
2SJ-74	60p
2SJ-75	280p
2SJ-76	220p
2SJ-77	360p
2SJ-79	225p
2SJ-103	75p
2SJ-106	40p
2SJ-108	60p
2SJ-115	525p
2SJ-116	1000p
2SJ-117	550p
2SJ-118	600p
2SJ-119	700p
2SJ-122	800p
2SJ-161	650p
2SJ-162	680p
2SK-19	45p
2SK-40	50p
2SK-49	50p
2SK-55	100p
2SK-68	100p
2SK-73	75p
2SK-106	40p
2SK-107	40p
2SK-109	120p
2SK-118	50p
2SK-125	100p
2SK-133	650p
2SK-134	415p
2SK-135	415p
2SK-147	160p
2SK-150	160p
2SK-162	115p
2SK-163	40p
2SK-168	40p
2SK-176	800p
2SK-192	45p
2SK-195	150p
2SK-197	140p
2SK-214	170p
2SK-216	200p
2SK-217	35p
2SK-218	400p
2SK-240	140p
2SK-270	50p
2SK-294	350p
2SK-310	200p
2SK-312	750p
2SK-315	70p
2SK-320	120p
2SK-322	140p
2SK-323	130p
3SK-358	300p
2SK-370	40p
2SK-371	40p
2SK-386	600p
2SK-388	850p
2SK-405	450p
2SK-413	500p
2SK-414	500p
2SK-415	500p
2SK-429	180p
2SK-511	450p
2SK-513	325p
2SK-517	200p
2SK-531	350p
2SK-534	700p
2SK-537	900p
2SK-538	450p
2SK-539	1100p
2SK-555	400p
2SK-556	500p
2SK-557	400p
2SK-566	475p
2SK-695	550p
2SK-719	300p
2SK-724	600p
2SK-725	600p
2SK-727	1200p
2SK-735	600p
2SK-758	300p
2SK-787	1100p
2SK-794	500p
2SK-872	950p
2SK-903	500p
2SK-1057	600p
2SK-1058	800p
2SK-45	100p
2SK-51	100p
2SK-59	100p
2SK-73	60p
2SK-74	50p
2SK-77	50p
2SK-81	50p
2SK-85	160p
2SK-87	45p
2SK-88	70p
2SK-121	150p
2SK-129	175p
2SK-165	225p
2SK-166	300p

COMPUTER ICs

2114	150p
2532	200p
2716	100p
2732	200p
2732A	220p
2764	150p
27C64	200p
27128	150p
27256-25	150p
27512	300p
4116	40p
4164-15	80p
4164-12	90p
4164-10	100p
41256-15	80p
41256-12	100p
41256-10	110p
41464-12	150p
41464-10	200p
6116	80p
6264-15	160p
6264-12	200p
6264-10	210p
62256-12	300p
6502	300p
6502A	360p
65C02	930p
6522	280p
6551	380p
6800	210p
6802	220p
6803	500p
6808	500p
6809	500p
6810	150p
6818	380p
6840	290p
6845	200p
6850	90p
8080A	380p
8085A	300p
8086	500p
8088	480p
8156	300p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8243	250p
8250	750p
8251	200p
8253	160p
8255	160p
8256	700p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p
8748	700p
8755	800p
Z80ACPU	100p
Z80BCPU	160p
Z80ADMA	200p
Z80APIO	150p
Z80BPIO	150p
Z80ACTC	140p
Z80BCTC	200p
Z80ASIO	210p
Z80ASIO-1	210p
Z80ASIO-2	210p
Z80ADART	260p
74S289	180p
74S387	200p
75107	65p
75110	75p
75113	100p
75122	110p
75150	95p
75154	100p
75162	700p
75182	95p
75183	95p
75188	55p
75189	55p
75195	185p
75451	40p
75454	65p
75492	55p
8T26	95p
8T28	110p

SIMMS

256Kx9-80	1000p
256Kx9-70	1100p
1MBx9-80	3000p
1MBx9-70	3200p

SIPS

256Kx9-80	1100p
256Kx9-70	1200p
1MBx9-80	3100p
1MBx9-70	3200p

OPTO COUPLERS

4N25	50p
4N26	50p
4N27	50p
4N28	50p
4N29	90p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	68p

BRIDGE RECTIFIERS

W005 1A/50V	16p
W01 1A/100V	18p
W02 1A/200V	19p
W04 1A/400V	21p
W06 1A/600V	23p
W08 1A/800V	28p
BR81D 2A/100V	33p
BR82D 2A/200V	33p
BR84D 2A/400V	37p
BR86D 2A/600V	43p
BR88D 2A/800V	43p
BR32 3A/200V	43p
BR34 3A/400V	43p
BR36 3A/600V	44p
BR62 6A/200V	80p
BR64 6A/400V	72p
BR251 25A/100V	150p
BR252 25A/200V	165p
BR254 25A/400V	185p
BR256 25A/600V	200p
BR258 25A/800V	240p
BR351 35A/100V	185p
BR352 35A/200V	200p
BR354 35A/400V	220p
BR356 35A/600V	230p
BR358 35A/800V	260p
BY164 1.5A/100V	40p
BY179 1.5A/800V	40p

TRIACS

TIC206D 4A/400V	60p
TIC225D 6A/400V	69p
TIC226D 8A/400V	68p
TIC236D 12A/400V	85p
TIC246D 16A/400V	105p
TIC253D 20A/400V	190p
TIC263D 25A/400V	205p
T2800D 8A/400V	52p

THYRISTORS

2N5061 0.8A/60V	20p
C106D 4A/400V	28p
TIC116C 8A/300V	59p
TIC116D 8A/400V	70p
TIC116M 8A/600V	79p
TIC126D 12A/400V	75p
TIC126M 12A/600V	90p
BR103	37p
BR303	85p
BT106	180p
BT116	80p
BT119	100p
TIC44	22p
17088	200p
17089	200p
17127	200p
15 80H	230p
15 85R	230p
SG264	550p
SG613	800p

SERVICE AIDS

SERVISOL PRODUCTS

VIDEO HEAD CLEANER	140p
SWITCH CLEANER	150p
SILICONE GREASE	170p
FREEZE IT	170p
FOAM CLEANER	170p
ANTI STATIC	170p
AEROKLEANE	140p
AERO DUSTER	170p
PLASTIC SEAL	160p
GLASS CLEANER	160p
COLDKLENE	160p

IF YOU PURCHASE MORE THAN ONE SERVISOL PRODUCT P&P WILL BE CHARGED AT 300p

GRANDATA LTD
K.P. HOUSE, UNIT 15,
POP IN COMMERCIAL CENTRE,
SOUTHWAY, WEMBLEY,
MIDDLESEX, ENGLAND
Tel: 081-900 2329 Fax: 081-903 6126
FOR EVEN MORE BARGAINS

SOLDERING IRONS

ANTEX
25 Watt 240Vac SOLDERING IRON (XS25W 240V) £7.00
15 Watt 240Vac SOLDERING IRON (X15W 240V) £7.00
25 Watt SPARE ELEMENT £3.80
15 Watt SPARE ELEMENT £3.80

WOODEN HANDLE
30 Watt 220/100 Volts SOLDERING IRON £3.50
40 Watt 220/100 Volts SOLDERING IRON £3.50
60 Watt 220/100 Volts SOLDERING IRON £3.50

SOLDERING IRON STAND
SOLDERING STAND (Made by ANTEX) £2.80
SPARE SPONGE £0.55

SOLDER
18 SWG 500 GRAMMES £5.00
20 SWG 500 GRAMMES £6.50
22 SWG 500 GRAMMES £7.00

DESOLDERING AIDS
DESOLDER PUMP £3.20
SPARE NOZZLE £0.60
SOLDER MOP Standard Gauge 1 2mm £0.60

VIDEO HEADS

AIWA
AV 66/AV 77 £14.00
G700 £12.00
G900 £22.00

AKAI
VS-105/112/115/116/125/126/201/220/250/301/303/304/205/244/247/248/VSP8 £15.00
VP7100/VP77/VS9300/VS9500/9800 £6.50
VP88/VS1/2/4/5/10/VS9700/VS9800/VSP1 £15.00
VS35/37/38/53/55/66/765/767/768 £32.00
VS512/515/516 £28.00
VS465 £30.00
VS11/12 £20.00
VS6/8/9 £30.00
VSX9 £32.00

ALBA
VCR4000/5000/6000 £21.00

AMSTRAD
VCR 4500/5200/9000/TVR1 £11.00
VCR 7000 £11.00
VCR 6000/6100 £15.00
TVR2/TVR3/VCR4600/VCR4600 MKII/VCR4700 £11.50

AUTHENTIC
N850 £8.00

AWA
ATVI £8.00

BAIRD
8900/8901/8902/8903/8906/8922/8928 £6.50
8904/8923/8924/8925/8929/8935/8941/8943/8944 £6.50
8909/8912 £8.00
8930/8931/8933/8940 £8.00
8942 £23.00
8945 £20.00
8947/8948 £16.00

BAIRD
8950 £17.00

BOSCH BAUER
VRP20 £10.00
VRP25 £10.00
VRP30 £33.50

CANON
VR10 £10.00
VR30A/30B/30E/40A £33.50

DAEWOD
912 £22.00
VCP 11 RAF £22.00

DECCA
8300 £10.00
8400/8500 £6.50

FUNAI
E11/VIP1000/VP1400/VCR4000/V1/2S/VCR4500/4800/VCR5200/5600/6400/6600
VIP3000/E1100 £12.00
VCR4600/5400/5800 £12.00
VCR5480/5843 £22.00
VCR6800/6803 £16.00

FISHER
FVHP510/520/530/615/622/710/715/720/721/722/910/FVHP620/711/905/906/908/911/915/916/5000/FVHP420/5005/5050/5075/5001/618/730/830/918 £12.25
VBS3500/7500/7600/9900/VBS3500/7100/7800/9900/VBR330 £20.00
VBS7000/VBS7100/VBS9000 £22.00
FVH711/715/721/722/FVHD720 £15.00
FVHP725/830 £30.00
FVHP990 £32.00
FVHP975 £27.00

FIDELITY
HQS200/VCR600/6100 £16.00
VCR100 £12.00
VTR1000 £13.00

GOLDSTAR
8000 3HSSDB £19.00
GVH51/GVH1221/VCP4000/VCP4100/VCP4200 £18.00
GHV12321/1245/1246/8210/8215/GHVP1240/1241/GHVP1247/1248/VCP400 £16.50

G.E.C.
4000H/4001H/4002H £16.00
V4001H/V4004 £16.00

GRANADA
CS1/DS2 £21.50
VHSAH1 £13.00
VHSAH3 £31.00
VHSAN3 £8.00
VHSAY3 £14.00
VHSBH1/CH1 £21.00
VHSBP1 £8.50
VHSBY3 £26.00
VHSD52 £16.00
VHSEH2 £21.00
VHSEY1/EY2 £14.00
VHSFG2/FG4 £16.00
VHFS1/FS2 £13.00
VHSTJ1/TJ2/TJ3/WJ3/VHSYJ2 £7.00
VHSVH4/WH1/XH1/YH2 £16.00
VHSWJ1/XJ3 £7.00

GRAETZ
4312/4605/4905/4912/4913/P4833/TR4605/4812/4905/4912/TR4913/4914/4943 £6.50
4935/4943/4963/4985/4993/TR4833/4935/4985/4993 £6.50
4920/4927/4930 £17.00
4946/TR4906/4916 £16.00
TR4994 £23.00
TR4995 £33.00

GRUNDIG
VS410/440/450/460/500/505/510/520/521/530 £17.00
BARCELONA/MVS400/440/500/600/SE5100/6100/TVR4500/VS400/440/500/505/510/518/600/610 £18.00
MADRID/SE5140/VS540/VS5480 £35.00
MVS550/620/630/640 £38.00
VS120 £28.00

HINARI
VXL2/VXL3/VXL4/VXL20/VXL25/VXL35 £11.50
VXL5/V20H £13.00
VXL6 £18.00
VXL7 £22.00
VXL8/VXL9/VXL10/VXL11/VTV100 £18.50

HITACHI
VT11/VT14/16/30/33/34/330/340/503/640/5030 £12.00
VT7/VT17/VT18/VT19 £23.50
VT35/VT38/VT39 £33.00
VT100/110/111/112/113/115/118/120/125/128/220/225/VT400/405/410/413/414/415/418/510/518/520/525/526/VTM625/626 £18.00
VT3000 £10.00
VT4000/4200/5000/5500 £15.00
VT77/680/3000/6500/7000/8000/8030/8040/8100/8300/VT8500/8700/9000/9300/9500/9700/9900 £12.00
VT8/VT9/VT56/VT57 £34.00
VT65 £35.00
VT130/VT135/VT138/VT145/VT250/VT255/VT258/VT420/425/426/428/430/431/435/438/535/536 £29.50
VT52/61E/VT62E/VT63/VT64/VT640 £20.00
VT150 (4 HEAD) £27.00
VT530 £25.00

ITT
VR3605/3905/3935/3943/3954/3985/3993 £8.50
VR3833/VR3913/VR3914/VR3963
VR3975/VR3912 £6.50
VR3986 £20.00
VP3826/VR3906/3916/3926/3946/VR3948/6948 £15.75
VR3927 £17.00
VR3976 £24.50
VR3977 £31.00
VR3994 £23.00
VR3995/3997 £31.50
VR3917 £16.00

JVC 3HSS
HR2200/HR3300/HR3320/HR3330/HR3350/HR3360/HR3660/HR3750/HR3860/HR4100 £6.50
3292/8903/8900/8901/8902/8903/8906/8922/8928/3VO1/3V06/3V22 £6.50
HR3660/HR7600/HR7610/HR7650/HR7700/HRD110/HRD111/HRD120/HRD121/HRD220/HRD225/HRS100 £6.50

FERGUSON 3HSSL PIN
8904/8924/8941/8943/8944/3V16/3V23/3V24/3V31/3V35/3V36/3V38/3V39/3V49 £6.50
HRD140/HRD141/HRD143/HRD150/HRD157/HRD158/HRD160/HRD5101/HRS10 £15.50

FERGUSON
8947/8948/3V42/3V44/3V45/3V46/3V47/3V52/3V54/3V55/3V56/3V57 £15.50
8950/8951/3V64/FV10/FV11/3V65/FV20/FV21/FV22/FV26 £17.00
3V48 £24.50
3V43/3V53 £31.50
8930/8940/3V29/3V30 £7.50
8945 £24.00
3V00 £10.00
FV31 £22.00
FV37 £38.00

JVC
HRD170/171/210/211 £17.00
HRD565/566 £24.50
HRD725/HRD755 £31.50
BR7000E/BR7000S £30.00
HR7200/7300/7350/2650 £7.20
HRD455 £20.00
HRD520 £22.00
HRD300/HRD400/HRD600 £29.00
HR4100 £10.00
HRD750 £33.00
HRD250/257 £27.00

JVC & FERGUSON
3V32/8942/HR7655 £23.00
HRD180/230/3V59/FV12L/FV20B/FV22/26/30/32/33 £30.50
HRD370/3V58/FV13H/HRD430/HRD470 £27.00
HRD530/700/FV14T £33.50
GRC1/GRG2/3V41 £30.00

LOGIK
VR960 £16.00
VR950 £16.00

LOEWE
OC410/420/440 £24.00
OC50/OC55/OC60/OC65 £15.00

LUXOR
9225 £21.50

MATSUI
VX500E/VX600A/VX800A/VX810A/VX880A/VX770B/VX773B £13.50
VCRL3/VX730 £15.00
VX735/VX755 £16.00
VX735A/VX755A/VX765/VX850 £17.50

MITSUBISHI
HS303/HS304/HS320/HS700 £19.50
HS306/HS318/HS710 £20.00
HS307 £37.00
HS319 £37.00
HS330 £32.00
HS400 £29.00
HS349 £28.00
HS411 £32.00
HSE30 £28.00
HS338 £28.00
HSE11 £37.00
HS300/HS301/HS302/HS310 £18.50
HS200 £6.50
HS337/HS347 £22.00

NATIONAL PANASONIC 4HSS-3HSSN
NV3000/NV300/NV7200/NV333/NV7500/NV7800/NV7850/NV322/NV332/NV340/NV390/NV2000/NV2010/NV7000/NV8170/NV8200/NV8400/NV8600/NV8610/NV8620 £6.25

NATIONAL
NV777/NV330 £17.00
NV430/AG1000 £11.00
NV280/NV460/470/480 £16.50
NV730/NV770 (4 HEAD) £18.50
NV366 £18.50
NV180/NVD48 £23.00
NV370/NV380/NV100/NV630 £8.50
NV788 £36.00
NV810/NV830 £30.00

NATIONAL Cont.
NV850/NV950 £35.00
NV870/NV890/NV970 £39.00
NVG33/NVG46/NVL23/NVL25/NVL28 £38.00
NVG30/NVG31/NVG40/NVG130/NVJ30/NVL20 £20.00
NVG10/NVG11/NVG12/NVG14/NVG16/NVG120/NV250/NV280/NV450/NV465 £16.50
NVG18 £25.00
NVG20/NVG21/NVG22/NVG25/NVG28/NVG200/NVD48 £25.00
NVG50/NVG300 £30.00
NVG45/NVG46 £30.00
NVH70 £50.00
NV688 £25.50
NV600 £23.00
AG-6800/6810 £39.00
AG-6100/6200/6300 £32.00
NVH65 £50.00
NVG7/NVG9/NV230 £18.00
NV780 £36.00
NVG15/NVG400 £48.00
NVM7/NVMC20/NVF70 £62.00

N.E.C.
N9011/N9012/N9013E/N9014E/N9014G/N9015/N9016/N9014A/N9024/N9033/N9034/N9054/N9063/N9065/N9066/N906A £20.00
N911A/N915A/N916A/N917 £27.00
PCV754/PV2300/PV2400/PV760/PV794/PV770/PV774/PVC7E3E £18.00
N380/N381/N830/N831/N832/N833/N834/N835/N836 £7.00
82611AH1 (for model DX3C00) £45.00
N895 £31.50

NORDMENDE
460/9 460/V100/V140/V200/V250/V304/V341/V450/V550 £7.00
V1001/V1005/V1015/V1025/V1035/V1041/V1055/V1065/V1105/V2005 £18.00
V110/V333 £20.00
V101/V102/V103/V112/V141/V142/V200/V300/V3005/V300/V3C1/V302/V350/V500 £7.00
V1205/V1215/V1235/V1245 £20.00
V1305 £33.50
V380 £27.00
V502/V503/V5005 £37.00

ORION
VH3/VH555/VH600/VH700/VH844/VH900/VH1000 (ALL MODELS) £13.00
VH1/VH2A £7.00

PHILIPS
VR6460/VR6520/64VR60/VF6420 £8.50
VR6711 4 HEAD £41.00
6920/VR6440 £58.00
VR6441/VR6540/VR6541/VF6640/VR6642 £14.00

RANK
BV6900AS £18.00
N830EA/RV300/RV310/RV320/RV330/RV340/RV350/RV380 £7.00

SAISHO
VR100/VR605/VR705/VR805/VR905 £12.50
VR1000/VR1100/VR1200/VR1600 £14.00
VR3300X/VR3600X/VR3650/VR3800 £15.00
VR3200/VR3500 £15.00
VR2000/VR3300/VR3600

SALORA
6500/6600 £21.50
SV7300/8200/8300/9200 £19.50
SV7400/8400 £23.00
SV8100 £13.50

SAMSUNG
SVX301/VB900/VB910/VT510/VT320/VT5600/VX510/VX511/VX520/VX616/VX626/VX627/VX717/SV716/717/SVX303/305/VB510/520/610/616/617/619/620/626/627/629/710/971/VI520/616/621/626/900/810/VX617/619/629/710/712/VX720/730/970/971/972 £19.00
VB770/VI730/770/VK8220/VX750/770/8225 £21.00

SANYO
VTC5000/VTC5400/VTC6000/VTC6500/VPR5000/VTC1500/VTCM10/VTCM11/VTCM20/VTCM21/VTCM25/VTC2000/VTC5100/VTC5150/VTC5300/VTC5400/VTC5350/VTC5370/VTCNX10/VTCNX15/VTCNX20/VTCNX30/VPR5800 £18.50
VTC5500/VTC5550/VTC9100/VTC9300/VTC9350/VTC9355/VTC9455/VTC9500 £19.00
VHR1110/VHR1150/VHR1300/VHR1700/VHR2300 £16.00
VHR3200/VHR3270/VHR3100/VHR3150/VHR3300/VHR3400/VHR3310/VHRD500 £18.00
VHR1100/VHR1200 £18.00
VHR1500/VHR2500 £28.00
VHR2700 £24.50

SHARP
VC390/VC393/VC496 £30.00
VC488 £48.00
VC779 £20.00
VC789/VC790 £32.00
VC300/VC381/VC383/VC386/VC387/VC388/VC482/VC483/VC486/VC3300/VC8381/VC9100/VC9300/VC3500/VC9700/VC9400/VC9600/VC200/220/384/385/471/477/481 £13.00
VC582/VC583/VC651/VC681/VC750/VC780/VC781/VC683/VC684/402/500/571/573/581/584/585/600/682/685/693/VC700/772/7810/782/7822/783/8481 £13.00
VC6000/VC6200/VC6300/VC7300/VC7700/VC7750/VC8000/VC8300 £20.00
VC793 £36.00
VC473/785/786 £25.00
VC699/VCA501/VCA602 £29.00

SONY
DSR-19R (FOR SL-T 9ME) £39.00
DSR-21R (FOR SLC 8 C9) £30.00
DSR-35R (FOR C20/C30/C40/SLF1UB/SLF1E) 2 PIN SLC24PS/SLC33E/SLC44PS/SLF30PF/SLF60PS/SLK85/SLT20ME/SLT30ME £15.00
DSR-43R (FOR SLC7 RANGE/SL5000/SL5100/SL3000) 1 PIN SLC6E/SL36ES/SL37E £13.00
SL3000/8000/8080/SLC5E/SLT7ME £16.00
SLV201/202 £29.50
SLK95/SLT50ME £29.00

TOSHIBA
V63 £18.00
V9680 £42.00
V8600/V8700 £38.00
V21/V31/V33/V50/V51/V53/V3600 £14.50
V55/V57 £7.00
V71/V73/V74/V75/V81/V82/V83/V84/V85/V86/V87/V80/V77 £14.00
V93/V80 £20.00
V5470/V5480 £18.00

SEE PREVIOUS PAGES FOR MORE ← GRANDATA BARGAINS

TRIUMPH
VR9500/VR9501/VR9525 £13.00

THOMSON
TX8000/V309/316/320/321/323/326/4100/4200/4300/VK305T/306T/309BL/3301/312T/410T/411T £6.50
TX8500/V318/342/343/351/352/353/4210/4230/4260 £15.75

VCR PINCHROLLERS

AKAI
VS9300, VS9500, VS9700, VS9800, VP7100, VP77 £2.50
VS1, VS2, VS3, VS4, VS5, VS6, VS9, VS10, VS8, VS15 £2.50
VS105, VS112, VS115, VS116, VS126, VS244, VS245, VS247, VS248, VS515, VS516, VS205 £2.60
VS201, VS301, VS303, VS304, VS603, VS606, VS607, VP58-P82 £2.50
VS125, VS155, VS165, VS220, VS240, VS250, VS512, VSX9 £2.50

AMSTRAD
VCR4500, VCR4600, VCR4600, VCR6000, VCR6100, VCR9000 £2.50
VCR5200 £2.50
VCR7000 £2.50
TVR1 £2.50

AIWA
AV66, AV77 £2.50
G700, G900 £2.50

ALBA
VCR3000X, VCR4000 £2.60
VCR5000, VCR6000 £2.50

AUTHENTIC
N850 £2/50

BLAUPUNKT
RTV100, 200, 202, 222, 224, 301, 306, 307, RTV309, 311, 312, 315, 316, 317, 319, 320, 328, RTV404, 414, 434, 444, 478, 707, RTX100 £2.50
RTV211, 214, 321, 322, 348, RTX250, 260 £2.50
RTV324, 325 £2.50
RTV330, 454, 520, 530, 535, 560, 660, 670, RTV720, 730, 740, 800, 810, 900, 910, 920 £2.50

DECCA
VR8300 £2.50
VRH8495DK (Pressure Roller Assembly) £6.25

FERGUSON
3V00, 3V16, 3V22, 3V23, 3V24, 3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929 £2.50
3V29, 3V30, 3V31, 3V32, 8930, 8931, 8940, 8941, 8942 £2.50
3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 3V58, 3V59, 3V64, 3V65, FV10, FV11, FV12, FV14, 3V49, 8943, 8944, 8945, 8947, 8948, 8950, 8951, FV13H, FV20B, FV21R, FV22L, FV26D, FV30B, FV32L, FV33H, FV39S, VC141L £2.50

FISHER
FVHP420, FVHP520, FVHP530 £2.50
FVHP615, FVHP710, FVHP715, FVHP716, FVHP722, FVHP725, FVHP830, FVH618, FVH620, FVH622, FVH622, FVH711, FVH720 FVH721, FVH722, FVH725, FVH730, FVH840 £2.50
FVHP905, FVHP970, FVHP980, FVHP990, FVHP5000, FVHP5005, FVHP5050, FVHP5075, FVHP5100, FVHP905, FVHP906, FVHP908, FVHP910, FVHP911, FVHP915, FVHP916, FVHP918, FVHP975 £2.50
VBR330, VBS3500, VBS7000, VBS7500, VBS7600, VBS9000, VBS9900 £2.50

FIDELITY
HQS200, VCR100, VCR600, VCR6100 £2.50
VTR1000 £2.50

FIJITSU
HS760, VX715, VX720D £2.50

FUNAI
V1, V2, VCR4000, VCR4500, VCR4530, VCR4600, VCR4800, VCR5200, VCR5400, VCR5840, VCR5843, VCR6000, VCR6600, VCR6800, VCR6803 £2.50
VIP1000, VIP1400, VIP3000 £2.50

GEC
V4004 £2.50

GRANADA
VHSAH1, VHSAH3, VHSVH4, VHSWH1, VHSXH1, VHSYH2 £2.50
VHSAN3, VHSBP1 £2.50
VHSAY3 £2.50
VHSBH1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3 £2.50
VHSBY3, VHSCC1 £2.50
VHSDS2 £2.50
VHSDP1, VHSFP2 (Pressure Roller Assembly £6.25
VHSEY1 £2.50
VHSFG2, VHSFG4 £2.50
VHSFJ4, VHSYJ2 £2.50
VHSF63 £2.50
VHSTJ1, VHSTJ2, VHSTJ3 £2.50
VHSWJ1, VHSWJ3, VHSXJ3 £2.50

GRUNDIG
BARCELONA, MADRID, MVS500, MVS550, MVS600, MVS620, 660, SE5110, SE5140, SE6100, SE6160, TVR4500, VS500, VS505, VS510, VS520, VS521, VS530, VS540, VS550, VS600, VS610, VS620, VS630, VS640, VS660, VS680, VS5180, VS5480 £2.50
MVS400, MVS440, VS400, VS410, VS440, VS460 £2.50
VS120 £2.50
VS150 £2.50

GOLDSTAR
GHV1221, GHV1232, GHV1240, GHV1241, GHV1242, GHV1243, GHV1244, GHV1245, GHV1246, GHV51, GHV8210, GHV8215, GHVP1240, GHVP1241, GHVP1247, GHVP1248, GHVP1290, GHVP1291, GHVP1295, GHVP1296, VCP4100, GHV51, GHV8000, GHV8200, VCP4000, VCP4130, VCP4200, VCP4300, VCP4301, VCP4305, VCP4306, VCP4310, VCP4311, VCP4315, VCP4316, VCP4320, VCP4321, VCP4325, VCP4326 £2.50

HINARI
V20H, VXL10, VXL11, VXL19, VXL5, VXL6, VXL7, VXL8, VXL9, VXL90 £2.50
VXL2, VXL3 £2.50
VXL4, VXL20, VXL35 £2.50

HITACHI
VT11, VT14, VT16, VT17, VT19, VT33, VT330, VT34, VT35, VT38, VT39, VT52, VT6500, VT680, VT6800, VT7, VT7000, VT8000, VT8500, VT9700, VT9900 £2.50
VT61, VT62, VT63, VT64, VT65, VT86, VT88, VT110, VT122, VT120, VT128, VT130, VT135, VT138, VT150, VT168, VT220, VM200, VM500, VM600, VT100, VT111, VT113, VT115, VT118, VT125, VT145, VT175, VT225, VT250, VT255, VT258, VT260, VT400, VT405, VT410, VT413, VT414, VT415, VT418, VT420, VT425, VT426, VT428, VT430, VT431, VT435, VT438, VT450, VT498, CT510, VT518, VT520, VT525, VT526, VT530, VT535, VT536, VT540, VT545, VT546, VT548, VT570, VT575, VT576, VT580, VT588, VT640, VT8, VT85, VT86, VT88, VTL30, VTM625, VTM626, VTM630, VTM636 VTM640, VTM645, VTM646, VTS80, VTS85 £2.50
VT3,000, 5000, VT8000, VT9300, VT9500 £2.50

ITT
VR3605, VR3905, VR3935, VR3985, VR3986, VR3993, VR3994, VP3826, VR3906, VR3916, VR3926, VR3946, VR3948, VR3976, VR3995, VR3997, VR6948 £2.50
VR3913, VR3914, VR3943, VR3954, VR3963, VR3984 £2.50
VR3907 £2.50
VR3912 £2.50
VR3917, VR3833 £2.50
VR3929, VR3968 (PRESSURE ROLLER ASSEMBLY) £6.25

JVC
HR2000, HR3300, HR3330, HR3360, HR3660, HR4100, HR7700, HR7200, HR7300, HR7350, HR7600, HR7610, HR7650, HR7655 £2.50
HRD110, HRD111, HRD120, HRD121, HRD140, HRD150, HRD160, HRD225, HRD455, HRD565, HRD725, HRD157, HRD158, HRD170, HRD180, HRD210, HRD230, HRD250, HRD257, HRD300, HRD320, HRD370, HRD400, HRD430, HRD470, HRD530, HRD566, HRD700, HRD750, HRD755, HRD950, HRP50, HRS5000, HRS5500 £2.50

MATSUI
VX850 £2.50

MITSUBISHI
HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS700, HS330 £2.50
HS306, HS307, HS337, HS338, HS349, HS400, HS411, HS412, HS421, HS710, HSB10, HSB20, HSB30, HSE10, HSE20, HSE30, HSE70 £2.50

NATIONAL
NV100, NV180, NV300, NV333, NV340, NV366, NV600, NV688, NV777, NV788, AG6010, AG6015, AG6100, AG6200, AG6400, AG6810, NV3321 £2.50
NV230, NV370, NV430, NV460, NV730, NV810, NV830, NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14, AG1000, AG1200, AG1500, AG2100, AG2100, AG2200, NV260, NV280, NV380, NV450, NV465, NV470, NV480, NV630, NV650, NV770, NV780, NV8050, NV8150, NV8200, NV8300, NV8400, NVG15, NVG30, NVG400, NVH70, NVG130 £2.50
NVG7, NVG19, NVG12, NVG18, NVG9, NVG10, NVG11, NVG120, NVG16 £2.50
NVG21, NVG25, NVH65, NVG33, NVG46, NVG50, NVG300, NVF65, NVF70, NVFS1, NVFS100, NVH75, NVJ30, NVL20, NVL23, NVL25, NVL28 £2.50
NVD48, NVD80, NVG21, NVG45 £2.50

NEC
N830, N831, N832, N833, N895 £2.50
PVC2300, PVC2400, PVC740, PVC744, PVC746, PVC760, PVC764, PVC766 £2.50

ORION
VH1, VH2 £2.50
VC150, VC180, VH1000, VH200, VH201, VH205, VH212, VH250, VH254, VH288, VH3, VH300, VH303, VH3030, VH312, VH33, VH3312, VH404, VH704, VH708, VH712, VH770, VH780, VR2948 £2.50
VH300, VH3050, VH2308, VH2400, VH2600, VH2700, VH4300, VXL20, VXL25, VXL30 Etc £2.50

PHILIPS
VR6460, VR6920 £2.50
VR2020, VR2021, VR2022, VR2023, VR2024 £3.20
VR6711 £2.50
VR6540 £2.50
DV856, VR6485, VR6585, VR6589, VR6880, VR6948 £2.50
VR445, VR6442, VR6542, VR6843, VR6943 £2.50
DV464, VR2324, VR2300, VR2334, VR2340, VR2350, VR2414, VR2480, VR2486, VR2489, VR2490, VR2498, VR6462, VR6463, VR64664, VR6560, VR6660, VR6860, VR6861, VR6862, VR6863 £2.50

Pressure Roller Assembly
DV186, DV190, DV286, DV486, DV471, DV582, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6760, VR6761, VR6762, VR6870, VR6970, VR6975, VR86B1, 63SB7, 68SB4, 71SB4, 72SB8, 92SB31 £6.25

SANYO
VHR1100, VHR1300, VHR1500, VHR2300, VHR1150, VHR1200, VHR2100, VHR2500, VHR2700 £2.50
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20, VTC5150, VTC5350, VTC5400, VTC6000, VTC6500, VTC9100, VPR5800, VTCM11, VTCM21, VTCM31, VTCM50 £2.50
VHR3100, VHR3300, VHR3310, VHR3700, VHRD500, VHRD700 £2.50
VTC3000 £2.50

SHARP
VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300, VC9100, VC9300, VC9500, VC9700, VC200, VC2300, VC3300, VC384, VC385, VC388, VC390, VC393, VC6000, VC6200, VC7750, VC800 £2.50

VCR PINCHROLLERS Cont.

SHARP Cont.
VC387, VC481, VC483, VC486, VC496
VC581, VC582, VC583, VC585, VC402
VC471, VC473, VC477, VC500, VC571
VC573, VC584, VC5W20E, VCA1031 £2.50
VC651, VC681, VC685, VC750, VC780
VC781, VC785, VC787, VC793, VC772
VC800, VC682, VC684, VC693, VC699
VC700, VC772, VC7810, VC782, VC7822
VC7282MK2, VC783, VC786, VC800
VCF3, VCA100, VCA102, VCA104
VCA202, VCA303, VCA211, VCA234
VCA501, VCA602, VCD801, VCD802
VCH852, VCH881 £2.50
VC220 £2.50

SAISHO
VR2000, VR3800 £2.50

SOLARA
SV6500, SV6600 £2.50
SV7300, SV8200, SV8300
SV9200, SV9300 £2.50
SV7400, SV8400, SV8420, SV8500
SV8520, SV8550, SV8600, SV8620
SV8700, SV8710, SV8720, SV8800
SV8830, SV9500, SV9600, SV9810 £2.50
SV8000, SV8100 £2.50

SAMSUNG
SV716, SV717, VB510, VB520, VB610
VB616, VB617, VB619, VB620, VB626
VB627, VB629, VB900, VB910, VI510
VI520, VI611, VI616, VI621, VI626
VI900, VI910, VX510, VX520, VX616
VX617, VX619, VX626, VX627, VX629 £2.50
SVX301, SVX303, SVX305, SVX307
SVX319, SVX322, VB710, VB770
VB8220, VB971, VB8225, VI730, VI770
VI790, VI8220, VI8225, VK8220, VX710
VX712, VX720, VX730, VX750, VX770
VX790, VX8220, VX825, VX970, VX971
VX972 £2.50

SIEMEN
FM350, FM352, FM355 £2.50
FM361, FM362, FM363, FM364 £2.50
FM391, FM392, FM394, FM461
FM462, FM464, FM468, FM561 £2.50

SONY
SLC5, SLC6, SLC7, SL3000, SL8000
SL8080, SL8200, SL8600, SL36, SL37
SLJ10, SLT6ME, SLT7ME £2.50
SLC9, SLC20, SLC24, SLC30, SLC33
SLC44, SLHF100, SLF1, SLF11, SLF25
SLF30, SLF60, SLF100, SL200, SLF60PS
SLF90E, SLHF150, SLHF850, SLK88
SLK95, SLT20ME, SLT30ME, SLT50ME £2.50
BMC100, BMC200, BMC500 £2.50
SLV201, SLV202, SLV301, SLV302
SLV401, SLV402, SLV801, SLV802 £2.50

TOSHIBA
DV80, DV90, DV96, DV97, V200, V200
V202, V205, V207, V300, V309, V500
V509, V55, V57, V61, V63, V65, V66
V67, V700, V71, V73, V74, V75, V77
V81, V83, V85, V86, V93, V94 £2.50
V5470, V5480 £2.50
V91, V951 (Pressure Roller Assembly) £6.25

VCR BELT KITS

AKAI
VP7100, VS9300, VS9500, VS9700
VS9800 £1.30
VS1, VS2, VS4, VS5, VS12, VS15
VS53, VP88, V56, V58, V59 £1.00
VS10 £0.65

AIWA
AV66 £1.25
AV77 £1.40
G700 £1.60
G900 £1.80

ALBA
VCR3000X, VCR4000 £1.30

AMSTRAD
TVR123, VCR4600, VCR4700, VCR5200 £1.60
VCR7000 £0.80
VCR6000, VCR6100 £1.80

AUTHENTIC
N850 £1.20

DECCA
VR8300 £1.20
VRH8945DK £0.80

FERGUSON
3292, 3V00, 3V01, 3V16, 3V22, 8900
8901, 8902, 8903, 8904, 8906, 8909
8912, 8922 £1.35
3V23, 8923, 8924, 8929 £0.65
3V29, 3V30, 8930, 8931, 8940 £0.90
3V31, 3V32, 8941, 8942 £0.85
3V35, 3V36, 3V38, 3V39, 3V49
8943, 8944 £0.70
3V42, 3V43, 3V44, 3V45, 3V48
3V53, 3V54, 3V55, 57, 8945, 8947, 8948 £0.65
3V58, 3V59, 3V64, 3V65, 8950, 8951
FV10, FV11, FV12, FV13, FV14, FV20
FV21, FV22, FV26, FV30, FV32, FV33 £1.05

FIDELITY
HQS200, VCR600, VCR6100 £1.80
VCR100 £1.60
VTR1000 £1.00

FISHER
VBS7000 £2.45
VBS9000 £1.20
FVHP520, FVHP530, FVHP420 £0.60
FVHP615, FVHP618, FVHP620, FVHP622
FVHP710, FVHP711, FVHP715, FVHP716
FVHP720, FVHP721, FVHP722, FVHP725
FVHP730, FVHP830, FVHP840 £1.00
FVHP905, FVHP906, FVHP907, FVHP908
FVHP910, FVHP911, FVHP915, FVHP916
FVHP918, FVHP5005, FVHP5005
FVHP5050, FVHP5075, FVHP5100 £1.00
VBR330, VBS7500, VBS7600, VBS9900 £1.00
VBS3500 £0.75

FUJITSU
HS760, VX715, VX720D £1.60

FUNAI
V1, V25, VCR4600, VCR4800, VCR5200
VCR5400, VCR5600, VCR6600 £2.10
VCR4530, VCR5840, VCR5843
VCR6800, VCR680 £1.80
VIP3000, VIP5000 £1.60

GEC
4005 £1.50
V4004 £1.00

GOLDSTAR
GHV1221, GHV1232, GHV1241
GHV1242, GHV1243, GHV1244
GHV1245, GHV1246, GHV1248, GHV51
GHV8000, GHV8210, GHV8215
VCP4100, VCP4130 £0.80
GHV1290, GHV1291, GHV1295
GHV1296, VCP4200, VCP4300, VCP4301
VCP4305, VCP4306, VCP4310, VCP4311
VCP4315, VCP4320, VCP4321, VCP4325
VCP4326, VCP4000 £1.20
GHV1247, GHV8200 £1.50

GRUNDIG
MVS400, MVS440, VS400, VS410
VS440, VS450, VS460 £0.55

HINARI
VXL2 £0.80
VXL7, VXL8, VXL9 £1.80
VXL4, VXL35 £0.70
VXL5, VXL6 £1.60
VXL3, VXL20 £0.90

HITACHI
VT11, VT14, VT17, VT19, VT33, VT34
VT35, VT38, VT39, VT88, VT165, VT330 £1.00
VT5000, VT5500 £1.20
VT7000, VT8000, VT8500 £0.60
VT680, VT6500, VT6800, VT9300
VT9500, VT9700, VT9900 £0.50
VT52, VT61, T62, T63, VT64, VT65, VT85, VT86, VT640 £1.50
VT3000 £1.50
VT100, VT110, VT111, VT113, VT115
VT118, VT120, VT125, VT128, VT130
VT138, VT145, VT150, VT175, VT220
VT225, VT250, VT255, VT258, VT260
VTL30 £1.50

ITT
VR3605, VR3905, VR3935, VR3954
VR3985 £0.90
VR3913, VR3914 £1.00
VR3826, VR3906, VR3916, VR3926
VR3946, VR3948, VR3976, VR3986
VR3995, VR3997, VR6948 £0.65
VR3927, VR3928, VR3977 £1.40
VR3993, VR3994 £0.85
VR3963 £0.65
VR3912 £1.50
VR3917 £1.50
VR3929, VR3968 £0.85
VR3907 £1.00

JVC
HR3300, HR3330, HR3360
HR3660, HR4100 £1.30
HR7200, HR7300 £0.70
HR7350, HR7600, HR7610
HR7650, HR7655 £0.75
HR7700 £0.75
HRD110, HRD111, HRD120
HRD121, HRD225 £ £0.90
HRD140, HRD150, HRD157, HRD158
HRD160, HRD250, HRD257, HRD455
HRD565, HRD566, HRD725, HRD755
HRP50 £0.80
HRD170, HRD180, HRD210, HRD230
HRD300, HRD320, HRD330, HRD370, HRD400
HRD430, HRD530, HRD700, HRD750
HRD950, HRS5000, HRS5500 £1.10

MATSUI
VX850 £0.75

MITSUBISHI
HS200, HS318, HS319, HS410 £2.00
HS300, HS301, HS302, HS307, HS310 £1.50
HS303, HS304, HS306, HS320, HS330
HS400, HS700 £1.50

NEC
N830, N831, N832, N833 £1.00
N895 £1.30
PVC2300, PVC2400

NATIONAL
NV300, NV332, NV333, NV340, NV366 £1.35
NV600, NV688, NV777, NV788
AG6010, AG6015 £1.00
NV2000, NV2010, NV3000 £1.50
NV7000, NV7200, NV7500, NV7800 £0.95
NV8600, NV8610, NV8620 £1.60
NV230, NV250, NV260, NV280, NV370
NV380, NV430, NV450, NV460, NV465
NV630, NV730, NV770, NV780, NV810
NV830, NV850, NV870, NV890, AG1000
AG1200, AG1500 £1.25

PHILIPS
VR6460, VR6920 £1.70
VR6540 £1.00
DV186, DV190, DV286, DV468, DV471
DV562, DV571, DV761, VR6180, VR6182
VR6185, VR6285, VR6290, VR6291
VR6293, VR6362, VR6367, VR6390
VR6391, VR6393, VR6467, VR6468
VR6470, VR6561, VR6570, VR6581
VR6670, VR6676, VR6760, VR6761
VR6762, VR6870, VR6970, VR6975
VR72SB8, VR68SB4, VR86SB1
VR92SB3 £0.85
VR6442, VR6542, VR6843, VR6943
VR44SB8 £0.70

SAISHO
VR2000 £0.90
VR3800 £0.75

SALORA
SV6500 £1.00
SV6600 £1.50
SV8000 £1.20
SV8100 £0.60
SV8500, SV8520, SV9500 £1.50
SV7300, SV7400, SV8400, SV8420
SV9200, SV9300 £1.20

SAMSUNG
SV16, SV717, VI616, VI621, VI626
VX616, VX626, VX627 £0.85
VB520, VB610, VB616, VB617, VB619
VB620, VB626, VB627, VB629, VI510
VI520, VI611, VX510, VX520, VX617
VX619, VX629 £1.00
VB900, VB910, VI900, VI910 £1.10

SANYO
VTC5000, VTC5150, VTC6000, VTC6500
VTCM10, VTCM11, VTCM20, VTCM21
VTCM30, VTCM31, VTCM50 £0.75
VTC5300, VTC5350, VTC5400, VPR5800 £1.00
VTC5500 £0.95
VTC9100, VTC9300 £2.20
VTC1100, VTC1300, VTC1500
VHR1100, VHR1150, VHR1200
VHR1300, VHR1500 £0.90
VHR2100, VHR2300, VHR2500, VHR2700 £1.50

SHARP
VC200, VC381, VC383, VC384
VC386, VC388, VC390, VC393
VC2300, VC8381, VC9100, VC9300
VC9500, VC9700 £1.25
VC6300 £1.50
VC7300, VC7500, VC7700 £1.50
VC8300 £1.80
VC300, VC387, VC471, VC473
VC477, VC481, VC483, VC486, VC488
VC496, VC8481 £1.00
VC402, VC500, VC571, VC573
VC581, VC582, VC583, VC584, VC585
VCSF3 £0.90
VC600, VC651, VC681, VC682
VC684, VC685, VC693, VC699, VC700
VC772, VC781, VC782, VC783, VC785
VC786, VC793, VC800, VC7810
VC7822, VC6F3, VC6V3, VCA100
VCA102, VCA103, VCA104, VCA202 £0.70
VC7750, VC8000 £1.50

SONY
SLC6, SL36ES, SLJ10, SLT6ME £1.40
SLC5, SLC7, SL37E, SLT7ME £1.40
SLC9 £1.65
SL8000, SL8080, SL8200, SL8600 £2.00

TOSHIBA
V55, V57 £0.85
V5250, V5280 £2.30
V33, V53, V96, V9600, V9680 £0.85
V61, V63, V65, V66, V67 £1.50

TRIPLERS

UNIVERSAL £4.50
THORN 9000 SERIES £8.00
PHILIPS G9 £7.50
G8 520 550 £7.50
KT3 £4.50
DECCA 100 SERIES £7.50
120 130 £6.50
ITT CVC 20 30 £7.00
CVC 825 £8.00
RANK T20A £7.00
UNIVERSAL TO FIT
20AX TUBE £8.00
30AX TUBE £8.00

DIODE SPLIT TRANSFORMER

LEADS TO FIT CHASSIS CODE
CTX TYPE £2.50
G11 TYPE £2.50
KT4 TYPE £2.50

VIDEO MOTORS

AMSTRAD
VCR7000 REEL MOTOR £17.00

AIWA
AV77 CAPSTON MOTOR £25.00

AKAI
VP7100, VS 9300, VS9500, VS9800
CAPSTON MOTOR £21.00
VP7100, VS9300, VS9500, VS9800
DRUM MOTOR £19.50

AUTHENTIC
N850 REEL MOTOR £19.00

BLAUNPUNKT
RTV211, RTV214 REEL MOTOR £13.00
RTV325 LOADING MOTOR £8.00

DECCA
VR8... REEL MOTOR £19.00

FISHER
BVR330, VBS3500, VBS7500
VBS7600, VBS9900 REEL MOTOR £6.30

FERGUSON
PU 45979 CAPSTON MOTOR £21.00
HR3300, HR3660, HR4100, 3V00, 3V01,
3V16, 3V22, 3292, 8900, 8901, 8902,
8903, 8904, 8906, 8909, 8912, 8922
PU 55371V CAPSTON MOTOR £19.50
3V35, 3V36, 3V38, 3V39, 8943
8944, HRD110, HRD111, HRD120,
HRD121, HRD225
PU 46414 DRUM MOTOR £19.50
HR3300, HR3320, HR3330, HR3360, HR3600,
HR3660, HR4100, 3V00, 3V01, 3V16,
3V22, 3292, 8900, 8901, 8902, 8903,
8904, 8906, 8909, 8912, 8922
PU 51381V REEL MOTOR £19.00
3V29, 3V30, 3V31, 3V32, 3V39, 8930,
8931, 8941, 8942, HR7200, HR7300,
HR7600, HR7610, HR7650, HR7655

FERGUSON & JVC
PU 58635V CAPSTON MOTOR £29.00
3V58, 3V59, 3V64, 3V65, 8950, 8951,
FV10B, FV11R, FV12L, FV13H, FV20B,
FV21R, FV22L, HRD170, HRD180, HRD230,
HRD370, HRD430
PU 58636W REEL MOTOR £17.00
3V58, 3V59, 3V64, 3V65, 8950, 8951
FV10B, FV11R, FV12L, FV13H, FV14T,
FV20B, FV21R, FV22L, HRD170, HRD180,
HRD230, HRD370, HRD430, HRD530
LOADING MOTOR £8.00
3V42, 3V43, 3V44, 3V45, 3V48, 3V53,
3V54, 3V55, 3V56, 3V57, 8945, 8947,
8948, HRD140, HRD150, HRD157,
HRD158, HRD160, HRD250, HRD257,
HRD455, HRD565, HRD566, HRD725,
HRD755, HRP50, R73AF
PU60201V CAPSTON MOTOR £34.00
HRD300, HRD330, HRD337, HRD400,
HRD520, HRD530, HRD700, HRD750,
HRD950, FV14T
HRD 140, HRD150 CAPSTON MOTOR £30.00
HRD250, HRD565, HRD566
3V29, 3V30 CAPSTON MOTOR £30.00
8930, 8931

HINARI
VXL2, VXL4, VXL20, VXL35
LOADING MOTOR £8.00
VXL20 REEL MOTOR £13.50

HITACHI
5578154 CAPSTON MOTOR £20.00
VT52, 61, 62, 63, 64, 65, 640
VT3000 CAPSTON MOTOR £21.00
VT3000 DRUM MOTOR £19.50

ITT
VP3826, VR3906 LOADING MOTOR £8.00
VR3916, VR3926, VR3846, VR3948,
VR3976, VR3997, VR6948
VR3912 CAPSTON MOTOR £21.00
VR3912 DRUM MOTOR £19.50
VR3605, VR3905 CAPSTON MOTOR £19.50
VR3935, VR3954, VR3985
VR3913, VR3914 REEL MOTOR £19.00
VR3993, VR3994

MITSUBISHI
288P02801 MOTOR REEL SPOOLING £33.50
HS300, 301, 302, 310
288P02806 MOTOR REEL SPOOLING £31.50
HS303, 304, 320, 330, 700
288P03401 MOTOR REEL
TAKE UP GEN £21.00
HS303, HS320, HS700

NEC
N830EG, N831EG CAPSTON MOTOR £19.50
N832, N833EG
N895 LOADING MOTOR £8.00

NATIONAL
MYN 135V5L REEL MOTOR £13.00
NV300, NV332, NV333, NV340, NV366
VEM0212 MOTOR REEL GEN £30.00
NV730, NV770
VEM0217 REEL MOTOR £19.00
NV7000
MAX13V9LP CAPSTON MOTOR £30.00
NV300, NV332, NV333, NV340,
NV366, NV600

ORION
NEVHL, VC150, VC180 REEL MOTOR £13.50
VH201, VH205, VH212, VH250, VH254,
VH288, VH3, VH300, VH303, VH312, VH700
VH704, VH708, VH712, VH770, VH774,
VH780, VH820, VH844, VH900, VH974,
VH1000, VH1204, VH200, VH2004,
VH2204, VH3030, VH3050, VH3060,
VH4008, VHF2A, VP200, VH2004,
VH2204, VH3030, VH3050, VH3060,
VH4008, VHF2A, VP200, VR2948,
VR2949, VR2956, VR2957

ORION Cont.
NVHL, NVHM LOADING MOTOR £8.00
VH250, VH254, VH288, VH300, VH404
VH412, VH512, VH530, VH535, VH600
VH630, VH635, VH640, VH666, VH704
VH730, VH735, VH744, VH770, VH774
VH820, VH844, VH850, VH888, VH893
VH900, VH974, VH1012, VH1204
VH1440, VH1500, VH1660, VH1800
VH2004, VH3030, VH3050, VH3060
VH4010, VH4015, VH4020, VH5010
VH5015, VHF2A, VP220, VR2948
VR2949, VR2956, VR2957, VR2966
VR2980, VXL20, VXL25, VXL30

PHILIPS
VR6540 REEL MOTOR £16.00

SAISHO
VR705, VR805 REEL MOTOR £13.50
VR805, VR2000

SAMSUNG
VB510 REEL MOTOR £11.00

SANYO
4 529V 10800 (RM11) REEL MOTOR
VTC5000, VTC5150, VTC5300 £6.30
VTC5400, VTC6000, VTC6500
VTC3000 CAPSTON MOTOR £25.00

SHARP
RMOTV 1008GEZZ REEL MOTOR £13.50
VC200, VC381, VC384, VC385
VC386, VC483, VC3300, VC8381
VC9100, VC9300, VC9500, VC9700
RMOTV 1007GEZZ REEL MOTOR £16.00
VC300, VC402, VC471, VC477
VC481, VC482, VC488, VC496, VC500
VC571, VC573, VC581, VC582, VC583,
VC584, VC5F3, VC8481, VC8581
VC7822, VCA102 CAPSTON MOTOR £32.00
VCA202, VCA234, VCA602

SONY
BHF 1100D CAPSTON MOTOR £25.00
SLC5, SLC7, SLC37, SL3000

THOMSON
VK300, VK301 CAPSTON MOTOR £21.00
VK302, VK303, VK305, VK3301
VK300, VK302 DRUM MOTOR £19.50
VK303, VK305, VK308, VK3301

TOSHIBA
V55, V57 CAPSTON MOTOR £19.50
V61, V63 LOADING MOTOR £8.00
V71, V73, V74 REEL MOTOR £10.50
V75, V81, V83, V85, V86, V93, V94
V300, V500, V700, DV90
V71, V73, V74 CAPSTON MOTOR £9.50
V75, V81, V83, V85, V700
V86, V93, V94 CAPSTON MOTOR £15.00

CASSETTE HOUSING

GRANADA
VHSDP1 CASSETTE LIFT ASSEMBLY £15.00
VHSYJ2 £24.00

FERGUSON & JVC
3V38, 3V39, 8943, 8944, 895, 3V35
3V36, 3V49, HRD110, HRD111, HRD120
HRD121, HRD225 £24.00
3V42, 3V43, 3V44, 3V45, 3V48
3V53, 3V54, 3V55, 3V57, 8945, 8947
8948, HRD140, HRD141, HRD150
HRD157, HRD158, HRD160, HRD250
HRD257, HRD455, HRD565, HRD566
HRD725, HRD755 £24.00
8948, 8950, FV10B, FV12L, FV13H
FV14T, FV20B, FV21R, FV22L, FV25
FV395, HRD230, HRD430, HRD530 £24.00
3V58, 3V59, 3V64, 3V65, FV11R
8950, 8951, HRD170, HRD180,
HRD370 £24.00

ITT
VR3605, VR3905 £24.00
VR3916, VR3926, VR2946, VR3948,
VR3976, VR3986, VR3995, VR3997,
VR6948 £24.00

NATIONAL
NV730 £31.00

NEC
N830EG, N831EG, N832, N833EG £24.00
N895 £24.00

PHILIPS
CASSETTE LIFT ASSEMBLY
69120366 £15.00
DV186, 190, 286, 471, 562, 761,
VR6180, 6182, 6185, VR6285, 6290
VR6291, 6293, 6362, 6367, 6393
VR6467, 6468, 6470, 6561, 6670
VR6760, 6761, 6870, 6970 £15.00

TELEFUNKEN
VR2970 £24.00

THOMSON
V320, V321, V323, V326,
V4200, V4300 £24.00
V342, V343, V352, V353, V360, V354,
V368, V4210, V4230, V4260, V4400
V5500, V6000, V8540 £24.00

TOSHIBA
V55, V57 £24.00
V65, V66 £24.00

PANASONIC MODE SWITCHES

NV2000, 2010, 7000, 7200
7800 (VSS0048) £4.00
NV230, 260, 430, 810, 870
2300, 4300 (VSS0110) £2.50
NV830 (VSS0091) £3.00
NV300, 333, 340, 366, 688, 777,
778 (VSS0060) £4.00
NVG21, 25, NVH65, NVD80
(VSS0175A) £2.50

ON/OFF MAIN SWITCHES

GRUNDIG
PART NO 29703-29102
USED ON C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M66 190, M66 190 99, M70-195, P40-345, ST66-1602, T55-340, V7722
PRICE **£3.25**

ITT
PART NO 13 1074
USED ON CP0200, 0211F, 0323, 0323 1, 0341 15, 0345F, 0351, 0351 1, 0361, 0361 1, 9350, CT0500, 0500 1 T, 0500T
PRICE **£3.50**
PART NO LFC 005
USED ON CVC40
PRICE **£3.25**

MATSUI/SAISHO
USED ON MATSUI 2190, SAISHO FST2130TX
PRICE **£3.50**

PHILIPS
USED ON K30, K35, K40, KT3, KT4
PRICE **£1.50**

SONY
PART NO 155466611 (POWER SWITCH 26mm REMOTE SWITCH)
USED ON KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2066, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3, KX20PS1, KX20PS2, KX27PS1
PRICE **£3.50**
PART NO 155496511 (POWER SWITCH 21mm REMOTE SWITCH)
USED ON KV2022, KV2024
PRICE **£3.50**
PART NO 155482011 (POWER SWITCH)
USED ON KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1
PRICE **£7.50**
PART NO 155496711 (POWER SWITCH 26mm)
USED ON KV1400, KV1440, KV2040, KV2060
PRICE **£2.00**

SONY
PART NO 155258800 (POWER SWITCH 21mm REMOTE SWITCH)
USED ON KV2020
PRICE **£2.50**
PART NO 155277400-21 (FUNCTION SWITCH)
USED ON KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KV2756PE3
PRICE £0.60
PART NO 155336300 (FUNCTION SWITCH)
USED ON VARIOUS
PRICE **£1.00**

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 9V 80mA (310mm) WIRES £0.30
PANASONIC VIDEO LAMPS £0.50
SHARP VIDEO LAMPS £0.50
HITACHI 5381682 (VT63 64) VIDEO LAMPS £1.35

VIDEO SENSOR LAMPS

AIWA, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FIDELITY, FISHER, FUJITSU, FUNAI, GEC, GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, FERGUSON, TOSHIBA
SENSOR LAMP CODE NO VLO5) £1.60

AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, HR3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, VR519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 3V16, 3V22, 3V24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925) £0.30
(CASSETTE LAMP 9V 80mA 310mm WIRES CODE NO VL01)

BLAUPUNKT, ORION (VH1 2A), NATIONAL (NV2000, NV2010, NV3000, NV8150, NV8200, NV8400, NV8600, NV8610, NV8620), SHARP (VC2300, VC6000, VC6200, VC6300, VC7300, VC7700, VC8000, VC8300) £0.50
(CASSETTE LAMP 6V 150mA CODE NO VLO2)

AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, VR3994), JVC (HR2650, HR7600, 7610, HR7650, HR7655), TELEFUNKEN (VR530, VR535, VR539, VR550, VR630, VR650), THOMSON (V309, V316, V357, VK309, VK411, TX8000), FERGUSON (3V31, 8941, 8942) £0.50
(CASSETTE LAMP 9V 80mA 310mm SKEQ CODE NO VLO6)

AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3, VHSWJ1, VHSWJ3), ITT (VR3913, 3914, 3963), JVC (HR7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 3V29, 3V30, 8923, 8924, 8929, 8930, 8931, 8940) £0.50
CASSETTE LAMP 9V 80mA 210mm SKEQ CODE NO VLO7)

GRANADA (VHSAY3), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700) £0.70
(CASSETTE LAMP 5V 115mA CODE NO VLO8)

NATIONAL LINE OUTPUT TRANSFORMER

TLF 146-11B £19.00
TLF 15542F £25.00
TLF 14568F £26.00
TLF 14567F £26.00
TLF 14715F £27.00
TLF 14749B £20.00
TLF 6609B £23.00

CASSETTE DC MOTORS

6V MOTOR £2.00
9V MOTOR £2.00
12V CW MOTOR £2.00
12V CCW MOTOR £2.00
13 2V CCW MOTOR £2.90

CASSETTE TAPE HEADS

MONO HEAD £0.90
STEREO HEAD £1.10
MINI HEAD £2.30
AUTO REVERSE HEAD £2.60

GRANDATA LTD

K.P. HOUSE, UNIT 15,
POP IN COMMERCIAL CENTRE,
SOUTHWAY, WEMBLEY,
MIDDLESEX, ENGLAND
Tel: 081-900 2329 Fax: 081-903 6126

SONY FLYBACK TRANSFORMERS

Part No	Models	Price
1-439-216-00	KV-2002E 2010E 2200E 2015 1820E 2010SE	
	KV-2012ME 2016ME 2015ME 2010ME	£14.00
1-439-256-11	KV-2704EC 2704UB 2704ET 2704E(A) 2704E	£40.00
1-439-286-21	KV-2215UB 2217UB 2215EI 2215FE 2212EX 2215ET	£30.50
1-439-289-21	KV-2705F 2705FE 2705UB 2705E 2706UB 2720EC	£40.00
1-439-303-00	KV-2064EC 20PS1 2082ME7 2056EC 2060SA	
	KV-2062E(ESP)	£22.75
1-439-311-00	KV-1440AEC 1440AS MK2 CPS-14CD3 CPV-14CD2	
	KTX-1350MF KTX-1430UB	£22.00
1-439-332-21	KV-2756 2730EC 2730FE 2764EC 2752UB 2752F	£30.00
1-439-333-00	KV-1882EC 1882UB 1882F 1882CH 1882AEB 1882AM	
	KV-1882ME3 1882HK 1882AS 16TR1 882EC(PS) 1770R	£21.50
1-439-363-21	KV-19HT1A 19FX1MT 18G2 1602M7 1602GE ADM-168	
	KV-2092UB 2096UB	£22.00

FLYBACK TRANSFORMERS

FERGUSON

00D-4208-001	TX9	£14.00
00D-4-208-002	TX9	£14.00
00D-4-235-002-01G	TX90	£14.00
00D-4-247-001	TX90	£14.00
00D-4-247-001 HT1	TX90	£14.00
06D-3-093-001	TX100	£14.00
(110) 06D-3-087-001	TX100	£14.00
(110) 06D-3-084-001	TX100	£14.00
06D-3-088-001	TX100	£14.00

GRUNDIG

29201-019-05		£8.00
29201-024-11		£14.00
29201-024-04		£14.00

PHILIPS

PS 140-17112	G11	£14.00
PS 140-10306	G90AE	£11.50
PS 140-10353	G90B	£15.50
PS 140-10151	K12	£15.00
PS 140-10283	K30 K30111	£15.00
PS 140-10246	K40	£13.00
PS 140-10247	KT4	£14.00
PS 140-10149	KT2	£9.00
PS 140-10161	KT3	£9.00
PS 140-17033	G8	£10.00
PS 140-17089	G9	£10.00
PS 140-10328	NC3	£14.00

ITT

	CVC20	£11.50
	CVC25	£11.50
	CVC30	£11.50

HITACHI

2432981	CPT 1444	£15.00
2434274	CPT 2174 CPT2176	£18.00
	CPT 2178	
OUTPUT TV MODULE	HM6251 (REF 2370551)	£5.50
	HM6232	£5.50

IDLERS & PULLEYS REPLACEMENTS

AKAI

VS1-2 VS4-5 VS15	FF-REW IDLER	M1327773	£4.50
VS3 6 12 56 58 59			
VS1-2 VS4-5 VS15	T-UP IDLER	BV327815	£6.00
VS3 6 12 58 59			
V9700	IDLER	BV321979	£6.00
VS125 126 155	IDLER ASSY	MZ366960J2	£11.00
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 IDLER	PU46381	£4.00
VS9500 VS9800			
VP7100 VS9300	REW IDLER	PU46380	£6.00
VS9500 VS9800			
VP77 VS10	REEL IDLER	BV327815	£3.00
VP88	IDLER	BV336067	£5.00
VS1 3 4 9 12	REEL TABLE	BR347731	£5.50
VS15 58			
VS23 35 37 53 55	CLUTCH	ML373043	£13.00
VS66 75 VSA77			
VS9700	FF IDLER	BV321761	£3.20
VS9700	REW IDLER	VV321762	£4.25

AMSTRAD

VCR7000	IDLER	150280	£1.50
TVR1 VCR4500	CLUTCH	150873	£3.75
VCR4600 VCR5200 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)	£4.50
VCR4700			
MOD KIT TAPE CREASING FOR AMSTRAD			
VCR4500 4600 4700			£4.50

FERGUSON

3V00 3V01 3V16	T-UP IDLER	PU47752	£4.50
3V22 3292 8900 8901 8904 8906			
3V16 3V22 8902	T-UP IDLER	PU49280	£5.50
8903 8909 8912 8922			
3V23 3V29 3V30	REEL IDLER	PU48967	£2.50
3V31 3V32 3V35 8923 8924 8929 8930 8931 8940 8941 8942			
3V23 3V31	ROLLER ASSY	PU49042A	£4.00
3V29 3V30 3V31	T-UP IDLER	51402	£1.25
3V32 3V35 3V36 3V38 3V39 3V49 8930 8931 8940 8941 8942			
3V29 3V30 3V31	T-UP CLUTCH	PU51380	£2.25
3V32 8930 8931 8940 8941 8942			
3V35 3V36 3V38	REEL IDLER	PU55374	£2.85
3V39 3V49 8943 8944			
3V35 3V36 3V38	T-UP CLUTCH	PU55373	£2.00
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	£13.50
3V42 3V44 3V45	CLUTCH ASSY	PU57658	£11.50
3V48 3V53 3V54 3V55 3V57 8947 8948			
3V42 3V43 3V44	T-UP CLUTCH	PU56043-1-4	£2.80
3V45 3V48 3V53 3V54 3V55 3V56 3V57 8947 8948			
3V42 3V43 3V44	SUPPORT CLUTCH	PU56044-1-5	£2.80
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	PU46308	£6.00
3292 8900 8901 8904 8906			
3V16 3V22 8902	IDLER	PU49281	£1.70
8909 8912 8922			
3V16 3V22 8902	IDLER	PU49283	£1.00
8909 8912 8922			

FISHER

FVHP420 520 530	FF-REW PULLEY	HI638531	£1.00
FVHP615 618 620	COMP IDLER ASSY	FI1430420400300	£3.30
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	£4.50
FVHP622 710 711 FVHP720 721 722			
FVHP725 730 830 FVHP840			
FVHP615 618 620	REEL T-UP ASSY	FI1430410400900	£5.50
FVHP622 710 711 FVHP720 721 722			
FVHP725 730 830 FVHP840			
FVHP905 906 908	GEAR IDLER ASSY	FI1430490402400	£4.00
FVHP910 911 915 FVHP916 918			
FVHP975 980 990	IDLER	FI1430420400700	£4.50
FVHP999 5000 5005			
FVHP5050 5075 5100			
FVHD40 55 140	REEL DRIVE ROLLER		£6.00
FVHP1 10 20			
FVHP975 980 990	GEAR		£3.00
FVHP975 980 990	CLUTCH	FI1430510404200	£9.50
FVHP420 520 530	IDLER		£2.80
FVHP420 520 530	TAKE UP IDLER		£3.60
FVHP990	LOADING GEAR		£2.00
VBS3500	REEL DRIVE PULLEY		£5.20
VBS3500	IDLER		£3.00
VBS7000	REW IDLER		£1.20

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		£1.70
GHV1241 1242 1243 GHV1244 1245 1246 GHV1247 1248 8000			
GHV8200 8210 8215 GHVP51 VCP4100 4130			

HINARI

VXL3 VXL20	REEL IDLER	40000009	£1.50
VXL2	IDLER		£1.50
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
111 113 115 118 120		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	£3.60
VT8500-8700			
VT8000-8300 7000	FF-REW PULLEY	6383531	£0.80
VT8500-8700			
VT9300-9500 6500	FF-REW IDLER	6681471	£3.30
VT680 6800 9700 9900			
VT9300-9500 6500	PLAY IDLER	6861482	£3.20
VT680 6800 9700		6861481	
VT9900			
VT9300-9500 9700	IDLER	681505	£3.00
VT9900 6500 680 6800			
	IDLER	687043	£3.80
VT11-33 VT63-64	FF-REW IDLER	6886971	£1.50
VT14 16S 17 19 34 VT35 38 39 52 61 62			
VT65 85 86 88 330 640			
VT100 110 111 113	FF-REW ARM	6886792	£2.75
VT115 118 118 120 125 128 130 135 138 145 150			
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	£3.00
VT9700 9900			

HITACHI TV

OUTPUT MODULE HM 6251			£5.50
OUTPUT MODULE HM 6232			£5.50

JVC

HR330 3660 4100	T-UP IDLER SML	PU49280	£5.50
HR7200 7600 7650	T-UP CLUTCH	PU53462A	£2.25
HR7655 7300 7350 7610			
HR7200 7300 7350	REEL IDLER	PU48967	£2.50
HR7600 7610 7650 7655 7700			
HR7600 7610 7650	ROLLER ASSY	PU49042A	£4.00
HR7655 7700			
HR3300 3660 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200 7600 7650	T-UP IDLER	PU51402A	£1.25
HR7655 HRD110 HRD111 HR7300 7350 7610 HRD120-121 225			
HRD110 HRD120-121	T-UP CLUTCH	PU55373	£2.00
HRD225 HRD111			
HRD110 HRD120-121	IDLER ARM	PU55374-3-8	£2.85
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	£13.50
HRD140 150 157 158	CLUTCH MECH	PU57658	£11.50
HRD160 250 257 565 566 755 HRP50			
HR3300 HR3330	REW IDLER	PU46380	£6.00
HR3660 HR4100			
HRD140 150 157 158	TAKE UP CLUTCH	PU56043-1-4	£2.80
HRD160 250 257 455 565 566 725 755 HRP50			
HRD140 150 157 158	TAKE UP CLUTCH	PU56044-1-5	£2.80
HRD160 250 257 455 565 566 725 755 HRP50			

MATSUI

VX730 735 750 755	CLUTCH	850A00005	£6.50
VX810 820 850 880 990			
VX730 735 750 755	LIMITER POST LEVER		£1.30
VX770 800 810 880	ASSY		
VX990			
VX800A VX900	IDLER REEL		£1.50
VX800A VX820	REEL UNIT CLUTCH		£3.50
VX850 VX900	ASSY IDLER		

MITSUBISHI

HS306 307 318 319	GEAR ASSY	522P00201	£6.25
HS400 410 710			
HS337 338 347 349	IDLER	552B01701	£6.50
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	522B02002	£3.00
HSB10 HSB20 HSB30 HSE10 HSE20 HSE30 HSE70			

MITSUBISHI Cont.

HS337 338 411 421	IDLER	552B01801	£3.50
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		£2.25
N830 N831 N832 N833	TAKE UP IDLER		£1.45
N830 N831 N832 N833	REEL IDLER		£2.85
N895	TAKE UP IDLER SMALL		£6.00
N911 N915 N916 N917	REEL DRIVE PULLEY		£5.50
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	£0.75
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	£1.70
NV280 NV370 NV380 NV430 NV450 NV460 NV465 NV470 NV480			
NV630 NV650 NV730 NV780 NV810 NV830 NV850 NV870			
NVG7 NVG9 NVG10 NVG11 NVG12 NVG14 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	£1.00
NV2000 2010 3000	IDLER UNIT	VXP0329	£1.00
NV2000 NV3000	CAM GEAR	VDG0069	£1.00
NV7000 7200 7800	IDLER UNIT	VXP0344	£1.00
NV7000 7200 7800	CLUTCH	VXP0343	£4.00
NV8150 8200 8300	IDLER UNIT	VXP0245	£0.90
NV8400 8600 8610 8620			
NV8200 8400 8600	PLAY IDLER	VXP0243	£0.90
NV8610 8620			
NV8620	CLUTCH	VXP0343	£4.00
NV332 NV600 NV688	IDLER	VXP0488	£3.50
NVG20 NVG21 NVG25	PULLEY UNIT	VXP0767	£5.00
NVG40 NVG45			
NV230 NV250 NV280	WORM WHEEL	VXP0604	£2.00
NV430 NV450 NV460 NV465 NV650 NV730 NV770 NV810			
NV870 NV890 AG1000			
NV370 NV380 NV630	IDLER	VXP0523	£3.50
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			
NVG130 NVG400 NVH70 AG1000			
NV230 NV250 NV260	CLUTCH GEAR		£2.50
NV280 NV430 NV450 NV730 NV770 NV810 NV870 NV890			
NVG7 NVG10 NVG11 NVG12 NVG14 NVG15 NVG18 NVG30			
NVG120 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			

ORION

MULTIPLE MODELS	IDLER	850A200004	£3.50
MULTIPLE MODELS	IDLER	850A200005	£6.50
VH1 VH2A	IDLER		£1.20
VH1 VH2A	IDLER		£1.20
VH1 VH2A	DRIVING GEAR		£0.60
VH1 VH2A	INTERMEDIATE GEAR		£0.65
VC150 VC180 VH200	IDLER		£1.50
VH201 VH205 VH212 VH250 VH254 VH288 VH300 VH303 VH312			
VH404 VH555 VH700 VH704 VH708 VH712 VH780 VH844 VH900 VH3 VH33			

SAISHO

VR605 VR800 VR900	CLUTCH	850A20000	£6.50
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		£3.50
VR2500 3200 3300 3500 3600 3800			
VR705 VR805 VR905	IDLER		£1.50

SANYO

VHR1110 1150 1200	IDLER	143-0-662T-14730	£5.00
VHR1300 1500			
VTC5000 5150 6000	FF-REW IDLER	143-0-741T-20001	£3.00
VTC6500 VTCM10 M11 M20 M21 M30 M31 M50			
VTC9100 VTC9300	IDLER	143-0-551T-01400	£1.20
VTC9300	FF ROLLER ASSY	143-0-547T-00200	£2.20
VTCM10 M11 M20 M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
VTCM30 M31 M50			
VHR2100 2300 2500	IDLER	6130374899	£5.00
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	£4.25
VHR3400 3700 3800	ROLLER		
VHR0500 VHRD700			
VPR5800 VTC5300	LOADING ROLLER	143-0-661T-03800	£1.00
VTC5400			
VTC3000	FWD LIMITER		£3.50
VTC3000	IDLER		£5.00

SHARP

	IDLER	N1DL0005GEZZ	£1.50
	IDLER	NIDL0006GEZZ	£1.50
VC600 651 681 682	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC684 685 693 699 700 783 VC6FR VC6V3			
VC7300 VC7700 7750	PLAY IDLER KIT	NPLYV0041 - NOA1V1007	£5.00

PLEASE PHONE US FOR TYPE NOT LISTED HERE AS WE ARE HOLDING 5000 ITEMS AND QUOTATIONS ARE GIVEN FOR LARGE QUANTITIES.

Please send £1 P&P and VAT at 17½%. Govt, Colleges, etc. Orders accepted. Quotations given for large quantities. Please allow 7 days for delivery. All brand-new Components. All valves are new and boxed. Prices quoted are subject to stock availability and may be changed without notice.

VIDEO SERVICE KITS

AMSTRAD

VCR7000
Contents
BELT SET. PINCH ROLLER. REEL IDLER. VIDEO LAMP
Order Code: SK41 £5.50

FERGUSON & JVC

3V42/43
HRD455/HRD725
Contents
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND
Order Code: SK37 £17.50
Economy Kit Contents
BELT SET. PINCH ROLLER. SUPPLY CLUTCH. TAKE UP CLUTCH
Order Code: SK38 £9.50

3V58/59/64/65
HRD170/180/210/230/300/320/370/400/430/530/700/750
HRS5000
Contents
BELT SET. PINCH ROLLER. IDLER ARM. TENSION BAND
Order Code: SK44 £8.50

3V29/3V30
HR7200/7300/7350
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK05 £6.00

3V35/36.38/39/49
HRD110/111/120/121/225
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK04 £5.50

3V31/3V42
HR7600/7610/7650/7655
Contents
BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDOE LAMP
Order Code: SK33 £12.00
Economy Kit Contents
BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK34 £5.50

3V35/36/38/39/49
HRD110/111/120/121/225
Contents
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND
Order Code: SK35 £10.50
Economy Kit Contents
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: SK36 £6.50

3V29/3V30
HR7200/7300/7350
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
Order Code: SK31 £11.50
Economy Kit Contents
BELT SET. T/U REEL IDLER TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK32 £5.60

3V44/45/48/53/54/55/57
HRP50/HRD140/150/158/160
HRD250/257/565/566/755
Contents
BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND
Order Code: SK39 £15.00
Economy Kit Contents
BELT SET. PINCH ROLLER
Order Code: SK40 £9.50

FISHER

FVHP905/906/907/908/910/911/916/918
Contents
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND
Order Code: SK57 £13.00
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK58 £5.00

FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840
Contents
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND
Order Code: SK68 £12.50
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK69 £3.60

HITACHI

VT11/VT33
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK08 £6.00

VT11/33
Contents
BELT SET. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. FF/REW IDLER. CLUTCH PLATE. TENSION BAND
Order Code: SK45 £15.00
Economy Kit Contents
BELT SET. PINCH ROLLER. FF/REW IDLER TYRE. T/UP REEL TABLE TYRE. SUPPLY REEL TABLE TYRE
Order Code: SK46 £4.50

VIDEO SERVICE KITS *(Cont.)*

HITACHI

VT52/61/62/63/64/65/85/86/640
Contents
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND
Order Code: SK49 £14.00
Economy Kit Contents
BELT SET. PINCH ROLLER. FF/REW IDLER
Order Code: SK50 £3.25

VT400/405/410/413/14/15/18/420/25/26/28/430/31/35/38/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
Contents
TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND
Order Code: SK52 £11.50

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 £15.00

PANASONIC

NV2000/NV2010
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK03 £6.25

NV7000/NV7200/NV7800
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES
Order Code: SK02 £5.50

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE
Order Code: SK01 £5.50

NV2000/NV2010
Contents
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP
Order Code: SK13 £9.50
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE
Order Code: SK14 £4.50

NV7000/NV7200/NV7800
Contents
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND
Order Code: SK11 £10.00
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE. CLUTCH TYRE
Order Code: SK12 £4.20

NV300/NV330/NV333/NV340/NV366
Contents
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND
Order Code: SK15 £8.00
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE. PLAY IDLER TYRE
Order Code: SK16 £4.00

NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/AG1810 (P/K)
Contents
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER. TENSION BAND
Order Code: SK27 £9.50
Economy Kit Contents
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TYRE
Order Code: SK28 £4.50

NV332
Contents
BELT SET. PINCH ROLLER. PLAY IDLER. FF REW IDLER. TENSION BAND. FF/REW TYRE
Order Code: SK29 £13.00
Economy Kit Contents
BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK30 £5.10

NV230/250/260/280/430/450/460/470/650/810/830/AG1200PK/AG1500PK
Contents
BELT SET. PINCH ROLLER. IDLER. TENSION BAND
Order Code: SK23 £7.00
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK24 £3.50

NV600/NV688
Contents
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND
Order Code: SK25 £13.00
Economy Kit Contents
BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE
Order Code: SK26 £6.50

NV730/NV770
Contents
SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER UNIT. TENSION BAND
Order Code: SK19 £7.00
Economy Kit Contents
SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER TYRE
Order Code: SK20 £4.30

NV370/380/480/630/780/830/850/AG2100PK/AG2200PK
Contents
BELT SET. PINCH ROLLER. IDLER. TENSION BAND
Order Code: SK21 £7.00
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK22 £3.50

NV777/NV788
Contents
BELT SET. PINCH ROLLER. IDLER UNIT. TENSION BAND
Order Code: SK17 £7.50
Economy Kit Contents
BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK18 £4.00

VIDEO SERVICE KITS *(Cont.)*

SHARP

VC381
Contents
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP
Order Code: SK47 £9.00
Economy Kit Contents
BELT SET. PINCH ROLLER. REEL IDLER TYRE
Order Code: SK48 £5.00

VC500/VC571/VC581/VC582/VC583/VC584/VC5F3
Contents
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND
Order Code: SK60 £9.50
Economy Kit Contents
BELT SET. PINCH ROLLER. REEL IDLER
Order Code: SK61 £6.50

VC781/VC7810/VC782/VC7822/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202
Contents
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND
Order Code: SK64 £13.50
Economy Kit Contents
BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE
Order Code: SK65 £6.25

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700
Contents
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND
Order Code: SK62 £13.50
Economy Kit Contents
BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE
Order Code: SK63 £6.25

THIS MONTH SPECIAL OFFERS

STK461	£6.00	STK7563F	£8.00
STK5332	£1.80	STK73410	£4.00
STK5333	£2.40	TA8205AH	£3.75
STK5422	£4.20	TA8210AH	£3.75
STK5476	£4.00	TA8215H	£3.75
STK7308	£3.50	TA8216H	£3.75
STK7348	£3.20	TIPL791A	£0.80
STK7358	£4.40		

VIDEO REEL MOTOR PU51381V £15.00
3V29, 3V30, 3V31, 3V32, 3V39, 8930, 8931, 8941, 8942, HR7200, HR7300, HR7600, HR7610, HR7650, HR7655

HITACHI VIDEO HEAD £11.00
VT11, VT14, 16, 30, 33, 34, 330, 340, 503, 640, 5030

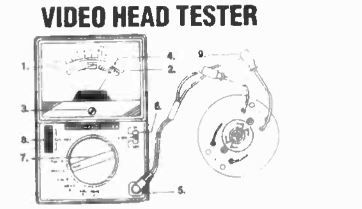
MITSUBISHI VIDEO HEAD £18.00
HS303, 304, 320, 700
HS306, 318, 710 £18.00
HS300, 301, 302, 310 £17.00
HS337, 347 £20.00

PHILIPS

CASSETTE LIFT ASSEMBLY 69120366 £11.00
DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, VR6285, 6290, 6291, 6293, 6362, 6367, 6393, VR6467, 6468, 6470, 6561, 6670, 6760, 6761, 6870, 6970

PRESSURE ROLLER ASSEMBLY £5.00
DV186, DV190, DV286, DV486, DV471, DV582, DV571, DV761, VR6180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6362, VR6367, VR6390, VR6391, VR6393, VR6467, VR6468, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6760, VR6761, VR6762, VR6870, VR6970, VR6975, VR86B1, 63SB7, 68SB4, 71SB4, 72SB8, 92SB31

VIDEO HEAD TESTER



1. Mechanical Position of Pointer
2. Scale Plate
3. Pointer Adjusting Screw
4. Pointer
5. Measuring Socket
6. Power ON/OFF and Battery Check Switch
7. Range Selector Rotary Switch
8. CAL. ADJ (calibration volume)
9. Measuring Clip

PRICE
YF-225 VHS £30.00+VAT
YF-225B BETAMAX £29.00+VAT

GRANDATA LTD

K.P. HOUSE, UNIT 15, POP IN COMMERCIAL CENTRE,
SOUTHWAY, WEMBLEY, MIDDLESEX, ENGLAND
Telephone: 081-900 2329 Telex No: 932 885 (Sunmit)
Fax: 081-903 6126

Access & Visa Card accepted. Open Monday to Saturday.

ELC EAST LONDON COMPONENTS
AUDIO TELEVISION VIDEO
COMPONENTS AT VERY KEEN PRICES
TEL: 081-472 4871 FAX: 081-503 5926

REMOTE CONTROLS FROM £9.99

IDLER TYRES 50p

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

3V29 TAKE UP IDLER	£1.00p
3V29 F/F REW IDLER	£2.60p
3V59/65 FV10/14 IDLER	£1.50p
3V23 LOADING ROLLER BAR	£3.99p
SHARP 0005 & 0006	£1.95p
SHARP VC651 ASSEMBLY	£6.99p
VT11/14/17 IDLER	£1.95p
VT11 CLUTCH ASSEMBLY	£6.99p
VT100/225/260 IDLER	£2.75p
NEC 9013 IDLER	£4.99p
SANYO VHR3300 IDLER	£3.99p
AKAI VS105/250 CLUTCH ASSEMBLY	£11.99p
SAISHO VR380 CLUTCH	£4.99p
MITSUBISHI H5337 F/F IDLER	£2.70p
ALBA SENTRA PULLEY	£1.35p
MATSUI LIMITER POST	£1.25p
PANASONIC NV370 IDLER	£1.95p
FISHER 615 IDLER	£3.50p
FISHER GEAR ASSEMBLY	£4.50p
AMSTRAD PINCH WHEEL MOD KIT	£5.99p
UNIVERSAL TRIPLER	£4.99p
UNIVERSAL TRIPER WITH FOCUS	£7.99p
HITACHI MODULE HM6251	£5.99p
TENSION BAND FOR MOST MOD FROM ££	1.99p
CIRCUIT PROTECTOR ICP	80p
TX10 FOCUS UNIT	£7.99p
PHILIPS BACK-UP BATTERY	£1.50p
ALBA BATTERY 1F 5.5V	£2.50p
TV SWITCHES FOR MOST MODELS FROM	£1.00p
SONY FUNCTION SWITCH	£1.00p
SCART TO SCART LEAD	£3.99p

VIDEO BELT KITS

HITACHI	
VT-11/33	£1.30p
VT-52/65	£1.75p
VT-110/135	£1.80p
FERGUSON	
3V22	£1.80p
3V29/30	£1.00p
3V42/43	85p
3V64.65	£1.00p
FISHER	
FVH 615/725	£1.10p
FVH 905/910	£1.10p
SANYO	
VHR1300	£2.15p
VHR3300	£2.05p
AKAI	
VS2/5FG	£1.00p
VS105/250	£6.99p
GRUNDIG	
VS180	£1.45p
VS300	£1.90p
VS380	£1.75p
HINARI	
VXL3-20	£1.25p
VXL4-35	£1.50p
MITSUBISHI	
HS306/307	£1.75p
SHARP	
VC651/681	£1.25p
VC381	£1.00p
VC9300	£1.60p
TV L.D.P.T.	
TX90 White	£14.99p
TX100 Green	£14.99p
HINARI 4/5	£16.99p
FIDELITY 20"	£12.99p
HITACHI	£19.99p
KV2704/5	£22.99p
KV2752	£22.99p

ELC EAST LONDON COMPONENTS
63 PLASHET GROVE, EAST HAM,
LONDON E6 1AD. TEL: 081-472 4871
FAX: 081-503 5926 OPEN 9AM TO 7PM.

two minutes walk from Upton Park Tube Station

PLEASE PHONE US IF WHAT YOU NEED IS NOT LISTED AS WE HOLD THOUSANDS OF ITEMS IN STOCK

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

VIDEO SERVICE KITS FROM	£4.99p
3V35/3V45 CASSETTE HOUSING	£24.99p
VT33/VT65 CASSETTE HOUSING	£24.99p
VR6467 CASSETTE HOUSING	£17.99p
3V35 CAPSTAN MOTOR	£22.99p
VT11/VT33 CAPSTAN MOTOR	£24.99p

AN3821K	795p
AN3822K	795p
AN5435	250p
AN5900	150p
AN7161	320p
AN7171K	395p
AN7172K	350p
AN7178	275p
BA718	199p
BA6109	180p
BA6208	199p
BA6209	199p
BA6219	250p
BA6222	199p
BA6238	199p
BA6239	250p
BA6229	250p
BA6259	300p
CNX62A	300p
HA1377	199p
HA1392	230p
HA1394	250p
HA1397	250p
HA11225	160p
HA11235	160p
HA11423	210p
HA11711	650p
HA11724	800p
HA13001	199p
HA13108	350p
HA13118	299p
HA13119	299p
HA13403V	550p
LA4270	275p
LA4440	240p
LA4445	250p
LA4460	160p
LA4461	160p
LA4465	299p
LA4466	299p
LA4475	399p
LA4476	399p
LA4495	399p
LA4496	399p
LA4500	230p
LA4505	260p
LA4508	260p
LA4700	399p
LA7520	300p
LA7530	400p
LA7800	180p
LA7801	195p
LA7820	299p
M494B1	850p
M293B1	995p
M490BB1	850p
M491BB1	850p
M54543L	400p
M54544L	400p
M54545L	400p
M54548L	450p
M54549L	450p
M54644L	400p
M54648L	450p
M54649L	400p
MB3730	200p

MB3732	300p
STK441	700p
STK430	500p
STK433	490p
STK459	600p
STK463	780p
STK465	750p
STK0029	400p
STK0040	550p
STK2025	750p
STK2129	699p
STK2250	800p
STK3062	650p
STK4121	699p
STK4131	650p
STK4132	699p
STK4141	650p
STK4142	750p
STK4151	680p
STK4152	900p
STK4161	799p
STK4162	799p
STK4171	850p
STK4172	899p
STK4181	899p
STK4191	999p
STK4192	999p
STK4372	600p
STK5332	350p
STK5333	699p
STK5338	399p
STK5372	399p
STK5211	699p
STK5325	650p
STK5315	650p
STK5434	699p
STK5422	650p
STK5466	850p
STK5476	600p
STK5481	499p
STK5490	550p
STK7226	850p
STK7308	475p
STK7348	450p
STR441	650p
STR451	499p
STR50103	499p
SR2M	80p
STR4211	599p
STR40090	595p
STR44115	750p
STR5412	450p
STR6020	450p
STR50020	650p
STR54041	550p
STR58041	550p
STR59041	650p
STRO1806	599p
STRD1816	599p
SAA1251	400p
SAA1291	900p
SAA1294	1250p
SAA5000	250p
TA7193	400p
TA7240	260p

TA7241	260p
TA7270	250p
TA7271	250p
TA7272	260p
TA7274	260p
TA7280	299p
TA7281	275p
TA7299	399p
TA8201	350p
TA8205	395p
TA8210	350p
TA8214	350p
TA8215	390p
TA8216	590p
TEA2018A	140p
TDA1044	275p
TDA1170	150p
TDA1515	250p
TDA1908A	100p
TDA2003	100p
TDA2005	130p
TDA2030	130p
TDA2270	340p
TDA2577	200p
TDA2579	250p
TDA2600	575p
TDA3560	350p
TDA3561	350p
TDA3562	350p
TDA3565	300p
TDA3651	200p
TDA3654	199p
TDA4500	395p
TDA4501	450p
TDA4503	400p
TDA4505	395p
TDA4510	375p
TDA4600	200p
TDA8170	300p
TDA8180	500p
TDA8190	300p
UPC1031	180p
UPC1185	400p
UPC1188	399p
UPC1230	210p
UPC1225	220p
UPC1277	240p
UPC1278	240p
UPC1288	250p
UPC1318	350p
UPC1363	199p
UPC1365	299p
UPC1378	210p
UPC1394	190p
UPC1420	525p
TRANSISTORS	
TIPL791A	130p
BUT11AF	120p
BUT11A	85p
BUT56A	120p
BU508AF	100p
BU508DF	130p
S2000AF	150p
S2055AF	150p
SG613	850p
SG264A	550p
2SA473	35p
2SA672	30p
2SA673	20p
2SA677	60p
2SA683	25p
2SA684	40p
2SA697	45p
2SA715	35p
2SA720	20p
2SA722	40p

2SA-726	25p
2SA-733	20p
2SA-748	90p
2SA 765	300p
2SA-769	130p
2SA-771	130p
2SA-777	50p
2SA-794	60p
2SA-798	55p
2SA-817	25p
2SA-841	40p
2SA-844	15p
2SA-861	50p
2SA-872	20p
2SA-893	15p
2SA-896	35p
2SA-899	60p
2SA-900	35p
2SA-905	20p
2SA-915	30p
2SA-916	30p
2SA-917	35p
2SA-921	10p
2SA-940	50p
2SA-950	25p
2SA-958	70p
2SA-962	60p
2SA-964	65p
2SA-965	25p
2SA-966	25p
2SA-968	70p
2SA-970	15p
2SA-984	30p
2SA-985	65p
2SA-992	30p
2SA-999	20p
2SA-1015	20p
2SA 1016	20p
2SA-1020	30p
2SA-1048	20p
2SA-1060	90p
2SA-1062	125p
2SA-1094	190p
2SA 1095	275p
2SA 1102	180p
2SA 1104	200p
2SA 1106	200p
2SA-1110	60p
2SA-1123	40p
2SA-1141	200p
2SA-1142	65p
2SA-1145	60p
2SA-1146	190p
2SA-1147	190p
2SA-1156	60p
2SA-1180	200p
2SA-1220	50p
2SA-1232	175p
2SA-1262	65p
2SA-1265	150p
2SA-1282	35p
2SA-1302	299p
2SB-507	100p
2SB 509	100p
2SB-511	100p
2SB 1016	80p
2SB-512	190p
2SB-514	100p
2SB 527	40p
2SB-528	40p
2SB-531	200p
2SB-534	200p
2SB-536	60p
2SB-537	60p
2SB-544	60p
2SB-545	150p
2SB-546	70p

2SB548	40p
2SB-554	350p
2SB-557	300p
2SB-558	300p
2SB-560	35p
2SB-561	20p
2SB-562	35p
2SB-564	70p
2SB-566	110p
2SB-568	40p
2SB-595	80p
2SB-596	75p
2SD1548	550p
2SB-631	40p
2SB-632	40p
2SB-633	50p
2SB-641	20p
2SB-643	20p
2SB-644	25p
2SB-647	30p
2SB-648	55p
2SB0649	40p
2SB 673	80p
2SB0681	250p
2SB-686	120p
2SB-688	130p
2SB-695	325p
2SB-705	200p
2SB-716	30p
2SB 717	70p
2SB-718	70p
2SB-738	25p
2SB-744	60p
2SB-755	310p
2SB-757	350p
2SB-764	25p
2SB-772	45p
2SB-792	45p
2SB-793	35p
2SB-817	200p
2SB-837	60p
2SB-856	60p
2SB-857	60p
2SB-861	60p
2SB-886	65p
2SC 789	50p
2SC-790	80p
2SC 815	15p
2SC-828	25p
2SC 829	20p
2SC-839	25p
2SC-929	20p
2SC-941	25p
2SC-945	20p
2SC-959	65p
2SC-984	40p
2SC-998	300p
2SC 1162	35p
2SC-1172	150p
2SC-1173	45p
2SC 1195	200p
2SC 1212	60p
2SC-1213	60p
2SC 1214	40p
2SC-1222	20p
2SC 1226	75p
2SC 1306	75p
2SC 1317	25p
2SC 1318	25p
2SC-1327	20p
2SC-1328	25p
2SC-1344	30p

2SC-1345	30p
2SC-1359	20p
2SC 1368	40p
2SC 1382	40p
2SC-1383	35p
2SC-1384	35p
2SC-1393	30p
2SC-1398	70p
2SC-1399	60p
2SC-1403	250p
2SC-1413A	240p
2SC-1417	20p
2SC-1445	250p
2SC 1446	60p
2SC-1447	75p
2SC-1454	320p
2SC 1473	30p
2SC-1474	45p
2SC-1475	45p
2SC-1507	50p
2SC-1509	45p
2SC-1514	40p
2SC-1520	85p
2SC-1550	60p
2SC-156·	60p
2SC-1568	60p
2SC-1573	40p
2SC-1577	800p
2SC 1584	600p
2SC-1627	30p
2SC-1667	150p
2SC-1669	85p
2SC-1670	85p
2SC-1675	20p
2SC-1677	80p
2SC-1708	20p
2SC 1722	60p
2SC-1756	40p
2SC-1758	30p
2SC-1760	85p
2SC 1775	20p
2SC-1815	15p
2SC-1819	50p
2SC-1845	20p
2SC-1846	45p
2SC 1848	45p
2SC 1875	260p
2SC 1890	20p
2SC 1906	30p
2SC 1909	250p
2SC-1913	100p
2SC-1914	30p
2SC-1922	275p
2SC-1923	20p
2SC 1941	40p
2SC-1942	190p
2SC 1945	350p
2SC 1969	160p
2SC-1980	25p
2SC 1986	60p
2SC-2003	25p
2SC-2009	60p
2SC 2022	60p
2SC-2026	45p
2SC-2057	25p
2SC 2068	50p
2SC 2073	50p
2SC-2120	15p
2SC 2153	40p
2SC-2229	25p
2SC-2230	30p
2SC-2236	30p

2SC-2238	60p
2SC-2240	25p
2SC-2274	30p
2SC-2275	50p
2SC 2278	75p
2SC 2320	25p
2SC 2335	120p
2SC-2371	45p
2SC-2427	80p
2SC-2440	70p
2SC-2458	30p
2SC-2482	40p
2SC 2500	30p
2SC 2501	85p
2SC-2502	90p
2SC 2537	450p
2SC-2546	20p
2SC 2550	70p
2SC-2555	150p
2SC-2564	230p
2SC-2565	260p
2SC-2570	50p
2SC 2575	25p
2SC 2577	125p
2SC-2579	130p
2SC-2580	175p
2SC-2581	200p
2SC-2582	40p
2SC-2603	20p
2SC-2611	40p
2SC-2631	40p
2SC-2634	40p
2SC-2660	85p
2SC-2688	50p
2SC-2753	50p
2SC-2781	50p
2SC-2785	50p
2SC-2791	325p
2SC 2792	275p
2SC-2944	175p
2SC-3078	40p
2SC 3156	325p
2SC-3179	200p
2SC-3182	250p
2SC-3284	175p
2SC-3298	120p
2SC-3506	250p
2SC 3281	299p
2SD-198	180p
2SD-200	210p
2SD-234	40p
2SD-235	40p
2SD-288	80p
2SD-299	160p
2SD-313	40p
2SD-315	75p
2SD-325	45p
2SD-331	80p
2SD-400	20p
2SD-401	50p
2SD-414	40p
2SD-421	60p
2SD-424	350p
2SD-426	300p
2SD-427	300p
2SD-428	300p
2SD-438	45p
2SD-461	100p
2SD-468	25p
2SD-471	30p
2SD-476	60p
2SD-478	100p

2SD-523	150p
2SD-525	70p
2SD-526	70p
2SD-560	50p
2SD-570	40p
2SD 571	30p
2SD-592	20p
2SD-600	80p
2SD-612	40p
2SD-613	70p
2SD-856	80p
2SD-636	25p
2SD-637	20p
2SD-639	25p
2SD-641	310p
2SD-666	25p
2SD-667	25p
2SD 669	40p
2SD-687	60p
2SD 716	120p
2SD 718	130p
2SD-721	150p
2SD-725	350p
2SD-745	250p
2SD-748	150p
2SD 761	50p
2SD-773	30p
2SD-781	30p
2SD-788	30p
2SD-789	25p
2SD-792	340p
2SD 794	60p
2SD-822	400p
2SD-836	85p
2SD-837	80p
2SD-1047	200p
2SD-845	250p
2SD-850	250p
2SD-859	100p
2SD-863	70p
2SD-869	320p
2SD-870	320p
2SD-871	320p
2SD-880	40p
2SD-882	70p
2SD-898B	260p
2SD-917	180p
2SD-951	175p
2SD-982	80p
2SD-985	80p
2SD-1128	80p
2SD-1134	80p
2SD-1135	90p
2SD-1138	60p
2SD-1153	50p
2SD-1207	50p
2SD-1265	100p
2SD-1267	140p
2SD-1273	100p
2SD-1275	125p
2SD-1276	125p
2SD-1397	200p
2SD-1398	170p
2SD-1426	275p
2SD-1427	275p
2SD-1432	400p
2SD-1439	200p
2SD-1441	200p
2SD-1453	170p
2SD-1497-02	520p
2SD-1497-06	520p
2SJ-50	425p

P.V. TUBES

104 ABBEY STREET
ACCRINGTON, LANCS
BB5 1EE
☎ 0254 236521/232611
FAX 0254 395361
24 Hr Answering Service

SEND LARGE S.A.E. FOR TRADE CATALOGUE

DARK NIGHTS NOW STOCK UP WITH SECURITY PRODUCTS

NEW YEAR & XMAS KISSES FROM ALL THE MISSES

ONE OF THE **LONGEST ESTABLISHED** MAIL ORDER SUPPLIERS, WE CONTINUE TO GIVE **FAST, FAIR** AND **EFFICIENT SERVICE.** WE HAVE STOCKS OF

- ★ **TELEVISION COMPONENTS**
- ★ **VIDEO COMPONENTS**
- ★ **REMOTE CONTROLS**
- ★ **CABLES, LEADS, PLUGS etc**
- ★ **AERIALS AND ACCESSORIES**
- ★ **HOME SECURITY PRODUCTS**
- ★ **DEGAUSSING COILS!! EVEN VALVES!!** ***Just Ask***

FORGED NOTE SCANDAL:
Anyone excepting cash today must have our forged note detector **£25** plus VAT
READY IN SECONDS

BRAND NEW TV'S + VIDEOS ASK FOR BROCHURE
21" FST MULTISYSTEM TV – FOR USE OVERSEAS (not **SECAM L**) II SYSTEMS **£222** + VAT

UPGRADE YOUR ASTRA DISH TO RECEIVE EUTELSAT II F1 13° EAST WITH
THE LITTLE CANNON KIT **£85**
inc. cable/LNB/clips/connectors/tape etc. + VAT

AND NOW SATELLITE SYSTEMS
WE HAVE A FULL RANGE OF FIXED AND MOTORISED SYSTEMS. ASK FOR FULL LIST AT TRADE PRICES – INCLUDES LNB'S, DISHES, MOUNTS, RECEIVERS, ACTUATORS, POLORISERS etc.

RING FOR DETAILS ON 'RED HOT' DUTCH DECODERS.
10 BAND WORLD RADIO **£16.95** plus VAT

VIDEOCRYPT DECODERS B GRADE **£69 + VAT**

CALLERS WELCOME AT TRADE COUNTER MON-FRI 9-5pm SAT 9-4pm

TELNET

1. OSCILLOSCOPES –

H.P. 1740A 100MHZ Dual Trace	£300
H.P. 1741A 100MHZ Dual Trace Analogue Storage	£325
H.P. 1744A 100MHZ Dual Trace Analogue Storage	£325
H.P. 182C 100MHZ 4 Channel	£300
PHILIPS 3211 15MHZ Dual Trace	£150
PHILIPS 3217 50MHZ Dual Trace	£200
PHILIPS 3226 15MHZ Dual Trace	£150
PHILIPS 3240 50MHZ Dual Trace	£225
PHILIPS 3261 120MHZ Dual Trace	£275
GOULD OS 4200 Digital Storage – Dual Beam	£250
TELEQUIPMENT D34 – 25MHZ Dual Trace	£150
TELEQUIPMENT DM64 – 50MHZ Dual Trace Storage	£125
TELEQUIPMENT D75 – 50MHZ Dual Trace	£250
TEKTRONIX 7603 – 100MHZ 4 Channel	£250
TEKTRONIX 7313 – 100MHZ 4 Channel + Anal. Storage	£275
TEKTRONIX 2215 – 60MHZ Dual Trace	£300

Trolleys available for scopes

2. DIGITAL MULTI-METERS + AVO's –

FLUKE 8010A	£100
FLUKE 8060A	£125
FLUKE 8600A	£75
FLUKE 8800A	£80
SOLARTRON 7045	£80
GOULD Alpha III + Alpha IV	£25
AVO's – Model 7 + Model 8's	£10 to £40

3. FREQUENCY COUNTERS –

RACAL 9903 – 50MHZ	£100
RACAL 9905 – 200MHZ	£125
RACAL 9820	£75
ADVANCE TC17A	£75

4. POWER SUPPLIES –

FARNELL L30-5 (30V-5A)	£120
FARNELL L30-1 Twin (30V-1A)	£120
FARNELL L30-1 Single (30V-1A)	£75
FARNELL L30F Single (12V-10A)	£100
FARNELL E350 (350v-200mA) also Fitted with twin 3.15V at 2A and 2.5V, 5V and 6.3V at 3A	£100
FARNELL SB30/10/SB31 30V-10A Not metered	£75
Weir 413 Twin 0-30V @ 1A variable Down to 0-5V @ 6A	£120
PHILIPS PE 1514 Twin (20V- 800mA) Plus 7V @ 3A	£75
COUTANT LB1000.2 (15V-10A)	£75
SOLARTRON AS 1164 Twin (20V-1A)	£75
G.E.C. 18V-22V @ 1A	£25

5. VARIOUS OTHER EQUIPMENTS SUCH AS W&G LEVEL

Meters/Oscillators, Philips 6 Line Pen Recorders, HP RMS Voltmeters, Broadband Sampling V/M, Lyons Pulse Generators, HP Logic Analysers, Marconi – FM/AM Modulation meters TF 2300, Electronic V/M TF 2604, Levell AC Microvoltmeter TM3B, Levell RC Osc. TG 200m, ADRET – Cadasyn 301 Synthesiser plus many more.

Send SAE for List and Prices or Fax List Available. Low Cost Delivery can be Arranged, if required (VAT to be added to Prices and Delivery). All Guaranteed 3 Months.

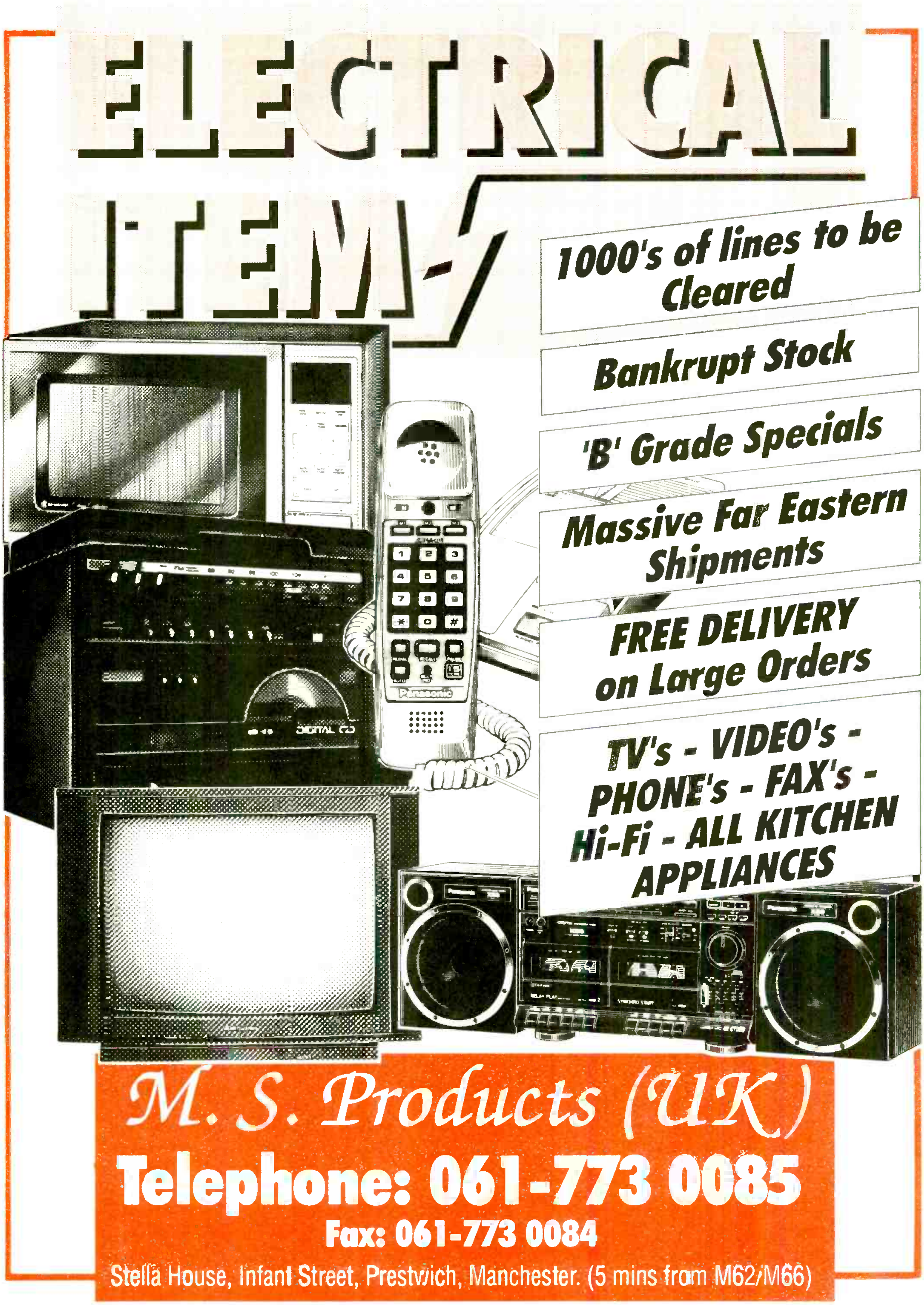
'C' Grade Audio Products and 'B' Grade TV/Video Products Available.

Send for Price Lists.

TELNET 8 CAVANS WAY, BINLEY INDUSTRIAL ESTATE, COVENTRY CV3 2SF

(Premises situated close to Eastern By Pass in Coventry with easy access to M1, M6, M40, M69, A45)

Telephone: 0203-650702 Fax: 0203-650773


ELECTRICAL
ITEM
1000's of lines to be Cleared
Bankrupt Stock
'B' Grade Specials
Massive Far Eastern Shipments
FREE DELIVERY on Large Orders
TV's - VIDEO's - PHONE's - FAX's - Hi-Fi - ALL KITCHEN APPLIANCES
M. S. Products (UK)
Telephone: 061-773 0085
Fax: 061-773 0084
Stella House, Infant Street, Prestwich, Manchester. (5 mins from M62/M66)

WE WILL ONLY SUPPLY TOP QUALITY, BRANDED COMPONENTS. REPUTATION COUNTS WITH US

G.G.L. COMPONENTS

PO BOX 72, UNIT 7, SOUTH JOHN STREET, CARLISLE, CUMBRIA CA2 5AL.
TEL: (0228) 39693/20358 Fax: (0228) 515127.

BUY WITH

AERIAL ACCESSORIES

COAX LINE CONNECTOR .18
COAX PLUG .18
F CONNECTOR .20
FLY LEAD 2M .75
PHILIPS AERIAL SKT 8.95
SATELLITE IF AMP
IN LINE 7-11 DB GAIN 21.50
VIDEO LEAD 2M .75
Y SPLITTER .95
4 WAY DISTRIBUTION AMPLIFIER MAINS 19.95
8 WAY DISTRIBUTION AMPLIFIER MAINS 21.75

BATTERIES

AVO TESTERS 15V 5.95
AA (pkt of 4) 1.15
AAA(pkt of 4) 1.15
FERGUSON 3V55 4.95
GRUNDIG VIDEO 1V2 6.95
J SIZE 6V 2.95
N SIZE (MN9100) .95
PHILIPS MEMORY 1V2 2.10
PHILIPS MEMORY 2V4 3.20
PP3 1.10

CAPACITORS

0.1f 5.5v (back-up) 2.50
63v
1uf at 63v .12
4.7uf at 63v .12
47uf at 63v .18
100uf at 63v .22
220uf at 63v .35
250v
1uf at 250v .20
4.7uf at 250v .25
10uf at 250v .35
22uf at 250v .40
33uf at 250v .55
47uf at 250v .65
100uf at 250v 1.25
400v
1uf at 400v .23
4.7uf at 400v .35
10uf at 400v .70
22uf at 400v .85
(All PCB Mounting)

DIODES

R2M .95
BY133 .15
BY227 .20
BY229/800 .85
BY299/800 .35
IN4007 .10
IN5408 .20
BZX61C (pkt of 5) 5v6, 6v8, 7v5, 12v, 15v, 24v, 33v, 68v, 120v, 130v 1.00

EHT TRAYS

CONTINENTAL 30AX FOCUS 8.95
DECCA 120/130 7.95
GRUNDIG CUC2410 14" 18.75
GRUNDIG CUC2410 22" 17.95
PHILIPS KT3 7.95
THORN 9000 8.00
UNIVERSAL 5.95

FUSES

20mm A/S (PKTS OF 10) 250MA, 315MA, 500MA, 630MA, 800MA, 1A, 1.6A, 2A, 2.5A, 3.15A, 4A, 5A, 6.3A, 8A 1.20
20mm Q/B (PKTS OF 10) 500MA, 630MA, 800MA, 1A, 1.6A, 2A, 2.5A, 3.15A .60

ICs

CNX62A 4.75
CNX83A 3.95
HA13001 2.95
HM6251 5.95
MSM5840H/84RS 12.95
SAA1293-02 5.95
SAA1293-03 6.95
SAA1293A-03 9.95
SAA3027P 6.95
SL1430 1.95
SL1431 2.50
SL1432 1.95
STK4332 5.95
STK5331 4.95
STK5332 4.95
STK5333 4.95
STK5421 4.95
STK5422 6.95
STK5467 12.50
STK5471 8.75
STK5481 6.95
STK5482 4.95
STK5490 7.95
STK5730 4.95
STK7308 6.50
STK7348 6.75
STR4211 4.50
STR5412 4.95
STR40090 8.95
STR50020 7.95
STR50103A 5.50
STR54041 9.95
STR55041 6.95
STR58041 5.95
STR59041 8.50
STR6020 (KIT) 5.95
TDA1035T 2.50
TDA1044 1.95
TDA1170S 1.95
TDA1510 1.95
TDA1515 3.50
TDA1670A 4.95
TDA1770A 3.95
TDA1908A 1.95
TDA2004 1.85
TDA2005 1.95
TDA2030 1.95
TDA2170 2.95
TDA2270 2.75
TDA2576A 3.50
TDA2577 3.75
TDA2577A 3.50
TDA2578A 2.95
TDA2579 3.95
TDA2581 2.95
TDA2582 2.50
TDA2595 5.95
TDA2600 6.50
TDA2653AQ 3.50
TDA3330 4.50
TDA3560 4.95
TDA3561A 4.95
TDA3562A (TFK) 5.35
TDA3565 3.95
TDA3571BQ 8.95
TDA3576B 12.95
TDA3640 6.75
TDA3650 8.95
TDA3651/3 2.95
TDA3651AQ 4.75
TDA3653A 3.50
TDA3654A 2.95
TDA4500 4.50
TDA4501H 3.95
TDA4503 4.95
TDA4505E 6.95
TDA4600/3 2.95
TDA4600/2D 3.95
TDA4601 2.95
TDA4601 DIL 3.75
TEA1039 1.95
TEA2018A 2.50
TMP47C434N-3414 13.95
TMP47C434N-3415 13.95
TMP47C434N-3537 13.95
TMP47C434N-3555 12.95
TMP47C434N-3558 12.95
TMP47C434N-3559 12.95
UPC1365 4.65
UPC1378H 3.95
UPC1394C 2.95
CIRCUIT PROTECTORS
N10,N20,N25 (each) .50

EXTENSIVE RANGE OF NEW MICROPROCESSORS NOW AVAILABLE PLEASE REQUEST DETAILS

LINE O/P TRANSFORMERS

FERGUSON TX90 14" 23.95
FERGUSON TX90 20" 17.50
FERGUSON TX99 22.95
FERGUSON TX100 90D 18.95
FERGUSON TX100 110D 17.25
FERGUSON TX100 FST 20.75
FIDELITY ZX2000 + MOD 15.50
FIDELITY ZX3000 14.95
FIDELITY ZX 22"/26" 18.95
FINLUX 1000 SERIES 19.95
HINARI CT4/5 18.25
HITACHI CPT1174 18.95
HITACHI CPT1446/2028 19.25
HITACHI CPT2174/76/78 18.95
ITT COMPACT 80 18.50
ITT COMPACT FST 20.50
ITT CVC1100 19.20
ITT CVC1200/1 19.95
ITT MONOPRINT A 18.25
ITT MONOPRINT B 23.85
MATSUI 1410/20/40 18.95
MATSUI C1480A 24.95
PHILIPS CF1 23.50
PHILIPS CP90 22.95
PHILIPS CTX14"/20" 21.50
PHILIPS K40 23.75
PHILIPS 2A 23.50
SAISHO CT141R/RA 18.50
SHARP C1410 24.95
ALL LOPTS ARE EITHER "KONIG" OR GENUINE MANUFACTURERS

*** NEW RANGE ***

GENUINE PANASONIC L.O.P.T'S
PANASONIC TC2000 39.50
PANASONIC TC2031 53.50
PANASONIC TC2033 53.50
PANASONIC TC2051 43.50
PANASONIC TC2061 43.50
PANASONIC TC2243 53.50
PANASONIC TC2263 43.50
PANASONIC TX1642 53.50
PANASONIC TX1752 43.50
PANASONIC TX2 43.50
PANASONIC TX2034 53.50
PANASONIC TX2044 53.50
PANASONIC TX2122 43.50
PANASONIC TX2162 43.50
PANASONIC TX2461 39.50
PANASONIC TX3 43.50
PANASONIC TX3300 53.50
PANASONIC TXC22 43.50

MITSIBUSHI, SONY & SHARP LOPTS AVAILABLE PLEASE ASK FOR QUOTE

SERVICE MANUALS

AMSTRAD 4600 9.95
AMSTRAD 6000 9.95
FERGUSON TX85 9.95
FERGUSON 3V55 11.95
FERGUSON 3V58 11.95
FERGUSON 3V59 11.95
FERGUSON 3V65 11.95
FERGUSON FV11 9.95
FERGUSON FV12 9.95
FERGUSON FV20 9.95
FERGUSON FV26 9.95
FERGUSON FV32 9.95
FIDELITY AVS1600 7.95
FIDELITY AVS2000 7.95
FIDELITY CTV14R 7.95
PANASONIC NV370 14.95
PANASONIC NV730 24.50
PANASONIC NV870 25.95
PANASONIC NVG7 24.95
PANASONIC NVG10 24.95
PANASONIC NVG12 17.50
PANASONIC NVG40 17.95
PANASONIC NVL25 16.95
PANASONIC TX1 9.95
PANASONIC TX3 9.95
PANASONIC TX24A1 9.95
PHILIPS KT4/40 9.95

WE ALSO SUPPLY MANUALS FOR: LOGIK,MATSUI,NEC, NIKKAI,SAISHO & SHARP PLEASE RING FOR PRICES

SWITCHES

AMSTRAD CTV2210 3.75
FIDELITY CTV140 1.50
FIDELITY CTV14R 2.95
FIDELITY CTV14S 2.95
GRUNDIG CUC731 3.50
G11 STANDARD 1.35
G11 REMOTE 1.75
ITT TX SERIES 4.95
MATSUI 2190 5.95
KT3 REMOTE 1.75
KT4/CTX REMOTE 1.75
SAISHO FST2130 5.95
SOLARA PCB REMOTE 3.95
SONY KV1612 REMOTE 3.95
SONY KV2022 REMOTE 3.95
TATUNG 140 2.50
TATUNG 161 1.50
TATUNG 165 REMOTE 1.75
THORN UNIVERSAL 1.00
TX9/10 STANDARD 1.00
TX9/10 REMOTE 1.75
TX90/100 STANDARD 1.50
TX90/100 REMOTE 1.75

SATELLITE LNB'S

KU-BAND 1.0db(max) 39.50
KU-BAND 0.9db(max) 49.95
KU-BAND 0.8db(max) 54.95
KU-BAND 0.7DB(MAX) 59.95
DUALBAND 1.1db (max) 74.95

DPS 70 VOLTAGE SWITCHED 1.2db SUITABLE FOR AMSTRAD 39.95
ALL LNB'S ARE JAPANESE MADE)

TRANSISTORS

BC307 .10
BC327 .10
BC337 .10
BC547 .10
BC548 .10
BC639 .20
BC640 .20
BD238 .40
BF458 .35
BF460 .95
BF871 .70
BU208A 1.45
BU208D 1.95
BU426A 1.45
BU500 2.00
BU508A 1.50
BU508AF 1.95
BU508D 1.95
BU508DF 2.50
BU508V 2.75
BU526 1.95
BU536 2.25
BU807 1.75
BU908 2.95
BUT11AF 2.75
BUT56A 2.75
BUX84 .80
R4050 2.95
R4051 2.50
T9053V 3.50
T9054V 3.50
T9064V 1.95
TIP29E (TO168V) .75
TIP41C .50
TIP42C .50
TIP112H (T0167V) .75
TIPL791A 1.95
2SC3156 4.50
2SD1398 2.50
2SD1453 2.95
2SD1497 3.95
2SD1497/02 5.95
7805 .50
7812 .50
TRANSISTOR EQUIVALENT BOOKS TVT A-Z & 2N-2SD 24.95

AKAI VIDEO SPARES

VS1/5
BELT KIT 1.95
PINCH ROLLER 3.95
REEL IDLER UNIT 6.95
TAKE UP CLUTCH 8.95
TENSION BAND 2.95
VIDEO HEAD VS1/5 17.95
VIDEO HEAD VS4 34.50

ALBA VIDEO SPARES

VCR4000
BELT KIT 1.95
CAPACITOR BACK-UP 1.85
PINCH ROLLER 3.95
REEL IDLER 3.95
REEL PULLEY 1.95
REPAIR KIT 11.50
TENSION BAND 2.50
VIDEO HEAD 16.95
VCR5000
BELT KIT 1.95
PINCH ROLLER 3.95
REEL IDLER 3.95
REEL PULLEY 1.95
TENSION BAND 2.50
VIDEO HEAD 16.95
VCR6000
BELT KIT 1.95
CLUTCH ASSEMBLY 4.50
PINCH ROLLER 3.95
REEL IDLER 4.50
REPAIR KIT 12.95
TENSION BAND 2.50
VIDEO HEAD 17.95

AMSTRAD VIDEO SPARES

VCR4500
BELT KIT 1.95
GEAR ASSEMBLY 9.95
MODIFICATION KIT 6.50
PINCH ROLLER 3.50
VIDEO HEAD 14.95
VCR4600BELT KIT 1.95
GEAR ASSEMBLY 9.95
MODIFICATION KIT 6.50
PINCH ROLLER 3.50
VIDEO HEAD 14.50
VCR7000
BELT KIT 1.95
LAMP .95
PINCH ROLLER 3.95
REEL IDLER 3.95
REEL MOTOR 14.95
VIDEO HEAD 15.25
VCR8000
BELT KIT 1.95
PINCH ROLLER 3.95
VIDEO HEAD 17.95

FERGUSON VIDEO SPARES

3V29/30
BELT KIT 1.95
CAPSTAN MOTOR 32.50
CASSETTE LAMP .70
LOADING BELTS (5) 1.95
PINCH ROLLER 3.95
REPAIR KIT 12.95
REEL IDLER 2.95
TAKE UP CLUTCH 2.95
TAKE UP IDLER 1.95
VIDEO HEAD 8.75
3V35/39
BELT KIT 1.95
CAPSTAN MOTOR 21.50
CASSETTE HOUSING 25.95
LOADING BELTS (5) 1.95
MAINS TRANSFORMER 23.95
PINCH ROLLER 3.95
REEL IDLER 2.95
REPAIR KIT 12.95
TAKE UP IDLER 1.95
TAKE UP CLUTCH 2.95
VIDEO HEAD 8.75
3V44/45
BELT KIT 1.50
CASSETTE HOUSING 25.95
PINCH ROLLER 3.95
REMOTE CONTROL 15.95
REPAIR KIT 14.95
VIDEO HEAD 19.50
3V65/FV11
BELT KIT 1.75
CAPSTAN MOTOR 27.50
CASSETTE HOUSING 29.95
PINCH ROLLER 3.95
REEL IDLER 2.75
REPAIR KIT 11.95
VIDEO HEAD 17.95

FISHER VIDEO SPARES

FVH5000
BELT KIT 2.20
REEL IDLER 5.50
PINCH ROLLER 3.50
TENSION BAND 2.60
VIDEO HEAD 24.50
FVH615/720
BELT KIT 1.95
CLUTCH ASSEMBLY 5.95
PINCH ROLLER 4.50
REEL IDLER 5.95
VIDEO HEAD 15.95
FVH905/910
BELT KIT 1.95
CLUTCH ASSEMBLY 19.95
REEL IDLER 5.95
VIDEO HEAD FVH905 15.95

HITACHI VIDEO SPARES

VT8000/8700E
BELT KIT 1.95
CAPSTAN MOTOR 38.50
FF/REW IDLER 2.95
FF/REW PULLEY .95
PINCH ROLLER 3.95
PLAY IDLER 3.95
REEL TABLE 3.95
TENSION BAND 2.95
VIDEO HEAD 15.70
VT9300/9700E
BELT KIT 1.95
CAPSTAN MOTOR 31.95
FF/REW IDLER 2.75
FF/REW PULLEY .95
PINCH ROLLER 3.95
PLAY IDLER 3.95
REMOTE CONTROL 16.95
TENSION BAND 2.95
VIDEO HEAD 15.70
VT11/33E
AUDIO HEAD VT11E 25.50
AUDIO HEAD VT33E 14.95
BELT KIT 1.95
CAPSTAN MOTOR VT11E 23.95
CAPSTAN MOTOR VT33E 23.95
CASSETTE HOUSING 16.50
CLUTCH ASSEMBLY 7.95
FF/REW IDLER Genuine 2.50
PINCH ROLLER 3.95
REPAIR KIT 15.95
RF CONVERTOR VT11E 29.95
TENSION BAND 2.95
VIDEO HEAD 15.70
VT63/64E
BELT KIT 1.95
CAPSTAN MOTOR 27.50
CASSETTE HOUSING 14.70
CLUTCH ASSEMBLY 7.95
FF/REW IDLER 2.50
PINCH ROLLER 3.95
REMOTE CONTROL 13.25
SERVICE MANUAL 10.95
TENSION BAND 2.50
VIDEO HEAD VT63/64E 20.30
VIDEO HEAD VT65 28.50
VT120/130E
BELT KIT 1.95
CAPSTAN MOTOR 24.95
CLUTCH ASSEMBLY 7.95
FF/REW IDLER 3.75
PINCH ROLLER 3.95
REMOTE CONTROL VT120E 15.95
REPAIR KIT
15.95TENSION BAND 2.95
VIDEO HEAD VT120E 21.95
VIDEO HEAD VT130E 24.95

PANASONIC VIDEO SPARES

NV230/430
REPAIR KIT GENUINE 11.50
BELT KIT 1.95
MODE SWITCH 3.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 2.95
VIDEO HEAD NV230 17.50
NV333/366
REPAIR KIT GENUINE 11.50
BELT KIT 1.95
PINCH ROLLER 3.95
PLAY IDLER GENUINE 4.95
REEL IDLER GENUINE 1.25
VIDEO HEAD NV333 8.95
VIDEO HEAD NV366 19.95
NV370
REPAIR KIT GENUINE 11.75
BELT KIT 1.95
MODE SWITCH 3.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 2.95
VIDEO HEAD 9.95
NV730
REPAIR KIT GENUINE 10.95
BELT KIT 1.95
MODE SWITCH 3.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 3.95
TENSION BAND 2.45
VIDEO HEAD 18.95
NV777
REPAIR KIT GENUINE 11.95
BELT KIT 1.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 3.95
VIDEO HEAD 18.95
NV2000/2010
REPAIR KIT GENUINE 18.95
BELT KIT 1.95
PINCH ROLLER 3.95
PLAY IDLER GENUINE 1.25
REEL IDLER GENUINE 1.25
VIDEO HEAD 8.95
NV7000/7200
REPAIR KIT GENUINE 14.95
BELT KIT 1.95
PINCH ROLLER 3.95
PLAY CLUTCH GENUINE 4.95
REEL IDLER GENUINE 1.25
VIDEO HEAD 8.95
NVG7/10/12
REPAIR KIT GENUINE 9.95
BELT KIT 1.95
MODE SWITCH 3.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 2.95
VIDEO HEAD NVG7/9 17.30

PHILIPS VIDEO SPARES

VR6185/6291
BELT KIT 2.95
CASSETTE HOUSING 16.95
PINCH ROLLER ASSY 7.50
REPAIR KIT 21.50
REMOTE CONTROL 29.50
VIDEO HEAD 42.50
VR6367
BELT KIT 2.95
CASSETTE HOUSING 16.95
PINCH ROLLER ASSY 7.50
REMOTE CONTROL 13.25
REPAIR KIT 21.50
VIDEO HEAD 40.70
VR6460/6520
BELT KIT 1.95
PINCH ROLLER 3.95
REEL IDLER 2.95
REPAIR KIT 12.50
VIDEO HEAD 9.95
VR6462/6560
REPAIR KIT 12.95
CASSETTE HOUSING 16.95
PINCH ROLLER 3.95
REEL IDLER GENUINE 4.95
VIDEO HEAD GENUINE 44.95
VR6467
REPAIR KIT GENUINE 21.50
BELT KIT 2.95
CASSETTE HOUSING 17.95
PINCH ROLLER ARM ASSY 7.50
VIDEO HEAD GENUINE 40.70
VR6760
REPAIR KIT GENUINE 21.50
BELT KIT 2.95
CASSETTE HOUSING 17.95
PINCH ROLLER ASSY 7.50
VIDEO HEAD GENUINE 41.70

SANYO VIDEO SPARES
VTC5000
BELT KIT 1.00
REEL MOTOR GENUINE 7.95
REEL PULLEY GENUINE 5.95
VIDEO HEAD 22.50
VHR1100/1300
BELT KIT 2.25
PINCH ROLLER 3.50
REEL DRIVE ROLLER 5.95
REEL MOTOR 14.95
TENSION BAND 2.60
VIDEO HEAD 21.70
VHR3100/3700
BELT KIT 1.95
PINCH ROLLER 3.50
REEL DRIVE ROLLER 5.95
TENSION BAND 2.60
VIDEO HEAD 20.50

SHARP VIDEO SPARES

VC9300/381
BELT KIT 2.50
PINCH ROLLER 3.95
REEL IDLER GENUINE 3.95
REEL MOTOR GENUINE 12.95
TENSION BAND 2.95
VIDEO HEAD 14.75
VC481/482
BELT KIT
2.50PINCH ROLLER 3.95
REEL IDLER GENUINE 3.95
REEL MOTOR GENUINE 19.95
TENSION BAND 2.95
VIDEO HEAD 14.75
VC581/582
BELT KIT 2.50
REEL IDLER GENUINE 3.95
PINCH ROLLER 3.95
VIDEO HEAD 14.75
VC681
BELT KIT 2.50
PINCH ROLLER 3.95
REEL PULLEY GENUINE 7.95
VIDEO HEAD 14.75
VCA140/VCT72
BELT KIT 2.95
PINCH ROLLER 3.95
REEL PULLEY GENUINE 7.95
TENSION BAND 3.50
VIDEO HEAD 14.75

SONY VIDEO SPARES

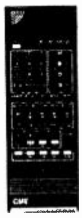
C5/6/7
BELT KIT C5/7 2.50
BELT KIT C6 1.95
PINCH ROLLER 4.50
REWIND KIT C5/7 4.95
REWIND KIT C6 3.95
VIDEO HEAD 14.95

VIDEO BELT KITS

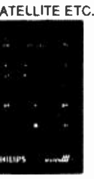
HINARI VXL3/20 1.95
HINARI VXL8/9 3.50
MITSUBISHI HS302 1.95
MITSUBISHI HS306 1.95
NEC 9053 2.95
SAMSUNG VX520 2.95
SAMSUNG VX710 3.50
SHARP 7300 2.50
SHARP 8300 2.50

VIDEO LAMPS

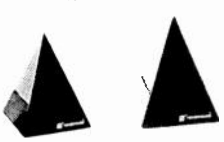
FERGUSON 3V00/22 .50
FERGUSON 3V29 .80
FERGUSON 3V35 LED 1.95
HITACHI VT63E END SNS. 1.95
PANASONIC NV2000 .95
SHARP 8300 .95
SHARP 9300 1.50
UNIVERSAL .50



TOP TEL
PREPROGRAMED REMOTE CONTROLS 5 INDIVIDUAL APPLIANCES
TV,VCR & SATELLITE ETC. ..24.95



PHILIPS UNIVERSAL REMOTE
CREDIT CARD SIZE ...9.95
WORKS MOST PHILIPS SETS BASIC FUNCTIONS. ENGINEERS MUST.



POWERMID
NO WIRES, JUST PLUG IN AND TRANSMIT BY YOUR REMOTE CONTROL TO ANY ROOM IN YOUR HOUSE ! ...44.95

REMOTE CONTROLS
AKAI VS10 ...15.95
FERGUSON T725 ...11.50
FERGUSON T732 ...
11.95FERGUSON T734 ...12.50
FERGUSON T738 ...11.95
FERGUSON T742 ...13.70
FERGUSON T785
FAST TEXT ...13.95
FERGUSON T789
FAST TEXT ...13.95
FERGUSON TX10
NON TEXT ...12.95
FERGUSON TX10 TEXT ...11.95
FERGUSON TX10 STEREO..15.95
FERGUSON TX100 TEXT ...11.95
FERGUSON ICC5 ...16.95
FERGUSON 3V32/35 ...11.95
FERGUSON 3V43 ...14.50
FERGUSON 3V55 ...15.30
FERGUSON SRA1 ...15.45
FIDELITY CTV14S ...12.95
FIDELITY CTV22T ...14.95
FIDELITY CTV2210 ...12.95
FINLUX 1000 SERIES ...22.95
FINLUX RC3001 ...19.95
FISHER FTS 5610TX ...22.95
FISHER FTS 6310TX ...22.95
FISHER FTS 110TX ...22.95
FISHER FVHP 905/910 ...22.95
GOLDSTAR OTMF 7110 ...17.95
GOLDSTAR 105-520D ...24.95
GOLDSTAR 105-523C ...24.95
GOLDSTAR GHV-1221 ...21.95
GOODMANS TX1100/1200 ...18.95
GRANADA UNIVERSAL ...12.95
GRUNDIG TP400 TEXT ...12.90
GRUNDIG TP650 TEXT ...14.25
GRUNDIG TP660 ...21.95
HINARI CT7 ...19.95
HINARI CT18 ...23.50
HINARI VXL-7/8 ...18.95
HINARI VXL-20 ...19.45
HITACHI CLE862F ...19.95
HITACHI CLE871A ...17.95
HITACHI CLE874A ...17.95
HITACHI CPT1446 ...17.50
HITACHI CPT1556 ...17.95
HITACHI CPT2038 ...14.95
HITACHI CPT2174 ...17.95
HITACHI CPT2188 ...15.25
HITACHI CPT2218 ...17.50
HITACHI CPT2246 ...15.25
HITACHI CPT2508 ...15.95
HITACHI CPT2596 ...17.95
HITACHI CPT2888 ...15.25
HITACHI VT8000 ...17.50
HITACHI VT9300 ...17.50
HITACHI VT17 ...15.95
HITACHI VT63/64 ...13.25
HITACHI VT120E ...13.95
ITT FS9/10 DIGIVISION ...13.95
ITT RG305 ...13.95
ITT RG306 ...13.95
ITT TX3126 ...20.95
ITT VS4 ...13.95
ITT VS5 TEXT ...15.95
JVC HRD540 GENUINE ...32.95
JVC HRD750 GENUINE ...32.50
JVC HRD755 GENUINE ...34.50
MASPRO SE-E-90/S ...15.95
MATSUI 1440 ...13.95
MATSUI 1465 ...18.50
MATSUI 2890 ...15.35
NEC N-831/33G ...11.50
NEC RB83EG/EP ...11.50
NIKKAI NT14/20/21 ...23.50
ORION VH1204 ...21.95
ORION VH3050/60RC ...21.95
ORION VR2949/2957 ...21.95
ORION VSP20 ...19.95
ORION VXL20 ...21.95
PANASONIC EUR51200 ...14.95
PANASONIC EUR51142 ...36.50
PANASONIC EUR64142 ...21.50
PANASONIC C71/C74 ...21.50
PANASONIC TNQ1411/2 ...14.95
PANASONIC TNQ1419 ...13.95
PANASONIC TNQ1621 ...17.95
PANASONIC TX2112
GENUINE ...34.95
PANASONIC TX2200 ...21.95
PANASONIC TX2234 ...21.95
PANASONIC TX2244 ...21.95
PANASONIC TX2464
GENUINE ...34.95
PANASONIC TX2470/72 ...21.50
PANASONIC TX2482/92 ...21.50
PANASONIC TX3300 ...21.95
PANASONIC NV230
GENUINE ...12.50
PANASONIC NV430
GENUINE ...31.50
PANASONIC NV730 ...15.25
PANASONIC NV870
GENUINE ...28.95
PANASONIC NVG10
GENUINE ...28.95
PANASONIC NVG12
GENUINE ...26.95
PANASONIC NVG18
GENUINE ...31.50
PANASONIC NVG21
GENUINE ...23.45
PANASONIC NVG40
GENUINE ...29.95
PANASONIC NVG45
GENUINE ...29.95
PANASONIC NVL28
GENUINE ...44.50
PHILIPS G11 I/R TEXT ...13.95
PHILIPS KT3/30 NON TEXT..12.95
PHILIPS KT3/30 TEXT ...12.50
PHILIPS RC5991 ...12.95
PHILIPS RC5903 GENUINE..12.95
PHILIPS 3A ...17.50
PHILIPS SIMPLE ...10.95
PHILIPS MINIATURE ...9.95
PHILIPS VR6362/7 ...13.25
PHILIPS VR6462 ...14.50
PHILIPS VR6467 ...13.25
PIONEER 505/525 ...17.50
PROGRAMMABLE ...22.50
PYE DV464/05 ...13.25
PYE DV662/05 ...14.50
RANK T26A ...13.95
RANK T524A ...13.95
RANK T528A ...19.95
REDIFFUSION MKIV ...12.95
REDIFFUSION MKIVA ...12.95
SABA FS602 ...11.95
SABA FS603/4 ...11.95
SAISHO CT142R ...14.50
SAISHO CT149TX ...14.95
SAISHO VR1000/1100 ...15.25
SALORA 16J10/20 ...15.90
SALORA 20J/20/30/40 ...15.90
SALORA 86173 ...16.50
SALORA C20XZ1 ...17.95
SALORA SATELLITE ...19.95
SAMSUNG SV716 ...15.50
SAMSUNG SV717 ...15.50
SAMSUNG VX616/617 ...15.50
SAMSUNG VX619/626 ...15.50
SAMSUNG VX627/629 ...15.50
SANYO CPT3144 ...17.95
SANYO E2 SERIES ...17.95
SANYO VHR 1100/1200 ...15.95
SANYO VHR 1300/2300 ...15.95
SANYO VHR 2700/3100 ...15.95
SENTRA VCR8000/8100 ...17.50
SENTRA VX8400 ...14.50
SOLAVOX 16R19 ...13.95
SOLAVOX 20T19 ...14.95
SOLAVOX 26R09 ...15.95
SOLAVOX CML14 ...15.95
SONY RM604/606 ...14.95
SONY RM613 ...29.50
SONY RM615/632 ...14.50
SONY RM650/651/652 ...17.95
SONY RM654/657 ...17.95
SONY RM662/663 ...21.95
SONY RM664/665 ...21.95
SONY RM670 ...14.95
TASHIKO 14D962 ...16.95
TASHIKO 14D966 ...16.95
TATUNG RC40/45 ...14.95
TATUNG RC60 ...14.95
TATUNG RC70 ...12.50
TATUNG RC90 ...14.95
TELEFUNKEN FB170 ...27.50
TOP TEL ...24.95
TOSHIBA CT995/6 ...16.95
TOSHIBA CT9128 ...17.95
TOSHIBA V55 ...11.95
TOSHIBA T534A/B ...15.95

REMOTES SUPPLIED ARE EITHER "KONIG","CME" OR MANUFACTURERS OWN

VIDEO HEADS
AKAI VS1/5 ...17.95
AKAI VS4 ...34.50
ALBA 4000X ...16.95
ALBA 6000X ...17.95
AMSTRAD 4500/9000 ...14.95
AMSTRAD 4600/4700 ...14.50
AMSTRAD 6000 ...17.95
AMSTRAD 7000 ...15.25
FERGUSON 3V30/39 ...8.75
FERGUSON 3V32 ...23.50
FERGUSON 3V42/55 ...17.50
FERGUSON 3V59/FV12 ...26.95
FERGUSON 3V65/FV11 ...17.95
FERGUSON FV12 ...34.50
FERGUSON FV13 ...41.50
FERGUSON FV26 ...28.50
FERGUSON FV31 ...26.50
FERGUSON FV32 ...27.95
FISHER FVH5000 ...24.50
FISHER FVH615/910 ...15.95
FISHER FVH725 ...34.50
FISHER FVH906/916 ...24.50
GOLDSTAR V1221/1290 ...15.95
GRUNDIG VS400/500 ...17.30
HINARI VTR200 ...21.95
HINARI VXL2/4/20/35 ...17.95
HINARI VXL6 ...19.50
HINARI VXL8/9/90 ...17.95
HINARI VXL10/11/19 ...17.95
HITACHI 8000/9700 ...15.70
HITACHI VT11/33 ...15.70
HITACHI VT17/19 ...24.70
HITACHI VT63/64 ...20.30
HITACHI VT65 ...28.50
HITACHI VT120E ...21.95
HITACHI VT130E ...24.95
HITACHI VT150E ...33.95
HITACHI VT220E ...21.95
JVC HRD170 ...17.95
JVC HRD250 ...23.50
JVC HRD470 ...27.50
JVC HRD540 ...17.95
JVC HRD725 ...34.50
JVC HRD755 ...34.50
LOGIK VR950/955 ...22.50
LOGIK VR960 ...17.95
MATSUI VX600 ...17.95
MATSUI VX730 ...17.50
MATSUI VX735A ...17.50
MATSUI VX820 ...15.25
MITSUBISHI HS301/302 ...22.70
MITSUBISHI HS303/305 ...21.50
MITSUBISHI HS306 ...23.95
MITSUBISHI HS318 ...24.50
NEC 9034/9053 ...19.95
ORION VH1 ...19.50
ORION VH3 ...19.95
PANASONIC NV230 ...17.50
PANASONIC NV333 ...8.95
PANASONIC NV366 ...19.95
PANASONIC NV370 ...9.95
PANASONIC NV430 ...14.25
PANASONIC NV688 ...27.70
PANASONIC NV730 ...18.95
PANASONIC NV777 ...18.95
PANASONIC NV788 ...25.95
PANASONIC NV870 ...37.30
PANASONIC NV2000/7000 ...8.95
PANASONIC NVG7/9 ...17.30
PANASONIC NVG10/12 ...17.30
PANASONIC NVG18 ...28.70
PANASONIC NVG20/21 ...24.95
PANASONIC NVG30/40 ...24.50
PANASONIC NVG45 ...34.50
PANASONIC NVL25 ...38.50
PHILIPS VR6185 ...42.50
PHILIPS VR6367 ...40.70
PHILIPS 6460/6520 ...9.95
PHILIPS 6462/6560
GENUINE ...44.95
PHILIPS 6467 GENUINE ...40.70
PHILIPS 6760 GENUINE ...41.70
PYE DV464 ...44.95
PYE DV468 ...40.70
REDIFFUSION 620 ...14.75
SAISHO VR705/805 ...15.25
SAISHO VR3200 ...17.50
SAISHO VR3500 ...17.50
SAISHO VR3600 ...19.50
SAISHO VI730 ...23.50
SAMSUNG VX520/710 ...17.50
SANYO VHR 1100/1300 ...18.95
SANYO VHR1110/1200 ...21.50
SANYO VHR 2300/3200 ...23.50
SCHNEIDER SVC20 ...21.50
SCHNEIDER SVC246 ...21.95
SENTRA 8000 ...16.95
SENTRA 8400 ...16.95
SENTRA 8600 ...17.95
SHARP VC9300/381/481 ...14.75
SHARP VC581/681 ...14.75
SHARP VC787 ...32.50
SHARP VCA140 ...14.75
SOLAVOX 1000 ...16.95
SONY C5/6/7 ...14.95
SONY SLC30 ...21.50
SUSUMI XR5 ...18.95
TASHIKO VVE921/2 ...19.95
TASHIKO VVE932 ...18.95
TASHIKO VVE934 ...22.50
TOSHIBA V55/57 ...8.75
TOSHIBA V73/83B ...14.95
TOSHIBA V93B ...18.95

VIDEO HEADS ARE OF THE BEST QUALITY AND ARE BRANDED OR MANUFACTURERS OWN

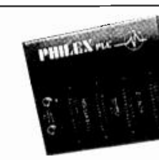
*** NEW ***
CASSETTE HOUSINGS
FERGUSON 3V65/FV11R ...22.50
FERGUSON FV31/FV31R ...36.45
FERGUSON FV37/FV37H ...17.50
HITACHI VT11E ...16.50
HITACHI VT64E ...14.70
PANASONIC NV333/366 ...18.20
PANASONIC NV230 ...32.85
PANASONIC NV730 ...34.50

SERVICE AIDS
ALLEN KEYS (8 METRIC) ...4.95
ANTEX 17W IRON ...8.50
ANTEX 25W IRON ...8.75
ANTEX IRON STAND ...4.95
CIRCLIP KIT ...5.95
CLEAR TEST TAPE ...7.95
COLCLENE WIPES ...95
FIBRE CLEANING PEN ...2.95
HEATSINK COMPOUND ...1.55
NUT & BOLT KIT 2.5MM ...2.35
ONYX SOLDER PUMP ...9.95
ONYX TIPS ...1.50
PERMABOND ADHESIVE ...3.95
PORTASOL STD ...15.95
PORTASOL
PROFFESSIONAL ...31.95
PORTASOL TIP ...3.95
SELF AMALGAMATING
TAPE ...3.45
SILICON GREASE ...1.85
SOLDA MOP ...80
SOLDER 0.5KG 18SWG ...8.50
SOLDER 0.5KG 22SWG ...8.75
SPRING KIT ...5.50
SUPER GLUE ...1.25
UTILITY KNIFE ...1.45
WELLER GUN TIPS (2) ...1.25
WATCHMAKERS
SCREWDRIVERS ...2.95
X1 PROBE KIT ...14.50
X10 PROBE KIT ...14.95

SUNDRIES
CTX EHT LEAD GENUINE ...8.25
MATSUI LEVER ASSY ...1.85
TX10 FOCUS UNIT ...8.50
98003 POSITOR ...1.35
98009 POSITOR ...1.35
98012 POSITOR ...2.95

TUNERS
FERGUSON TX90/100 ...16.45
PANASONIC TNV87510F2
TC208/TC225/TC2000/TC2024
TC2213/TC2284/TC85 ...31.95
PHILIPS ELC2003 ...24.45
U321 ...11.95
U411 (PHONO SKT) ...18.50
U411 (COAX SKT) ...19.75

VIDEO LEADS
CAMCORDER COPYING KIT7.95
SCART LEAD FULLY WIRED4.95



SCART SWITCHING
KIT ...16.95
SCART LEAD TO 6 PHONO..4.95
SCART COPYING KIT ...5.95
SCART TO 2 SCART SKT ...5.95
SCART TO 5 SCART SKT ...6.95
VIDEO COPYING KIT ...5.95
VIDEO FLY LEAD ...75

VIDEO REPAIR KIT
ALBA 4000 ...11.50
ALBA 6000 ...12.95
FERGUSON 3V23 ...15.95
FERGUSON 3V29/30 ...12.95
FERGUSON 3V31/32 ...15.95
FERGUSON 3V35/39 ...12.95
FERGUSON 3V44/45 ...14.95
FERGUSON 3V64/65 ...11.95
FISHER FVH615/715 ...12.75
FISHER FVH905 ...12.95
GOLDSTAR GVH1221 ...12.50
GOODMANS VCR1000 ...12.95
HITACHI VT8000 ...12.95
HITACHI VT9300 ...12.95
HITACHI VT11/33E ...14.95
HITACHI VT120/130E ...15.95
MITSUBISHI HS306 ...17.95
PANASONIC G DECK ...6.50
PANASONIC NV230 ...11.50
PANASONIC NV333 ...11.50
PANASONIC NV370 ...11.75
PANASONIC NV430 ...11.50
PANASONIC NV730 ...10.95
PANASONIC NV777 ...11.95
PANASONIC NV2000 ...18.95
PANASONIC NV7000 ...14.95
PANASONIC NVG10/12 ...9.95
PHILIPS VR6460 ...11.75
PHILIPS VR6462 ...12.50
PHILIPS VR6467 ...21.50
SENTRA 8000 ...11.50
SOLAVOX 1000 ...11.50
SONY C5/7 ...10.50
SONY C6 ...8.95

* 5 SHEET AUTOMATIC DOCUMENT FEEDER.
* 10 AUTODIALS FOR EASE OF USE.
* 30 METRE PAPER ROLL.
* MERCURY BUTTON TO TAKE ADVANTAGE OF CHEAPER TELEPHONE COSTS.
* PHOTOCOPY FACILITY

SAMSUNG SF1700 ...£275.00

* 5 SHEET AUTOMATIC

DOCUMENT FEEDER.
* AUTOMATIC FAX RECEPTION.
* SIMPLE CONTROL SETTINGS.
* 10 AUTODIALS FOR EASE OF USE.
* PHOTOCOPY FACILITY.

CANON FAXPHONE ...£325.00

* 10 SHEET AUTOMATIC DOCUMENT FEEDER.
* HIGH VOLUME RECEPTION WITH 100 METRE PAPER ROLL.
* 16 AUTODIALS FOR EASE OF USE.
* AUTOMATIC GUILLOTINE.
* PHOTOCOPY FACILITY.
* CANONS DE-CURL FEATURE FOR FLAT FAXES .

CANON FAX T50 ...£469.00

* FULLY PORTABLE ELECTRONIC TYPEWRITER
* FULL LINE OF CORRECTION MEMORY* WORD DELETION & BOLD PRINT
* ABILITY TO CENTRE BETWEEN MARGINS

CANON ES3 ...£89.00

* 14 CHARACTER PER SECOND DAISYWHEEL PRINTING.
* SPELL CHECK FACILITY + 16K TEXT MEMORY.
* PAPER FEED, BOLD PRINT & UNDERLINE FACILITY.
* 10, 12, 15, CHARACTER PITCH.

CANON ES23 ...£157.00

* 50K MEMORY.

* 10, 12, 15, PS CHARACTER PITCH.
* 80,000 WORD SPELL VERIFIER.
* LCD DISPLAY.
* 15 CHARACTERS PER SECOND BI DIRECTIONAL PRINTING.
* 3.5" MS DOS DISK DRIVE FOR UNLIMITED MEMORY.

SHARP PA-W1410 ...£329.00

ALL MACHINES ARE COVERED BY 12 MONTHS WARRANTY

THESE ARE A SMALL RANGE OF OUR BUSINESS MACHINES THAT WE SELL INC: CALCULATORS, COMPUTERS, FAX MACHINES, PHOTOCOPIERS & WORD PROCESSORS. PLEASE RING FOR DETAILS

CELLULAR TELEPHONES

*** SPECIAL OFFER ***
NOKIA 101 ...£149.00

WE OFFER A RANGE OF MOBILE PHONES INC. MOTOROLA, PANASONIC, NEC,NOKIA, MITSUBISHI & TECHNOPHONE.

FROM NEW & USED HAND PORTABLES TO MOBILES AND TRANSPORTABLES

NO LONG TERM CONTRACTS & A RANGE OF BILLING PLANS TO SUITE EVERYBODY

PART EXCHANGE & RECONNECTIONS ARE WELCOME

WE ALSO PURCHASE SECOND HAND EQUIPMENT

CELLULAR SPARES ANTENNAE
3DB BODY MOUNT ...14.25
3DB GLASS MOUNT ...15.95
3DB PASSIVE REPEATER..24.50
5DB PASSIVE REPEATER..28.50
1/4 WAVE ON GLASS ...14.95
1/4 WAVE SHARKS FIN ...15.95
MAGNETIC MOUNT 3DB ...22.50
MOTOROLA T/PORT ...19.95
MOTOROLA 8500X
1/4 WAVE ...15.95
MOTOROLA 8500X
BUTTON ...14.50
MOTOROLA 8800X ...19.95
MOTOROLA 9800X ...19.95
PANASONIC D SERIES ...24.75
PANASONIC F1 ...23.95
PANASONIC H SERIES ...24.50
PANASONIC I SERIES ...23.50
NEC P3 ...22.95
NOKIA 101 ...21.50
MITSUBISHI MT4 ...32.50
MITSUBISHI MT5 ...29.50
TECHNOPHONE TP2 1/4 ...22.50
TECHNOPHONE TP2 1/2 ...22.50
TECHNOPHONE TP305 ...19.95

BATTERIES
MITSUBISHI MT3 ...34.50
MITSUBISHI MT5 ...35.00
MOTOROLA 4500X ...45.00
MOTOROLA 4800X SLIM ...27.50
MOTOROLA 8000X ...29.95
MOTOROLA 8500X ...29.95
MOTOROLA 8800X ...29.95
MOTOROLA PERSONAL
1000MAH ...29.95
MOTOROLA MICROTAC I
1000MAH ...29.50
MOTOROLA MICROTAC II
1350MAH ...34.50
NEC 9A ...29.95
NEC P3 ...28.50
NEC P4 800MAH ...49.50
NOKIA 101 800MAH ...33.50
NOKIA 190 ...38.50
NOKIA 1320 ...37.50
PANASONIC D SERIES ...32.50
PANASONIC E/H SERIES ...32.50
PANASONIC F1 700MAH ...29.95
TECHNOPHONE TP2 STD..34.50
TECHNOPHONE TP2 H/D...45.00
TECHNOPHONE TP305
800MAH ...33.50

BATTERY CHARGERS
MOTOROLA T-PORT ...39.50
MOTOROLA 8000/8800X ...34.95
MOTOROLA MICROTAC ...45.95
NEC P3 ...45.95
PANASONIC F ...77.95
TECHNOPHONE TP2 ...59.50
TECHNOPHONE TP305 ...59.50

BATTERY ELIMINATORS
MOTOROLA 8000/8800X ...14.95
MOTOROLA MICRO TAC ...14.95
NEC P3 ...15.95
NEC P4 ...16.95
NOKIA 190 ...17.95
PANASONIC D SERIES ...14.95
PANASONIC F SERIES ...14.95
TECHNOPHONE TP2 ...18.50

P/P CHARGES:
COMPONENTS £1.00 PER ORDER UK
SERVICE MANUALS £1.25 EACH
CELLULAR TELEPHONES £5.00 PER ITEM
OFFICE MACHINES £5.00 PER ITEM
EXPORT ORDERS P/P CHARGED AT COST

WHEN ORDERING:: PLEASE ADD P/P VALUE TO ORDER TOTAL THEN ADD 17.5% VAT TO THIS TOTAL

DELIVERY BY RETURN ON ALL STOCK ITEMS
***** MINIMUM ORDER VALUE £5.00 *****

TELE SPARES LTD
DISTRIBUTORS

250 COLEMAN STREET WHITMORE REANS
WOLVERHAMPTON WV6 0RH

TEL: 0902 745581/2 FAX: 0902 746833

CMOS	
40014B	0.20
4001B	0.12
4002B	0.15
4006B	0.27
4007B	0.12
4008B	0.20
40106	0.24
4010B	0.23
4011B	0.13
4012B	0.12
4-13B	0.18
4014B	0.30
4015B	0.30
4016B	0.20
4017B	0.27
4019B	0.27
4020B	0.25
4021B	0.33
4023B	0.15
4024B	0.23
4025B	0.12
4027B	0.18
4028B	0.23
4029B	0.25
4030B	0.15
4035B	0.38
4040B	0.25
4042B	0.18
4043B	0.27
4044B	0.25
4046B	0.25
4049B	0.20
4050B	0.18
4051B	0.20
4052B	0.25
4053B	0.24
4066B	0.15
4068B	0.12
4069B	0.12
4070B	0.18
4071B	0.12
4072B	0.18
4073B	0.12
4075B	0.17
4076B	0.35
4078B	0.12
4081B	0.15
4082B	0.12
4093B	0.18
4094B	0.36
4098B	0.28
4501B	0.20
4502B	0.18
4503B	0.23
4508B	0.67
4510B	0.23
4511B	0.35
4512B	0.27
4514B	0.52
4516B	0.27
4519B	0.30
4520B	0.20
4526B	0.27
4528B	0.28
4532B	0.30
4538B	0.28
4539B	0.20
4543B	0.38
4555B	0.27
4556B	0.25
4584B	0.27
4585B	0.23
4N	
4N25	0.35
74	
7400	0.18
7401	0.18
7402	0.18
7403	0.20
7404	0.18
7405	0.25
7406	0.30
7407	0.30
7408	0.24
74107	0.23
74109	0.52
74121	0.27
74123	0.32
74125	0.25
74132	0.48
7414	0.30
74141	0.67
74151	0.30
74154	0.52
74155	0.48
74156	0.52
7416	0.20
74161	0.38
74163	0.57
7417	0.25
74173	0.48
74174	0.67
74175	0.52
74184	0.52
74194	0.52
7420	0.18
7421	0.27
74221	0.30
74251	0.50
74259	0.78
74279	0.25
74283	0.23
74367	0.25
7438	0.27
7441	0.20
7442	0.23
7453	0.18
7470	0.20
7472	0.20
7473	0.20
7474	0.23
7475	0.48
7479	0.60
7483	0.48
7486	0.30
7490	0.20
7492	0.38
7493	0.20

74F175N	0.48
74F86	0.30
74HC107	0.38
74HC377	0.48
74LS	
74LS00	0.18
74LS01	0.12
74LS02	0.12
74LS03	0.12
74LS04	0.18
74LS05	0.18
74LS08	0.12
74LS09	0.12
74LS10	0.18
74LS107	0.38
74LS109	0.23
74LS11	0.12
74LS112	0.20
74LS113	0.20
74LS114	0.48
74LS12	0.18
74LS122	0.52
74LS123	0.52
74LS125	0.25
74LS126	0.20
74LS13	0.20
74LS132	0.18
74LS133	0.41
74LS136	0.41
74LS138	0.38
74LS139	0.25
74LS14	0.18
74LS145	0.33
74LS147	1.38
74LS148	1.20
74LS15	0.12
74LS151	0.25
74LS153	0.25
74LS154	0.65
74LS155	0.25
74LS156	0.25
74LS157	0.23
74LS158	0.27
74LS160	0.25
74LS161	0.25
74LS162	0.27
74LS163	0.30
74LS164	0.32
74LS165	0.57
74LS166	0.33
74LS168	0.87
74LS169	1.34
74LS170	1.43
74LS173	0.48
74LS174	0.25
74LS175	0.42
74LS181	0.98
74LS182	1.13
74LS183	0.86
74LS190	0.30
74LS191	0.42
74LS192	0.67
74LS193	0.27
74LS194	0.35
74LS195	0.35
74LS196	0.41
74LS197	0.41
74LS20	0.12
74LS21	0.18
74LS22	0.23
74LS221	0.42
74LS240	0.35
74LS241	0.35
74LS242	0.48
74LS243	0.36
74LS244	0.41
74LS245	0.42
74LS247	0.90
74LS248	0.98
74LS249	0.52
74LS253	0.25
74LS257	0.30
74LS258	0.48
74LS259	0.35
74LS26	0.18
74LS260	0.25
74LS266	0.25
74LS27	0.18
74LS273	0.35
74LS279	0.25
74LS28	0.18
74LS280	0.78
74LS283	0.27
74LS290	0.33
74LS293	0.30
74LS295	0.38
74LS298	0.50
74LS299	0.67
74LS30	0.18
74LS32	0.18
74LS33	0.18
74LS363	3.09
74LS365	0.20
74LS368	0.20
74LS37	0.18
74LS373	0.30
74LS374	0.23
74LS377	0.30
74LS379	0.25
74LS38	0.27
74LS386	0.25
74LS393	0.38
74LS398	0.38
74LS40	0.18
74LS42	0.35
74LS447	1.16
74LS47	0.72
74LS48	0.35
74LS49	0.35
74LS490	0.35
74LS51	0.18
74LS54	0.18
74LS540	0.35
74LS55	0.18
74LS629	1.32
74LS640	0.67
74LS73	0.23
74LS74	0.23
74LS75	0.20
74LS76	0.25

74LS78	0.25
74LS83	0.23
74LS85	0.52
74LS86	0.23
74LS90	0.27
74LS91	0.35
74LS92	0.48
74LS93	0.27
74LS95	0.32
74LS96	0.33
74S	
74300	0.23
74S02	0.11
74S03	0.12
74S04	0.12
74S09	0.18
74S10	0.12
74S112	0.20
74S133	0.18
74S138	1.17
74S139	0.30
74S140	0.18
74S153	0.27
74S163	0.30
74S174	0.52
74S189	0.42
74S20	0.18
74S241	0.48
74S373	0.48
74S374	0.52
74S38	0.20
74S40	0.12
74S51	0.78
74S64	0.12
74S74	0.12
74S86	0.20
AN	
AN-103	0.86
AN-115	0.74
AN-136B	1.88
AN-1458	0.27
AN-203	1.80
AN-210	1.31
AN-210B	1.88
AN-211	1.37
AN-214	1.43
AN-214Q	1.65
AN-228	2.93
AN-236	2.76
AN 240P	0.90
AN 241	1.35
AN-252	3.75
AN-253	1.17
AN-259	2.54
AN-260	7.50
AN-262	0.72
AN-271	1.64
AN-274	1.80
AN-278	0.67
AN-301	4.79
AN-302	2.76
AN-303	2.10
AN-304	2.13
AN-305	3.74
AN-3130	2.03
AN-3132	3.38
AN-315	3.75
AN-316	2.73
AN-321	1.15
AN-3211K	4.50
AN-3215K	4.47
AN-3231K	6.48
AN-3310	3.66
AN-3312	2.32
AN-3313	3.75
AN-3320K	5.46
AN-3330K	3.30
AN-3331K	6.80
AN-337	5.75
AN-3380NK	4.50
AN-355	0.67
AN-360	0.27
AN-362	1.20
AN-363	0.71
AN-366	0.90
AN-3792	6.15
AN-3794	2.91
AN-3795	3.38
AN-3812K	4.88
AN-3814K	4.41
AN-3821	5.72
AN-3821K	6.38
AN-3822K	6.75
AN-3830K	7.13
AN-3990K	2.13
AN-3991K	2.27
AN-4558	0.32
AN-5010	2.84
AN-5011	2.28
AN-5015	2.31
AN-5020	0.89
AN-5-25	1.49
AN-5026K	0.98
AN-503	2.99
AN-5030	3.38
AN-5033	3.60
AN-5034	3.41
AN-5050	1.88
AN-5071	0.60
AN-5111	3.74
AN-5120	2.47
AN-5132	1.43
AN-5135	4.14
AN-5138	6.26
AN-5150	4.13
AN-5151	3.29
AN-5215	0.48
AN-5216	1.32
AN-5255	2.55
AN-5256	1.20
AN-5260	2.43
AN-5262	1.13
AN-5265	1.19
AN-5320	0.90
AN-5352	4.61
AN-5410	2.88
AN-5411	3.21
AN-5415	6.06
AN-5421	1.13

AN-5429	3.15
AN-5431	2.40
AN-5431N	2.16
AN-5435	1.13
AN-5436	0.98
AN-5437	0.98
AN-5440	2.31
AN-5510	2.66
AN-5512	1.46
AN-5515	1.88
AN-5520	3.77
AN-5521	1.46
AN-5601K	8.25
AN-5612	2.63
AN-5613	1.38
AN-5615	3.60
AN-5620	2.82
AN-5622	2.25
AN-5625	3.74
AN-5625N	3.36
AN-5630	4.13
AN-5630N	2.81
AN-5632	5.02
AN-5633	3.90
AN-5635	3.38
AN-5700	0.72
AN-5701	1.02
AN-5710	1.43
AN-5712	1.26
AN-5722	0.87
AN-5730	1.02
AN-5732	0.78
AN-5733	1.61
AN-5750	1.13
AN-5753	0.92
AN-5760	1.16
AN-5763	2.70
AN-5790	1.88
AN-5791	2.18
AN-5836	2.78
AN-5862	1.74
AN-5900	1.13
AN-608	1.01
AN-610	0.95
AN 612	1.28
AN-6120	1.37
AN-6130	1.16
AN-6135	1.13
AN-6136	0.98
AN-6151	0.96
AN-6170	0.32
AN-6209	4.50
AN-6238	2.61
AN-6247	0.93
AN-6248	1.88
AN-6249	1.13
AN-6250	0.45
AN-6251	3.78
AN-6256	2.03
AN-6263	1.16
AN-6263N	1.16
AN-6270	2.63
AN-6270	2.63
AN-6291	1.95
AN-6300	3.56
AN-6306	3.68
AN-6307	1.58
AN-6310	4.14
AN-6320	1.79
AN-6326	3.18
AN-6327	2.63
AN-6328	3.06
AN-6330	1.76
AN-6331	4.52
AN-6332	3.30
AN-6337	3.14
AN-6341	2.03
AN-6342N	1.38
AN-6344	4.86
AN-6344S	3.00
AN-6345	2.84
AN-6346	3.03
AN-6347	4.08
AN-6350	4.86
AN-6354	0.89
AN-6356	2.83
AN-6357	4.18
AN-6360	2.51
AN-6363	5.51
AN-6367	5.19
AN-6371	2.54
AN-6387	5.12
AN-6500	0.72
AN-6510	0.45
AN-6512	0.72
AN-6514	5.94
AN-6531	1.13
AN-6540	1.34
AN-6541	1.16
AN-6551	0.52
AN-6552	0.52
AN-6553	0.52
AN-6554	0.87
AN-6555	0.57
AN-6556	0.35
AN-6562	0.57
AN-6564	0.83
AN-6570	0.72
AN-6571	0.90
AN-6581	2.03
AN-660	6.83
AN-6601	0.72
AN-6605	0.44
AN-6610	0.67
AN-6612	0.71
AN-6612S	0.67
AN-6614	0.35
AN-6636	4.93
AN-6650	0.72
AN-6651	0.50
AN-6652	0.56
AN-6653	0.25
AN-6671K	4.73
AN-6676	4.61
AN-6677	5.27
AN-6780	0.90
AN-6810	2.03
AN-6838	0.45
AN-6873	1.28
AN-6875	0.72

AN-6876	0.42
AN-6879	1.26
AN-6880	1.01
AN-6881	1.25
AN-6884	0.83
AN-6888	1.64
AN-6889	0.54
AN-6912	0.67
AN-6913	0.90
AN-6914	0.35
AN-7000	8.25
AN-7003K	0.54
AN-7010K	2.10
AN-7016	4.41
AN-7025	1.13
AN-7060	1.20
AN-7062	1.79
AN-7073	1.65
AN-7105	1.49
AN-7106	1.64
AN-7108	1.13
AN-7110	0.90
AN-7111	1.02
AN-7112	0.67
AN-7114	1.23
AN-7115	1.26
AN-7116	0.56
AN-7117	0.72
AN-7118	1.08
AN-7120	0.87
AN-7130	0.83
AN-7131	1.28
AN-7133N	2.61
AN-7134	2.58
AN-7140	0.83
AN-7141	0.41
AN-7142	0.75
AN-7143	1.64
AN-7145	1.98
AN-7146	2.40
AN-7147	2.21
AN-7148	1.20
AN-7149	2.39
AN-7154	2.63
AN-7156	2.52
AN-7158	2.41
AN-7160	2.31
AN-7161N	2.85
AN-7161NFP	2.25
AN-7163	2.10
AN-7166	3.07
AN-7168	2.43
AN-7169	2.58
AN-7170	2.81
AN-7171K	4.29
AN-7172K	2.87
AN-7173K	4.01
AN-7177	4.43
AN-7178	2.03
AN-7205	0.35
AN-7213	0.60
AN-7218	0.95
AN-7220	1.13
AN-7221	2.01
AN-7222	1.20
AN-7223	1.13
AN-7224	1.13
AN-7225	1.17
AN-7226	1.34
AN-7227	0.60
AN-7254	1.13
AN-7256	1.65
AN-7273	1.61
AN-7310	0.60
AN 7311	0.57
AN-7312	1.17
AN-7315	0.45
AN-7316	0.60
AN-7320	0.56
AN-7330K	1.20
AN-7337	4.50
AN-7362	1.17
AN-7363	3.42
AN-7410	0.71
AN-7411	0.52
AN-7414	1.61
AN-7415	0.52
AN-7418	0.39
AN-7418	0.39
AN-7420	0.72
AN-7470	1.10
AN-7808	0.28
AN-7809	0.28
AN-7810	0.28
AN-7812	0.39
AN7812F	0.30
AN-7818	0.39
AN-78MOSF	0.30
AN-78M12	0.51
AN-78N24	0.57
AN-7908	0.30
AN-7909	0.39
AN-8003	0.45
AN-8090	1.58
BA	
BA 1310	1.20
BA-1320	1.08
BA-1330	0.72
BA-1332	0.60
BA-1335	1.46
BA-1350	1.43
BA-1351	0.75
BA-1355	0.71
BA-1360	1.28
BA-1404	1.17
BA-222	0.72
BA-1301	0.48
BA-308	0.45
BA-311	0.57
BA 313	0.48
BA-314	0.48
BA-328	0.56
BA 3302	0.69
BA-3304	0.69
BA-3304	0.52
BA 3306	0.72
BA-3308	0.78
BA 3310	0.60
BA-3312	0.65
BA 335	0.63

BA-338	0.78
BA-340	0.75
BA-3402	0.75
BA 3406	0.83
BA-3408	0.83
BA-3410	1.08
BA-346BL	1.05
BA-3416L	1.02
BA-343	0.95
BA-3502F	1.95
BA-3505F	1.26
BA-3506	1.43
BA-3516	1.13
BA-3520	1.56
BA-3702	1.28
BA 3704	1.31
BA-3706L	1.02
BA-3707	1.05
BA-3711	0.63
BA-3812	0.80
BA-3812L	0.86
BA-3821L	0.75
BA-3822LS	0.72
BA 3823LS	0.90
BA-3824LS	0.65
BA-3900	1.05
BA-401	0.48
BA-402	0.60
BA-403	0.75
BA-4110	0.90
BA 4210	0.87
BA 4220	0.83
BA-4220B	0.83
BA-4224	0.83
BA-4234L	1.10
BA-4236	0.80
BA-4236L	0.86
BA-4243L	1.13
BA 4402	0.57
BA-4403	0.57
BA-4405	0.74
BA-4412	0.52
BA 4422	0.72
BA-4558	0.60
BA-5101	1.34
BA-5102A	1.13
BA-5102AL	0.83
BA-5104	1.05
BA-511	1.31
BA-5114LS	1.35
BA-511	1.43
BA-511	1.43
BA-511	1.19
BA-514	1.13
BA-515	0.67
BA-5204	1.31
BA-5206	1.31
BA-5208	1.26
BA 521	1.01
BA-5214	1.16
BA-524	0.93
BA-526	0.72
BA 527	0.83
BA-5302	1.53
BA-532	1.13
BA 534	0.93
BA-536	1.38
BA-5402	1.08
BA-5402A	1.08
BA-5404	1.01
BA-5406	1.19
BA-5408	1.16
BA-5410	1.88
BA-546	0.86
BA-547	0.98
BA-6104	0.87
BA-6107A	1.08
BA-6109	1.26
BA-612	0.80
BA-6121	1.58
BA-6122	1.53
BA-6137	0.67
BA-6138	1.17
BA-6139	1.01
BA-614	0.80
BA-6144	0.52
BA-6149	1.31
BA-6149LS	1.16
BA-6154	1.02
BA-618	0.71
BA-619	0.80
BA-6208	1.05
BA-6209	1.16
BA-6209N	0.99
BA-6209U	1.16
BA-6218	1.35
BA-6219	1.28
BA-6219B	1.28
BA-6220	0.83
BA-6222	1.05
BA-6229	1.49
BA-6235	0.42
BA-6238A	1.38
BA-6239A	1.37
BA-6247	1.13
BA-6247N	1.05
BA-6248	1.13
BA-6256	0.96
BA-6259	1.53
BA-6266	0.63
BA-6267	1.35
BA-6280AF	2.93
BA-6301	1.28
BA-6302A	1.10
BA-6303	2.25
BA-6304	0.95
BA-63-5	1.13
BA=631	2.32
BA-6328	1.35
BA-6334	1.14
BA-634	0.72
BA-6340	0.84
BA-6406	1.02
BA-6410	1.43
BA-6411	1.72
BA-6418N	0.60
BA-6435	3.00
BA-6435S	3.00
BA-6480	1.28
BA-656	0.74

BA-6564A	0.99
BA 6565	1.05
BA 6565A	1.05
BA-6566	1.17
BA-6569S	3.03
BA 658	1.76
BA 664	1.34
BA-681	1.68
BA 683A	2.18
BA 684	1.25
BA 695	1.20
BA 6993	0.67
BA 7001	0.80
BA 7004	0.98
BA 7005	1.13
BA-7007	1.01
BA-702	0.48
BA-7021	0.80
BA-7022	2.70
BA 7022A	2.25
BA 7023	3.00
BA 7024	0.99
BA-7025L	1.56
BA-7028	3.00
BA-707	0.65
BA-7100	1.64
BA-7107	4.43
BA-7107S	2.82
BA-714	0.86
BA-715	0.72
BA-718	0.67
BA-7212S	1.05
BA-7252S	1.34
BA-7255BS	3.00
BA 7258AS	3.68
BA 7266S	2.01
BA-728	0.60
BA-7280S	4.38
BA-7602	0.98
BA-7603	0.83
BA-7604N	0.75
BA-7611N	1.13
BA-7730S	2.40
BA-7751ALS	1.13
BA-7751LS	1.35
BA-7752	1.28
BA-7755	0.56
BA-7767AS	1.29
BA-823	1.62
BA-8420	2.78
BA 843	1.01
BA-847	1.05
BA-8500	1.88
BA-8504	3.75
BA-852	1.31
BA-855	1.31
BA6309	0.63
BN-5115	4.50
BPW24	2.18
BX-342	3.77
CA	
CA-1310E	0.69
CA-3020	2.55
CA-3026	0.67
CA-3028A	2.16
CA-3039	1.47
CA-3046	0.45
CA-3065	0.67
CA-3065E	0.67
CA-3080E	0.71
CA-3081	0.67
CA-3082A	1.38
CA-3085A	2.63
CA-3085E	1.53
CA-3086	1.13
CA-3088	1.94
CA-3089E	1.34
CA-3090AQ	1.89
CA-3100E	1.53
CA-3127	2.32
CA-3130E	1.20
CA-3130T	1.53
CA-3140	0.62
CA-3140E	0.62
CA-3146E	0.58
CA-3161E	1.58
CA-3280E	2.28
CA-8100M	0.75
CNX-62A	0.67
CNX-83A	0.66
CX	
CX-104	7.50
CX-108	7.49
CX-109	9.75
CX134A	7.14
CX-136	4.68
CX-139	11.17
CX-139A	5.70
CX-141	5.70
CX-143	6.28
CX-143A	9.54
CX-145	5.64
CX-150B	2.47
CX-158	6.39
CX-175	2.63
CX-186	5.94
CX-187	6.39
CX-20007	2.76
CX-20029L	2.27
CX-523-113P	2.28
CX-555A	6.00
CX-804A	6.00
CX-832	6.39
CX-867	4.50
CX-868	4.13
CX-877	2.47
CXA-1011P	1.74
CXA-1044P	13.50
DAN-401	0.27
DSA-3005SY	3.75
DTS-02P-A4	4.50
ER-1440E	2.40
HA	
HA-11211	1.49
HA-11219	1.35
HA-11221	1.90
HA-11223	1.38
HA-11224A	1.20
HA-11225	1.43
HA-11227	1.16
HA-11235	1.58
HA-11244	3.38
HA-11247	3.82
HA-1124A	0.65
HA-1125	0.95
HA-11251	1.20
HA-1137	1.41
HA-11401	3.60
HA-11414	2.39
HA-11423	1.79
HA-11423MP	2.03
HA-11431	3.75
HA-11431NT	3.30
HA-1144	2.16
HA-11440	2.58
HA-11485ANT	1.13
HA-11498	6.75
HA-1150	2.00
HA-11508	3.75
HA-1151	1.38
HA-11529NT	1.56
HA-1156	0.80
HA-11580	4.89

HA-1166X	4.50
HA-1167	2.25
HA-11702	2.63
HA-11704	5.25
HA-11705	2.63
HA-11706	2.41
HA-11714	1.80
HA-11715	1.72
HA-11716	7.50
HA-11724	6.51
HA-11725	5.99
HA-11727	8.64
HA-11738	4.49
HA-11741NT	5.81
HA-11744	3.48
HA-11745	5.99
HA-11745NT	5.18
HA-11747ANT	6.72
HA-11749	2.40
HA-11751NT	8.57
HA-11752	2.85
HA-11755	5.39
HA-11756	7.85
HA-11781	3.75
HA-11781NT	3.75
HA-11782	2.13
HA-11797NT	3.75
HA-11811ANT	4.68
HA-118227NT	8.39
HA-11829NT	2.63
HA-11839NT	4.88
HA-11870NT	5.48
HA-1190	2.25
HA-1194	2.63
HA-1196	0.87
HA-1199	1.26
HA-12005	2.70
HA-12016	1.43
HA-12017	0.86
HA-12018	1.56
HA-12019	1.61
HA-12038NT	1.58
HA-12044	4.49
HA-12045	2.99
HA-12047	2.25
HA-12058	3.23
HA-12067NT	3.43
HA-12072ANT	6.71
HA-12072NT	6.71
HA-12-96	2.78
HA-12411	1.62
HA-12412	1.43
HA-12413	0.93
HA-12418	1.13
HA-12428	0.63
HA-12430	1.64
HA-12441	0.90
HA-13001	1.19
HA-13002	0.98
HA-13006	4.49
HA-13007	3.38
HA-13043	3.23
HA-1305S	2.78
HA-13108	2.43
HA-13116	1.88
HA-13117	1.95
HA-13118	1.31
HA-13119	1.49
HA-13127	2.96
HA-13128	4.32
HA-1319	1.79
HA-1325	3.00
HA-13402	2.70
HA-13403	3.60
HA-13403V	5.25
HA-13405	1.50
HA-13406	9.75
HA-13408	4.14
HA-13412	4.17
HA-13421	2.99
HA-13426	5.72
HA-13431	1.86
HA-13432	3.51
HA-13441	7.50
HA-13442	8.98
HA-13447	6.86
HA 1361	2.25
HA-1377	1.49
HA-1384	3.45
HA-1388	2.32
HA-1389	2.63
HA-1389R	2.63
HA-1392	1.68
HA-1394	2.32
HA-1396	3.59
HA-1397	2.32
HA-1398	2.32
HA-1406	0.78
HA-16603	3.36
HA-16617	1.41
HA-16617P	1.79
HA-17008	2.47
HA-17080	0.98
HA-17301	1.41
HA-17324	0.67
HA-17339	0.52
HA-17358	0.52
HA-17458	0.30
HA-17524	1.88
HA-17555	0.27
HA-17558	0.25
HA-17723	0.83
HA-17747	0.98
HA-17805	0.51
HA-17806	0.83
HA-17807	0.38
HA-17808	0.38
HA-17812	0.52
HA-17815P	0.57
HA-17824	0.48
HA 178L08	0.36
HA 178M12	0.44
HA-17902	0.63
HA-17902P	1.62
HA-17903	0.50
HA 17903PS	0.65
HA-17904AP	0.71
HA-17904PS	0.66
HA-19216	3.75
HA-19507	2.45
HA-51338SP-1	6.00
HA-51338SP-3	4.50
HD 2206P	1.50

HD-38702A25	3.75
HD-38800B12	1.88
HD-38805A27	1.88
HISH1007	3.75
HT-4238	1.88
HT-4239	0.83
ICL7660CPA	2.10
ICM7556IPD	1.20
IP-1060AN	1.05
IR	
IR2C05	1.13
IR2E01	1.88
IR3403	1.20
IR3N06	0.75
IX	
IX0035TA	1.13
IX01113CE	1.13
KA	
KA-1222	0.30
KA-2101	0.52
KA-2102	1.10
KA-2130	0.98
KA-2131	0.83
KA-2133	1.34
KA-2154	2.64
KA-2201	0.41
KA-2206	0.78
KA-2209	0.83
KA-2210	1.72
KA-2212	0.30
KA-2213	0.67
KA-2214	0.75
KA-2221	0.28
KA-2223	0.27
KA-2224	0.41
KA-2247	0.52
KA-2249	0.27
KA-2261	0.35
KA-2263	0.48
KA-2264	0.42
KA-2284	0.35
KA-2401	0.48
KA-2411	0.30
KA-2412	2.25
KA-2911	0.90
KA-2912	0.78
KA-2914A	2.25
KA-2919	2.01
KA 2944	2.90
KA-8301	1.38
KIA	
KIA-6201H	3.75
KIA-6201AH	4.50
KIA 6210H	4.50
KIA-7130P	0.67
KIA-7217AP	1.13
KIA-7227CP	2.25
KIA-7270P	1.37
KIA-7271P	1.72
KIA-7280	1.82
KIA 7281	1.82
KIA 7282	1.65
KIA-7299	1.76
KIA-7312P	0.90
KIA-7313AP	0.60
KIA-7343AP	0.63
KIA-7640AP	0.95
KIA-78008AP	0.25
KIA-78012AP	0.30
KIA-7809P	0.27
KIA-8210	3.60
L	
L-297	5.96
L-298-01	7.92
L036T1	0.67
L149V	1.38
L165V	1.50
L200	1.26
L2605C	1.32
L2685CV	1.32
L2720	1.05
L2722	0.96
L2726	1.05
L272D	0.95
L272M	0.95
L290B	2.36
L291B	3.60
L292	3.68
L293B	2.32
L293C	2.67
L293D	2.40
L293E	2.94
L294	3.59
L295	3.78
L296	4.49
L297P	3.12
L298N	4.57
L387A	1.37
L4811CV	1.43
L482-1	2.18
L4916	1.31
L4918	1.49
L497B	2.31
L584	2.54
L585	2.85
L601C	1.37
L602C	1.37
L603C	1.37
L604C	1.37
LA	
LA-1130	0.90
LA-1132	1.17
LA-1135	1.35
LA-1140	0.83
LA-1150	0.65
LA-1170	1.16
LA-1185	0.38
LA-1186N	0.35
LA-1201	0.72
LA-1205	0.65
LA-1210	0.95
LA-1222	0.41
LA-1230	1.17
LA-1231	1.23
LA-1235	1.55
LA-1240	1.08
LA-1245	1.31
LA-1260	0.72
LA-1261	0.78
LA-1265	1.17
LA-1266	1.61
LA-1267	2.46
LA-1363	0.90

LA-1365	0.72
LA-1368	2.01
LA-1383	1.08
LA-1385	1.28
LA-1503	0.72
LA-1600	0.42
LA-1810	1.13
LA-2000	0.67
LA-2001	0.45
LA-2010	0.56
LA-2101	2.25
LA-2110	0.90
LA-2113	1.38
LA-2200	1.28
LA-2220	1.31
LA-2231A	4.73
LA-2400	0.67
LA-2500	0.54
LA-2800	2.21
LA-3101	0.86
LA-3133	0.78
LA-3155	0.83
LA-3160	0.35
LA-3161	0.42
LA-3170	0.80
LA-3210	0.48
LA-3220	0.67
LA-3225	0.65
LA-3226	0.57
LA-3246	0.81
LA-3300	1.02
LA-3301	0.56
LA-3325	0.58
LA-3350	0.67
LA-3361	0.65
LA-3365	0.52
LA-3370	0.76
LA-3373	1.02
LA-3375	1.20
LA-3376	1.28
LA-3400	1.58
LA-3401	1.25
LA-3430	1.55
LA-3433	1.29
LA-3524	0.90
LA-3600	0.57
LA-4030	1.58
LA-4032META	4.50
LA-4101	0.75
LA-4102	0.83
LA-4108	1.34
LA-4110	0.78
LA-4112	1.49
LA-4120	1.76
LA-4125	4.50
LA-4137	1.17
LA-4138	1.08
LA-4140	0.42
LA-4142	0.65
LA-4145	0.65
LA-4146	0.57
LA-4160	0.95
LA-4162	1.10
LA-4170	1.08
LA-4180	1.10
LA-4182	1.34
LA-4183	0.98
LA-4185	1.83
LA-4190	1.61
LA-4192	1.01
LA-4195	2.63
LA-4200	1.20
LA-4201	1.88
LA-4230	3.75
LA-4260	1.50
LA-4261	1.46
LA-4265	1.01
LA-4270	1.86
LA-4280	2.67
LA-4281	6.23
LA-4282	1.88
LA-4420	1.26
LA-4422	0.98
LA-4440	1.38
LA-4445	1.14
LA-4446	1.28
LA-4460	1.19
LA-4461	1.14
LA-4465	2.24
LA-4466	1.95
LA-4470	2.63
LA-4475	1.86
LA-4476	1.98
LA-4480	1.72
LA-4490	1.88
LA-4491	2.18
LA-4495	2.09
LA-4496	2.25
LA-4497	1.88
LA-4498	1.95
LA-4500	1.49
LA-4505	1.58
LA-4508	1.86
LA-4510	0.57
LA-4520	0.95
LA-4530	1.13
LA-4530M	1.08
LA-4530S	1.08
LA-4533	0.39
LA-4540	1.61
LA-4550	0.87
LA-4555	1.02
LA-4557	1.08
LA-4558	1.88
LA-4560	1.25
LA-4560M	1.28
LA-4570	0.86
LA-4575	0.86
LA-4597	1.13
LA-4630	2.63
LA-4700	3.11
LA-5005	0.74
LA-5112N	0.67
LA-5511	0.52
LA-5512	0.42
LA-5515	0.75
LA-5521D	0.60
LA-5522	0.60
LA-5523	0.56
LA-5524	0.69
LA-5525	0.44
LA-5527	0.57
LA-5533	0.52

LA-5537	0.42
LA-5587	0.78
LA-5655	1.65
LA-5658	1.79
LA-5700	1.46
LA-6324	0.52
LA-6339	0.39
LA-6358	0.38
LA-6358N	0.38
LA-6358S	0.38
LA-6393D	0.60
LA-6393S	0.60
LA-6458	0.42
LA-6458S	0.33
LA-6510	1.98
LA 6517	1.50
LA-6520	1.35
LA-7000	2.66
LA-7000S	2.25
LA-7003	3.03
LA-7003S	2.21
LA-7005	2.21
LA-7005S	1.61
LA-7007	2.66
LA-7007S	2.25
LA-7009	3.70
LA-7009S	2.31
LA 7011	1.88
LA-7013	1.61
LA-7015N	2.09
LA-7016	0.48
LA-7017	2.58
LA 7018	1.50
LA-7019	0.71
LA 7020	3.11
LA-7025	2.66
LA-7027	2.51
LA-7031	2.93
LA-7032	4.26
LA-7033	2.03
LA-7034	2.46
LA-7035	5.27
LA-7040	1.20
LA 7042	2.25
LA-7043	1.49
LA-7043M	1.16
LA-7045	1.16
LA-7046	1.34
LA-7048	1.16
LA-7050	0.78
LA-7051	1.43
LA 7053	1.38
LA-7055	0.86
LA-7060	0.95
LA-7061	1.01
LA-7070	3.06
LA-7071	3.36
LA-7072	1.38
LA-7090	1.17
LA-7096	1.95
LA-7098	1.41
LA-7110	3.15
LA-7112M	1.10
LA-7113	1.65
LA-7116	1.13
LA-7131	1.50
LA-7181	1.88
LA-7191	1.82
LA-7205	0.95
LA-7205M	0.86
LA-7207	2.73
LA-7208	2.28
LA-7210	1.08
LA-7212	1.31
LA-7215	1.31
LA-7220	1.13
LA-7221	0.38
LA-7222	1.34
LA-7223	2.24
LA-7224	0.52
LA-7225	0.80
LA-7226	4.13
LA-7230	4.01
LA-7250	2.72
LA-7259	1.37
LA-7295	1.28
LA-7297	1.08
LA-7300	1.88
LA 7305	3.18
LA 7309	1.01
LA-7313	3.63
LA-7320	1.35
LA-7323	3.38
LA-7330	3.00
LA-7332	2.82
LA-7333	2.25
LA-7506	1.46
LA-7507	2.10
LA-7508	1.46
LA-7509	1.65
LA-7510	0.65
LA-7520	1.88
LA-7520N	1.88
LA-7521	1.88
LA-7521N	1.64
LA-7522	1.38
LA-7530	1.88
LA-7530N	2.25
LA-7545	1.88
LA-7550	2.52
LA-755520	2.00
LA-7601	2.72
LA 7621	3.26
LA-7680	5.25
LA-7710	1.56
LA-7751	2.91
LA-7755	1.56
LA-7770	1.53
LA-7800	1.13
LA-7801	1.13
LA-7802	1.20
LA-7806	0.87
LA-7808	0.87
LA-7810	1.86
LA-7811	1.72
LA-7818	1.90
LA-7820	1.38
LA-7822	1.13
LA-7823	1.38
LA-7824	1.20
LA-7830	0.90
LA-7831	1.13
LA 7832	0.90

LA-7835	1.32
LA7836	1.20
LA-7837	0.98
LA-7850	1.95
LA-7851	1.88
LA 7852	2.25
LA-7856	2.32
LA-7900	0.60
LA-7905	0.39
LA-7910	0.57
LA-7913	1.01
LA-7920	0.50
LA-7925	1.50
LA-7930	3.38
LA-7940	1.46
LA-7956	0.58
LB	
LB-1205	1.53
LB-1213	1.20
LB-1214	0.83
LB-1215	0.65
LB-1235	1.08
LB-1240	1.13
LB-1246	1.46
LB-1256	1.28
LB-1257	1.17
LB-1258	0.75
LB 1264	0.52
LB-1268	0.67
LB-1272	0.86
LB-1274	0.72
LB-1275	0.75
LB-1288	0.80
LB-1290	1.08
LB-1292	0.98
LB-1403	0.60
LB-1405	0.63
LB-1407	1.16
LB-1410	1.49
LB-1415	0.57
LB-1416	0.90
LB-1423	0.83
LB-1450	0.95
LB-1615	2.10
LB-1616	1.88
LB-1620	1.72
LB-1622	1.88
LB-1630	0.95
LB-1640	1.65
LB-1641	0.75
LB-1645	1.35
LB-1649	1.68
LB-1710	0.84
LC	
LC-3664NL-12	7.50
LC-4966	0.54
LC-7011	3.75
LC-7120	2.47
LC-7130	2.63
LC-7131	2.10
LC-7132	2.47
LC-7136	2.21
LC-7151	1.23
LC-7181	3.09
LC-7191	3.75
LC-7257	5.09
LC-7258	4.61
LC-7259	5.25
LC-7363	3.00
LC-7582	2.40
LC-7730	0.69
LC-7800	1.41
LC-7815	2.55
LC-7818	2.32
LC-7880K	6.18
LF-351	0.50
LF-353H	1.32
LF-356N	0.72
LM	
LM-1011N	2.09
LM-1017	1.71
LM-1036N	2.25
LM-1111	2.19
LM-1112CN	1.53
LM-1131	5.09
LM-1131CN	1.50
LM-1203	9.20
LM-1303	2.10
LM-1458	0.21
LM-1868	1.46
LM-1875T	2.52
LM-1877	1.13
LM-1877N-9	1.88
LM-1881	2.78
LM-1889	1.17
LM-1889N	1.13
LM-1894	1.80
LM 2005	1.35
LM-2901N	0.60
LM-2902	0.45
LM-2907	0.67
LM-2917N	1.74
LM-2917N-8	2.25
LM-301	0.83
LM-301AN	0.83
LM-3046	0.45
LM-306P	4.08
LM-308N	0.44
LM-309K	4.50
LM-311	0.33
LM-317K	3.60
LM-317T	0.42
LM-318	0.95
LM-319N	0.35
LM-324N	0.27
LM-337K	4.73
LM-337T	0.58
LM-338K	6.30
LM-339N	0.27
LM-340	1.50
LM-340T15	0.47
LM-340T5	0.47
LM-314N	1.74
LM-350T	2.57
LM-358	0.20
LM-358P	0.21
LM-359	1.82
LM-361N	1.64
LM-377N	7.80

Continued next month...

All orders placed before 5.00pm are despatched the same day.
Please add £1.00 P+P and 17.5% VAT to total.

Access and Visa cards accepted. VISA

Please phone us if the part required is not listed as we have a vast range of stock.
All components are brand new.
Prices may change without prior notice.
Sorry no refunds for returned stock.

TELEVISION

The BBC Green Paper

It is a relief that the government's green paper on the future of the BBC, published on November 24th, is a cautious, open-minded affair rather than a dogmatic effort. Times change. In the Thatcher years one would have expected a radical document full of threats to the the BBC's independence and position in our society – and of course its method of funding. In his introduction to the green paper Peter Brooke, national heritage secretary, writes "the government believes the BBC should continue as a major broadcasting organisation and should have special responsibilities for public service broadcasting". Nevertheless "the BBC cannot continue as if nothing has happened since 1981, when it was granted its present charter... the role, function and organisation of the BBC was bound to change..." and "we should be ready to contemplate radical changes in the way the BBC operates".

The green paper is intended as the start of a public discussion on the BBC's future. Here's Mr. Brooke again: "we now wish to listen to the arguments before deciding on proposals to bring forward to the House". So that legislation can be enacted in time for the renewal of the BBC's charter, which ends on December 31st 1996, a time limit on public representations has been imposed. Comments are invited by April 30th 1993. The Department of National Heritage has produced a pocket-sized summary of the green paper: it's free to interested parties, being available from the Department of National Heritage, Room 668, 50 Queen Anne's Gate, London SW1H 9AT. In addition free leaflets are being distributed via public libraries and Citizens' Advice Bureaux.Twenty questions have been formulated by the government on the BBC, as follows:

(1) What should be the objectives of public service broadcasting? (2) Should the BBC continue to broadcast a wide range of services appealing to all tastes and interests or should it concentrate on information, education and minority interests, and programmes unlikely to be provided by other broadcasters? (3) Should the BBC broadcast a high proportion of programmes to reflect the interests of people throughout the UK? (4) Should the number of BBC television and radio services be changed? (5) Should the BBC continue to expand services for audiences overseas? (6) What standards should the BBC be expected to meet in its programmes and services? (7) How many of its present functions should the BBC continue to carry out? (8) How can its organisation be improved to carry out these activities more effectively? (9) Should the BBC be encouraged to develop or expand its activities, and what should be the implications for its structure and organisation? (10) Should the BBC reduce expenditure by cutting the range and quality of programmes and services? (11) Should the BBC continue to be financed by the licence fee? (12) If not, how should the BBC be financed? (13) If so, should any changes be made to present licence fee arrangements? (14) How can the BBC become more efficient? (15) Should changes be made in the way the BBC keeps in touch with its audience? (16) How should the interests of audiences in Scotland, Wales and Northern Ireland be represented? (17) Should changes be made in the functions of the governors and the BBC Board of Management? (18) Should there be a public service broadcasting council either to regulate the BBC or to promote, finance and regulate public service broadcasting by the BBC and other services? (19) Should the BBC have clearly stated objectives and publish results showing how far it has met them? (20) Should there be improved arrangements for regular parliamentary scrutiny of the BBC's objectives and how far the BBC has gone in meeting them?

Because it is publicly funded, it's right that the BBC should be subjected to scrutiny from time to time. But the basic facts remain that by any standards of comparison the BBC provides an excellent and economic service.

EDITOR
John A. Reddihough

PRODUCTION EDITOR
Tessa Winford

Please note that the telephone numbers below are for contact with the advertisement departments. Editorial enquiries should be sent to the editor at the address given on page 81 or faxed to 081 652 8956.

ADVERTISEMENT MANAGER
Patrick Irwin
081 652 3732

SALES EXECUTIVE
Pat Bunce
081 652 8339
Fax 081 652 8931

ADVERTISING PRODUCTION
Brian Chapman
081 652 8681
Fax 081 652 8917

PUBLISHER
Robert Marcus
081 652 3930

READER HELPLINE
For help if you have difficulty obtaining *Television* phone 081 652 8620

SUBSCRIPTION ENQUIRIES
0444 445 566

SUBSCRIPTION HOTLINE
24-hour subscription ordering with credit card number phone 0622 721 666 and quote reference INJ.

COVER PHOTO
This month's cover photograph shows a selection of TV receiver components and modules. A new series on modern TV receiver techniques starts on page 178.

REED
BUSINESS
PUBLISHING

The Scartbox

Keith Wevill, B.Sc.

The scart connector is now well established as a means of feeding video and audio signals from a VCR, satellite receiver, computer etc. to a TV set. Once the connector is in place however it's not normally possible to monitor any of the signals to check for correct operation. With this in mind the break-in box described below was devised. In addition to allowing video and audio inputs and outputs and control signals to be monitored it enables signals from non-scart equipped sources to be connected and signals from scart equipped sources to be extracted.

Circuit

The circuit, see Fig. 1, is simply a pin-to-pin link between a scart socket, SK1, and a scart plug, PL1. Each of the composite video signals (pins 19 and 20) is connected to a BNC socket and each of the audio signals (pins 1, 2, 3 and 6) is connected to a phono socket. The control signals (pins 8 and 16) and the RGB signals (pins 15, 11 and 7 respectively) are connected to 3mm sockets. All the signal earths are connected together and taken to a sixth 3mm socket. Other connectors could be added but those specified were found to be convenient for my own use.

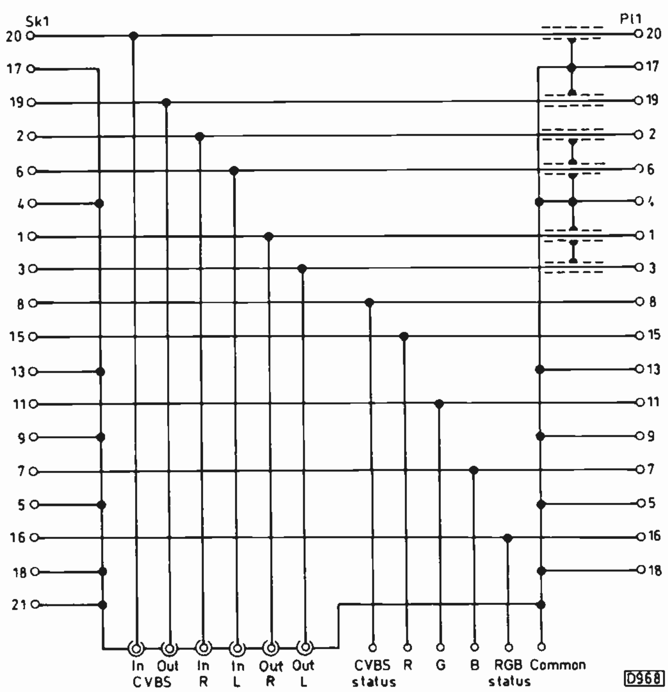


Fig. 1: Scartbox wiring circuit.

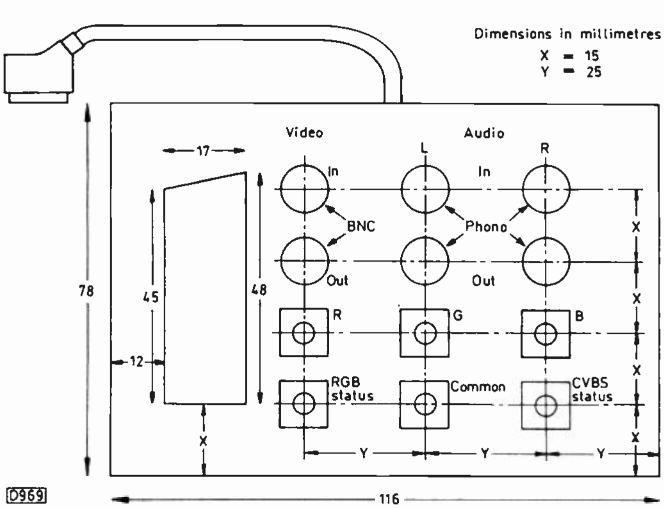


Fig. 2: Scartbox panel layout.

Layout

The connector layout is shown in Fig. 2. A Verobox type 303 is suitable, with a piece of copper-clad board to replace the top – the copper acts as an earth plane, with all the scart socket earths and the BNC and phono sockets connected to it directly, thus minimising the wiring required. The 3mm sockets should have different colours: red, green and blue for the RGB signals, black for the common earth socket, yellow for RGB status (pin 16) and white for composite video (CVBS) status (pin 8). Use screened cable for the audio and video signals. Feed the cables to the scart plug through a slot at the top of the box, with sleeving to protect them. They shouldn't be too long – about one metre is probably a convenient length. This enables the box to be placed at the front of the TV set or VCR being monitored so that you don't have to struggle with test equipment round the back.

Computer Connections

The scartbox can be used to connect a computer to a scart equipped TV set but with some computers, such as the Amstrad CPC series, a purpose-made cable is more convenient. The Amstrad CPC series of computers have a six-pin DIN connector to link them to the monitor, which may be either a monochrome or colour type. The signal levels are suitable for direct connection to the 75Ω RGB inputs of a scart equipped TV set. The connections are as listed in Table 1 below.

The sync signal isn't used because the luminance signal provides the sync pulses. The TV set will have to be manually switched to the external input as the computer doesn't provide a suitable switching voltage at the monitor socket. Switching to the external composite video input will produce a monochrome display as the signal isn't PAL encoded, whereas switching to the external RGB inputs produces a colour display.

Components Required

Scart plug (Maplin FJ41); scart socket (Maplin JW34), two BNC sockets; four phono sockets; six 3mm sockets (red, green, blue, black, yellow, white); Verobox 303 (Maplin LH50); copper-clad board; cable sleeving; screened cable; wire.

Table 1: Amstrad computer connections.

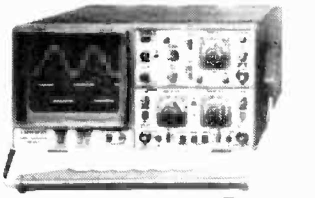
Computer DIN plug	*Use*	*Scart connector*
1	Red	15
2	Green	11
3	Blue	7
4	Sync	–
5	Common	17, 13, 9, 5
6	Luminance	20

HOW TO INCREASE YOUR PROFITS, IMPROVE YOUR SERVICE, WITH COST EFFECTIVE TEST EQUIPMENT.

HAMEG OSCILLOSCOPES

HAMEG are Europe's top selling **DUAL TRACE OSCILLOSCOPES**. Select from four superb models. All, with the exception of the HM 1005, incorporate a useful **COMPONENT TESTER**. Size - all models - 285mm x 145mm x 380mm. Clear display 8cm x 10cm. Mains supply: 110/220/240V AC 50/60Hz.
All supplied with **2 PROBES, a COMPREHENSIVE MANUAL and a 2 YEAR WARRANTY**.

HM203-7 20MHz STANDARD

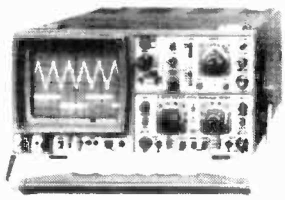


SPECIFICATION
- 2 Channels
- Bandwidth: DC - 20MHz
- Sens: Ch.1, Ch.2, 1mV/cm
- Timebase: 0.1s - 20ns/cm
- Triggering: DC - 40MHz
- Active TV - Sync - Separator
- Variable hold-off
- Trigger LED indicator
- Calibrator: 1KHz Square wave
- Component tester
- Plus many features

Price £338.00 + £59.15 V.A.T. **FREE Specialist Carrier Delivery**

HM604 60MHz UNIVERSAL

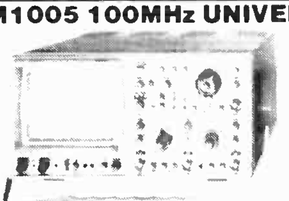
SPECIFICATIONS
- 2 Channels
- Bandwidth: DC - 60 MHz
- Sens: Ch.1, Ch.2, 1mV/cm
- Timebase: 2.5s - 5ns/cm
- Triggering: DC - 80MHz
- Active TV - Sync - Separator
- After delay trigger
- Sweep delay
- Delay line
- Trigger LED indicator
- Calibrator: 1KHz & 1MHz Sq. Wave
- Component tester



Price £610.00 + £106.75 V.A.T. **FREE Specialist Carrier Delivery**

HM1005 100MHz UNIVERSAL

3 CHANNELS - UP TO 6 TRACES

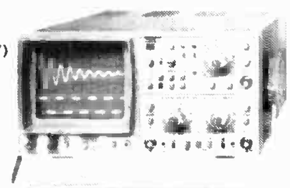


SPECIFICATION
- 3 Channels
- Bandwidth: DC - 100MHz
- Sens: Ch.1, Ch.2, Ch.3, 1mV/cm
- Timebase A: 2.5s - 5ns/cm
- Timebase B: 0.2s - 5ns/cm
- Triggering DC - 130MHz
- After delay trigger
- Delay line
- Trigger LED indicator
- Overscan LED indicator
- Active TV - Sync - Separator
- Calibrator: 1KHz & 1MHz Sq. Wave

Price £792.00 + £138.60 V.A.T. **FREE Specialist Carrier Delivery**

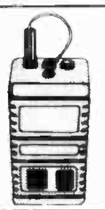
HM205-3 20MHz DIGITAL STORAGE

SPECIFICATION
- Digital Storage
- Analogue real time (Same as 203-7)
- Bandwidth: DC - 20MHz
- Sens: Ch.1, Ch.2, 1mV/cm
- Timebase Digital: 5s-1μs/cm
- Triggering DC - 40MHz
- Active TV - Sync - Sampling
- Max sampling rate: 2 x 20MHz
- Memory: 2 x 2048 x 8 Bit
- Dot joiner
- Printer/plotter output



Price £610.00 + £106.75 V.A.T. **FREE Specialist Carrier Delivery**

B.K.'s CRT TESTER REJUVENATOR

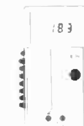


Tests and rejuvenates blue, green and red guns separately. Fitted with delta and P.I.L. sockets. Compact size 120 x 65 x 60mm. Supply 240V AC

Price £34.00 + £5.95 V.A.T.

DIGITAL CAPACITANCE METER

- High accuracy
- 0.1pf-2,000μf.
- LCD display
- 8 ranges
- Accuracy +/- 0.5%. Full scale +/- 1 digit
- Inc. protective case.

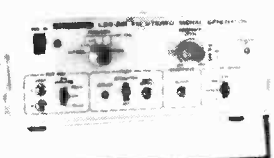


Price £39.99 + £6.99 V.A.T.

LEADER FM STEREO SIGNAL GENERATOR

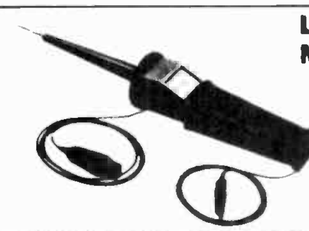
At last! A generator specifically designed for testing and fault finding on FM stereo and monaural VHF receivers including stereo multiplex circuits.

FEATURES
- Carrier frequency 100 +/- 1MHz (adjustable)
- Output level 0.1mV - 10mV.
- Pilot signal 19KHz +/- 2Hz.
- L & R separation over 50dB.
- External Modulation 50Hz - 15KHz.
- Pre-emphasis 50μs, 75μs & off.
- Comprehensive test lead set included.
- Mains powered.
- Size: 80 x 200 x 250mm.



Price £299.00 + £52.33 V.A.T.

LEADER HIGH VOLTAGE METERED EHT PROBE

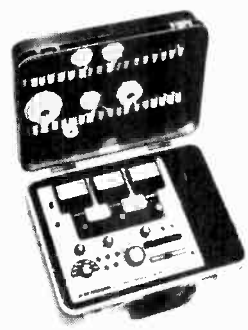


Light weight, easy-to-grip high-impact plastic handle with arc-over protection and no need of extra equipment. An indispensible item in your TV service kit. Measures up to 40kV DC with safety and the greatest of ease. Entirely self-contained. Connect the lead clip to chassis and probe tip to the check point, read the meter for voltage.
A must for the Health and Safety at Work Acts.

Price £66.00 + £11.55 V.A.T.

B & K PRECISION CRT ANALYSER-RESTORER

The number one CRT Test Instrument. Over 5000 U.K. Television engineers wouldn't be without it.



- All CRT's checked identically, including all in-line and one gun types - Tests all three guns of colour CRT's simultaneously under actual operating conditions (model 490) - Exclusive multiplex technique (model 490) - Measure true dynamic beam current that actually passes through G1 aperture to screen - Measures all shorts and leaks - preserving more CRT's - Tests focus electrodes lead continuity finding faults that other testers miss - Uses most powerful restoration method known with minimum danger to CRT - Rejuvenated CRT's guaranteed as new for two years - Obsolescence proof - perpetual set up chart updated and new adaptors developed - Tests and rejuvenates VDU's and oscilloscope tubes - A range of over 40 CRT base adaptors available - Increase profit - Pays for itself in months.

Prices

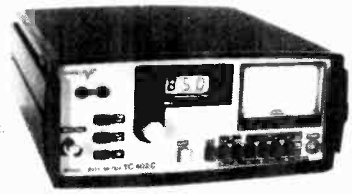
Model 490 Tri-dynamic three meter instrument inc. 6 common adaptors	£509.00	£89.08 V.A.T.
Without adaptors	£446.00	£78.05 V.A.T.
Model 480 Single meter instrument inc. 6 common adaptors	£375.00	£62.63 V.A.T.
Without adaptors	£310.00	£54.25 V.A.T.

SADELTA SIGNAL STRENGTH METERS

The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-C and the TC90, allowing the evaluation of signal conditions for satisfactory operation. Both models have a clear LCD direct frequency readout, coupled to a multiturn tuning control enabling precise channel identification.

TC402-C VHF & UHF

FEATURES
- Three bands:
  Low VHF: 45-110MHz
  High VHF: 110-300MHz
  UHF: 470-862MHz
- Digital display for direct frequency readout.
- Built-in monitor loudspeaker AM/FM.
- Signal measurement from 20μV to 100mV.
- Powered by eight 1.5 AA batteries.
- Fully portable with sturdy carrying case.



Price 259.00 + £45.33 V.A.T.

TC90 VHF-UHF-SAT.

FEATURES
- Five bands:
  Low VHF: 45-110MHz
  High VHF: 110-300MHz
  Hyper VHF: 300-470MHz
  VHF: 470-862MHz
  Satellite: 950-1750MHz.
- Digital display for direct frequency readout.
- Signal measurement VHF/UHF 20μV to 3V.
- Signal measurement satellite -70dBm to -10dBm.
- Audible indication of satellite signal level.
- Built-in-monitor loudspeaker AM/FM (not satellite).
- Powered by rechargable battery (complete with charger 220/240V AC).
- Fully portable with sturdy carry case.

Price £ 499.80 + £87.47 V.A.T.

BLACK STAR COLOUR PATTERN GENERATOR

THE 'ORION' THREE-IN-ONE

PAL VHF/UHF - PAL VIDEO COMPOSITE - R.G.B.

The Orion is a compact, bench instrument offering a wide range of patterns and facilities at a truly low cost.

In addition to a switchable sound carrier facility which allows use with the majority of PAL TV systems, the Orion provides highly flexible RGB outputs, ensuring compatibility with most video monitors.

More than 50 pattern combinations can be selected, including those for testing static and dynamic divergence, video amplifier linearity, colour purity, general colour performance, focus etc.

A separate video input to modulate camera signals; fully variable RF and video output levels facilitating AGC testing; trigger output allowing easy triggering of difficult oscilloscope waveforms; external sound modulation input via DIN connector for frequency response testing of TV sound systems; adjustable wide frequency coverage of VHF and UHF TV bands.

Just some of the features making the Orion Pattern Generator an indispensible tool in the manufacture, test, and servicing of televisions, and computer and video monitors.

FEATURES
- Colour bars, purity, greyscale, crosshatch, dots, focus, etc
- VHF/UHF Channels.
- 5.5MHz, 6.0MHz, 6.5MHz Sound Carriers.
- Internal/External Sound.
- External Video Output.
- Trigger Output.
- PAL B,D,G,H,I,K.
- Separate R, G, B and sync. O/P's.
- RGB @ TTL & 1V.
- Green + 0.3V Syncs.
- Composite Video Output.
- Variable RF/Video Output.
- Switchable Video Polarity.
- Mains powered 220/240V AC 50/60Hz.
- Size: 98 x 219 x 240mm.

Price £229.00 + £40.08 V.A.T.

BARCLAYCARD VISA

U.K. POST PAID, export enquiries welcome. Visa/Access or cheque with order, payable B. K. Electronics. Official Orders welcome from Govt. Depts., colleges, P.L.C.s etc. Large (A5) S.A.E. for technical leaflets of complete range. **Credit card orders are accepted by 'phone, fax or post.** Delivery normally within seven days.

Access

B. K. ELECTRONICS

UNITS 1 & 5 COMET WAY, SOUTHEND-ON-SEA
ESSEX SS2 6TR
Tel.: 0702 - 527572 Fax.: 0702 - 420243

More on the Philips KT3 Chassis

John C. Priest

The well laid out Philips KT3 chassis was used in a number of popular sets that were sold over the years 1980-83. There were Philips and Pye models from 14in. portables to 20in. table models in wooden cabinets, with and without teletext.

Chassis Details

The chassis consists of a vertical mother board which is well supported in a metal frame and carries the line and field output stages and the chopper transistor and smoothing components, most of the rest of the circuitry being mounted on daughter boards. There are many similarities with the larger screen K30 chassis, and many of the subpanels are interchangeable. The KT3 has a line output transformer with separate e.h.t. and focus units while the K30 has a diode-split line output transformer.

Because of their good reliability these sets are seldom seen in the workshop. Recently however we had a rash of them in.

A 14in Portable

The first one was a 37KT3052, which is a 14in portable in a white plastic cabinet with simple remote control and incremental channel change. It was completely dead, the culprit being the 4·7Ω surge limiting resistor R6191 associated with the mains bridge rectifier circuit. Note that in some manuals it's shown as R6291 in the components list. This used to be a common fault, but as these sets are now around ten years old I would have thought that all the dodgy 4·7Ω wirewound resistors would have been weeded out by now.

Pye 16in Portable

The next set was a Pye 42KT3157, similar to the first but with a 16in. tube, full remote control and teletext. This set had partial field collapse, with the top half of the picture compressed down to the middle half inch of the screen and a fairly normal display in the lower half. It seemed that someone else had already had a go: when the back had been removed we saw that just about every component in the field output stage had been resoldered.

As a quick check I fitted the sync/timebase generator subpanel from the first set. This made no difference to the symptoms and voltage checks around the field output transistors and the driver and pre-driver transistors on the main panel indicated that the fault was in this area. The two output transistors had received previous attention but I removed them for checking. Resistive checks gave them an apparently clean bill of health, but when a transistor tester was used the gain of the upper transistor, a BD233, was found to be only 49 as opposed to 155 with a new sample. So a new BD233/BD234 output pair were fitted, restoring the scan and the voltages to normal. Moral: don't rely on resistive checks only when investigating possible transistor faults.

Two Philips Portables

The third set, a Philips 14C925 in a silver cabinet, had a faulty tuner which was packed off to those nice people at MCES for attention. It was an ELC2003, but you also come across the U321 in these sets. The associated i.f. modules differ, so bear this in mind when you're contemplating component swaps from the graveyard.

Set number four was another 14C925. It had what looked like a small golf ball welded to the aerial socket – in fact a coaxial plug corroded by water from the downlead. Luckily these sets have a separate aerial socket/isolator which is liked to the tuner via a short coaxial lead, so repair was simply a matter of fitting a new aerial socket. A better arrangement than with most modern sets in which, because they have an isolated chassis, the aerial socket is mounted directly on the tuner. With these, water damage can be extensive and expensive, if not fatal.

Line Output Faults

Set five suffered from hour-glass distortion with no control of the width. The BD234 diode modulator driver transistor T1490 and the BC548 pre-driver T1485 were both leaky, replacements solving this little problem.

Set six, a Pye 42KT3157, tripped at infrequent intervals. There was a lot of greasy/sooty deposit around the line output stage, so this was first cleaned up. The e.h.t. tray was then removed and examined: you sometimes find that there's a pinhole through the bottom to chassis, but this one seemed to be o.k. I then noticed that the set cut out momentarily when any contact was made with the focus or the first anode controls. As both of them (T1572 and R1581) were showing their age I replaced them along with R1580 (2·7MΩ) and R1582 (1MΩ). A good soak test showed that this had done the trick.

Goes Red

The complaint with another 3157 was that the picture "goes red". At switch on there was if anything a lack of red. The picture was a pale cyan, then improved considerably over the first three or four minutes to give a good display. But after about half an hour the green gradually faded, leaving a strongly magenta picture. This reverted to normal when the back was removed. Judicious use of the hairdryer and freezer soon pinpointed the TDA3560 colour decoder chip on the luminance/chroma panel as being the cause of the trouble. Note that the 3157 is a teletext set with the later single-chip decoder – the earlier luminance/chroma module has two chips.

The TDA3560 is fitted in a socket which can also give problems. When this happens the best cure is to remove the socket completely and solder the chip to the panel directly. It's necessary to quil the pins before refitting. With this particular receiver however a new chip and grey-scale set-up provided a complete cure.

The main panel socket into which the luminance-chroma module is fitted can also be responsible for intermittent loss of or flooding with different colours. When working on these sets it's worth cleaning and examining all the subpanel connectors.

Monitor Use

The next set, a 16CT3715, was the Philips equivalent of the 3157. It wasn't actually faulty. The owner used it as a monitor for editing video and camcorder tapes and wanted video compatibility on more than the single channel (12) provided. Video switching in these sets is carried out on the tuning subpanel at the right-hand side of the cabinet, behind the cover over the tuning potentiometers. There are three four-bit decoder chips, IC856/7/8, on this panel. Each switches three of the twelve channels. Pins 10, 12, 14 and 16 on each chip can be used for video switching, but only pin 16 of IC858 is so used – it switches to the video mode on channel 12 by taking one end of R868 (10kΩ) to chassis, thus turning on transistor TS859. This in turn switches pin 10 of the TDA2571Q chip on the sync panel. If you just want to extend the VCR switching to one or two more channels, further 10kΩ, 0·25W resistors can be added on the print side of the tuning panel (U856), from pins 12 and 14 of IC858 to the junction of R868/R869. Channels 10 and 11 will then be VCR compatible. A quicker and easier way is to link pins 3 and 5 of plug M on the lower edge of the mother board, immediately below the sync module. This makes all channels VCR compatible.

No Sound

The last KT3 had no sound, a common fault in the early days. The seven-pin DIN headphone socket next to the mains switch has a small slide switch that turns off the loudspeaker when 'phones are in use. It's easy to turn this switch off accidentally when dusting etc. In this case however the switch was open-circuit, probably because of lack of use. Switch cleaner often provides a cure, but a better solution if the switch is never used is to solder a permanent link across its contacts. When the switch is frequently used a complete replacement headphone-panel assembly can be obtained from Philips under part no. 4822 212 20503. It consists of a socket, switch and isolation transformer mounted on a small PCB.

Tube Boosting

A final note. When one of these sets shows signs of c.r.t. fading and a replacement is ruled out because of the age or condition of the set, a temporary improvement in picture quality can be achieved by shorting out one of the two chokes L9603/9604 on the c.r.t. base panel. The resultant cathode emission increase provides a dramatic improvement in picture quality, and I know of several instances where doing this has extended the useful life of the set by well over a year. Don't be tempted to increase the boost by shorting out both chokes: this is likely to result in either a cathode-heater short-circuit or an open-circuit heater, both of which make the tube and the set useless. Don't neglect to explain to the customer beforehand what you propose to do and to emphasise that it will provide only a temporary cure, a new tube or set being essential sooner or later.

Room at the Back

J. Le Jeune

It was a busy afternoon in the Electric Dreams workshop. Service Manager Sid had the kettle on the boil and an old Ultra Bermuda colour set – Thorn 8500 series chassis – on his bench. Young Gareth was looking at an Hitachi VT220 with no deck functions, noisy r.f. bypass and a general lack of go. He began to take off the cover. Norman had his head in a Ferguson SRA1 satellite receiver that seemed to be working perfectly well. The customer had complained that it switched between good clean pictures and no picture or sound at all, just a screenful of noise. It would take about an hour after switch on for this to happen: the receiver would then switch between the two states every fifteen to twenty minutes. Norman decided to leave it on and see what happened, turning his attention to a Toshiba 140R3B that wouldn't come out of standby.

Sid switched on the Ultra set and got a picture. The e.h.t. sizzled a bit at the cap, which was not surprising considering that it was a damp day. He switched the set off, discharged the e.h.t. with his wand and took a look at the area around the tube's bowl. After cleaning it carefully, first with methylated spirit and then with a small drop of industrial alcohol, he found that the underside of the e.h.t. cap had been crazed by corona discharge. So he'd have to replace it. After a gigantic clear out a couple of months previously he'd lost his vast stock of defective triplers, kept for the anode caps only, but there'd been an improvement since then. He went to rummage amongst his little cache of obsolete spares in an old outhouse.

Norman had found the cause of the Toshiba set's problem: D808 had been short-circuit. He replaced the back cover, put the set on the soak test bench and picked up a Mitsubishi HSB30 with no playback picture. Time to get the scope and settle down for a signal tracing session.

Gareth grunted with satisfaction. The voltage regulator chip in the Hitachi VCR had proved to be faulty. He went to order a replacement, stopping to watch Sid's struggle with the Ultra set's e.h.t. cap. Flashes of lightning penetrated the workshop's grimy windows and thunder boomed at shortening intervals. Sid soldered the cavity connector back in place and pushed it into the recess in the final anode cap, then pushed it into the tube and switched on. There was an almighty flash and an almost instantaneous clap of thunder, followed by darkness as the power was cut. Sid steadied his hand and regretted not having brewed a fresh pot before the power went off.

The power soon returned. Norman scoped the Mitsubishi VCR's playback signal path and found that the f.m. didn't go beyond Q2B2. Fitting a replacement transistor restored the playback picture. He turned to the SRA1. The loss of power had allowed it to cool down. To raise the working temperature quickly he forced hot air from a hairdryer through the ventilation slots. This worked: the signal dissolved instantly into noise. Leaving the unit powered up, Norman removed the cover and began to check voltages. In later versions of this satellite unit R145, the safety resistor in the a.c. supply to BR3, was replaced with a small self-resetting fuse called a polyswitch. This is in the LNB supply. Operation of the polyswitch had produced the fault condition. Norman removed the offending item and went to the stores for a replacement. When this had been fitted the SRA1 produced a good picture and sound. Norman put it on the soak test rack. It was getting late: the other patients would have to wait till the following day.

Modern TV Receiver Techniques

Part 1

Eugene Trundle

The first domestic TV receivers came on the market in 1936. Since then there has been over fifty five years of development in TV receiver circuitry. The product that sits in the corner of the contemporary living room is a very sophisticated one indeed, the culmination of all those years of research and improvement. This new series will look at the circuits and techniques used in modern receiver designs. The idea is to examine each section of the set in turn, see what it does, how it does it and how it interfaces with the rest of the set, with the aim of making everything clear for newcomers to the TV field, those who may have got a bit rusty and practising technicians who never had the time to get to the bottom of such developments as the I2C bus, switch-mode field scanning or colour transient improvement.

With the exception of high-power, high-voltage and stages that handle very high frequencies – and inroads are being made in all three – most TV circuitry is based on integrated circuits that are generally designed and mass-produced for domestic TV applications. We shall look inside typical examples including, later in the series, the digital ones that process the vision and sound signals and provide such advanced features as 100Hz flicker-free displays. To start with however we'll look at basic television to provide a foundation on which to build.

The TV Signal

The signal being received consists of a carrier wave and its sidebands plus extra carriers and their sidebands for the sound signals and the chroma (colour) information. With a terrestrial transmission the carrier is at a frequency between 470-860MHz, in the UK Bands IV and V. The carrier wave is amplitude modulated by the composite video signal, which consists of an analogue voltage proportional to picture brightness, sync pulse trains at line (15,625Hz) and field (50Hz) rates, the chroma information in the form of a pair of sidebands of a suppressed 4·43MHz subcarrier, and bursts of digital data conveying teletext information. We'll examine each of these in turn as we reach the circuit sections concerned.

Each vision carrier is accompanied by a sound carrier which is at a 6MHz (UK System I) higher frequency and is frequency modulated by the mono sound signal and, for Nicam sound, a third very low-level carrier at 6·552MHz (UK) that carries, in the form of phase modulation, a digital pulse stream from which two high-quality sound signals can be recreated. We'll be looking at the processing of these signals later in the series.

The whole bunch of signals described above is handled as a single entity in the early stages of the receiver. After demodulation each signal is separately processed to produce a colour display on the picture tube and high-quality sound from the loudspeaker(s) – not such high quality if the manufacturer has skimpt on this part of the receiver.

Receiver Block Diagram

This brings us to the basic colour TV receiver block diagram shown in Fig. 1. Although it's not part of the set the first and very important stage is the aerial, which is in effect a broad-band tuned circuit, capturing a group of channels. To reduce possible interference the aerial has a directional characteristic and is mounted so that it responds to signals with either vertical or horizontal polarisation. Its downlead forms a matched transmission line to the aerial socket.

The Front End

The signals picked up by the aerial are applied to the tuner which has three basic functions: to amplify the tiny incoming signal with the minimum addition of noise (since any noise added here will be amplified in subsequent sections of the receiver); to provide selectivity, suppressing out-of-channel signals; and to convert whichever channel is selected by the user to a fixed set of carrier frequencies that remain the same (in the 30-40MHz region) regardless of the transmitted carriers being received. The new carriers, called i.f.s (intermediate frequencies), make it easier to design the filtering and bandpass circuitry required to select the wanted vision and sound signals and reject any on adjacent channels.

The tuner is followed by the i.f. section which consists of a selectivity filter, an amplifier and a demodulator. In most receivers this handles the vision and sound carriers together. The selectivity filter has a sharply-defined response: it rejects all but the wanted vision and sound signals; balances the energy in the sidebands of the vision signal; establishes the correct ratio of vision and sound carrier level; and provides sharp suppression of the carriers in the adjacent channels. The following amplifier raises the level of the wanted carriers to that required for efficient demodulation. It includes an a.g.c. (automatic gain control) loop to ensure that the level of the signal presented to the vision demodulator remains constant over a very wide range of input signal levels at the aerial socket. A.G.C. is also applied to the tuner to reduce the gain here in the presence of a very strong r.f. input. A second feedback loop to the tuner provides a.f.c. (automatic frequency control) to correct any tendency to deviate from the correct i.f.s.

The vision demodulator samples the level of the vision signal once per carrier cycle: integration of these samples produces a facsimile of the original video modulation. What emerges, after filtering, is the composite video signal complete with the colour subcarrier, the text data and any other items (such as test and programme identification signals) added at the transmitter. Also the sound signals. These items are separated by filters that select particular groups of frequencies which are then passed to their own processing circuitry. We'll consider the mono sound signal first – the added complication of Nicam will be left till another time.

FM Audio

Because, with the UK System I, the transmitted vision and sound carriers are exactly 6MHz apart the i.f. carriers in the receiver are likewise 6MHz apart. Non-linearity in the demodulation process gives rise to a beat between them, the result being a 6MHz intercarrier signal that contains the

frequency modulation of the original sound carrier. This can be selected by a sharply-tuned filter, amplified and clipped to remove any amplitude variations, then fed to an f.m. demodulator to recover the sound signal. The demodulated sound is finally equalised, amplified and fed to the loudspeaker.

Video Feeds

We don't want the 6MHz intercarrier sound signal in the vision stages of the TV set – it would beat with the vision signal to produce patterning on the screen. So the 6MHz signal is filtered out by a sharply-tuned rejector circuit. After this the vision signal goes along four paths: luminance, chrominance, teletext (if incorporated) and sync.

Luminance and RGB Signals

The luminance signal carries the brightness information and is all that a monochrome set requires to produce pictures (plus sync pulses of course to synchronise the display). To prevent patterning the accompanying colour subcarrier is stripped from the luminance signal by a narrowband rejection filter tuned to the 4·43MHz colour subcarrier frequency. The luminance signal is then clamped to restore and maintain the correct black level, amplified and delayed by about 800μsec so that it remains in step with the chroma signal – the latter gets delayed because it passes through relatively narrowband circuits, which have this effect. Finally the luminance signal is added separately to the colour-difference signals produced by the decoder, the result being the three RGB (red, green and blue) signals. These are the primary-colour signals required by the tube to produce a full-colour display. The shadowmask tube's three cathodes require about 70V peak-to-peak drive. So the RGB signals are boosted by high-voltage transistor amplifiers that are usually mounted on the tube's socket-base board. A very few sets have used an i.c. for this purpose.

Chrominance Signal

The signal that contributes the colour to the display is carried in the sidebands of a 4·43MHz carrier which is itself suppressed at the transmitter. It's called the chrominance signal, or chroma signal for short, and consists of two colour-difference signals, R – Y and B – Y (red minus luminance and blue minus luminance). Transmitting colour-difference signals instead of primary-colour signals enables the colour to be added to the brightness information in a colour receiver: the technique means that the signal is compatible, i.e. a monochrome receiver can simply ignore the colour signal and produce a monochrome display. The two colour-difference signals transmitted modulate the colour subcarrier in quadrature, i.e. with a 90° phase difference. After demodulation the phase of the signal indicates the hue, i.e. colour, while its amplitude indicates the saturation, i.e. strength. What about green? A G – Y colour-difference signal can be produced in the colour decoder by adding together the R – Y and B – Y signals is certain proportions.

Before the hue and saturation can be detected it's necessary to recreate the missing chroma carrier, i.e. the continuous 4·43MHz wave that's suppressed at the transmitter to avoid patterning and interference on the picture. This is done by including in the colour decoder a stable, crystal-controlled oscillator that's locked to the 4·43MHz colour subcarrier frequency. To enable this phase locking to be carried out a sample 4·43MHz signal called the colour burst is transmitted during the sync pulse period – it's included on the back porch of the line sync pulse. More on this when we come to colour decoding.

A high-pass filter extracts the chroma signal from the composite video. It's then set at a constant level by an a.c.c. (automatic chrominance control) loop which samples the colour burst – this is transmitted at a constant level and is thus a reliable indicator of the chroma signal strength. Because the chroma signal is phase (as well as amplitude) modulated, demodulation has to be carried out by timed demodulators. These can be considered as two gates that are opened one after the other at precisely-timed instants during each subcarrier cycle, the timing being controlled by the recreated subcarrier. The outputs from these sample-and-hold circuits are the two transmitted colour-difference signals, R – Y and B – Y, whose levels have to be adjusted to compensate for weighting carried out at the transmitter (to prevent the transmitter being over-modulated). Matrixing (adding signals in various proportions) then produces the G – Y signal and finally the RGB signals.

The amplitudes of the colour-difference signals are set by the user's colour/saturation control, the contrast control sets the level of the luminance signal while brightness is set by adjusting the luminance signal clamping level.

The PAL colour-encoding system introduces a modification to the phasing of the chrominance signal (PAL = phase alternation by line): we'll examine this when we come to consider decoding in greater detail in a later article.

Synchronising the Scans

To ensure that the individual pixels (picture elements) that make up the colour image on the tube's screen occur at the correct positions, the TV set's line and field scanning generators must be held in precise step with those in the studio. This is the purpose of the sync pulses that are inserted in the video waveform. A line sync pulse occurs at the end of each line and a field sync pulse train at the end of each field. In the very early days the line sync pulses were used directly to trigger the TV set's line waveform generator. This is not a very good idea since interference etc. can give rise to misfiring. Instead flywheel sync arrangements of varying degrees of complexity are employed. The incoming sync pulses are used as a reference to control a phase-locked loop of which the line oscillator forms a part. In theory we no longer need to transmit field sync pulses since they can be obtained by counting down from the line sync pulses, something that was unthinkable in the pre-i.c. days. In practice the field sync pulse train is usually integrated and used to trigger the field oscillator.

It's simple to separate the sync pulses from the rest of the video signal: as they are "blacker than black", i.e. below the signal black level, they can be separated by amplitude slicing. The line and field sync pulses can then be sorted out on a frequency-selective basis.

Line Scanning

The duration of each field is 20msec, during which 312·5 horizontal scanning lines must be traced out on the face of the picture tube. This represents a line scanning frequency of 15,625Hz. So the line timebase, the section of the set that controls the horizontal deflection of the beams in the tube, starts with an oscillator (more correctly described as a timing pulse generator) that runs at this rate, synchronised as outlined above to the transmitted sync pulses by means of a phase-locked loop. The line oscillator's output consists of drive pulses with a carefully chosen duty cycle (ratio of

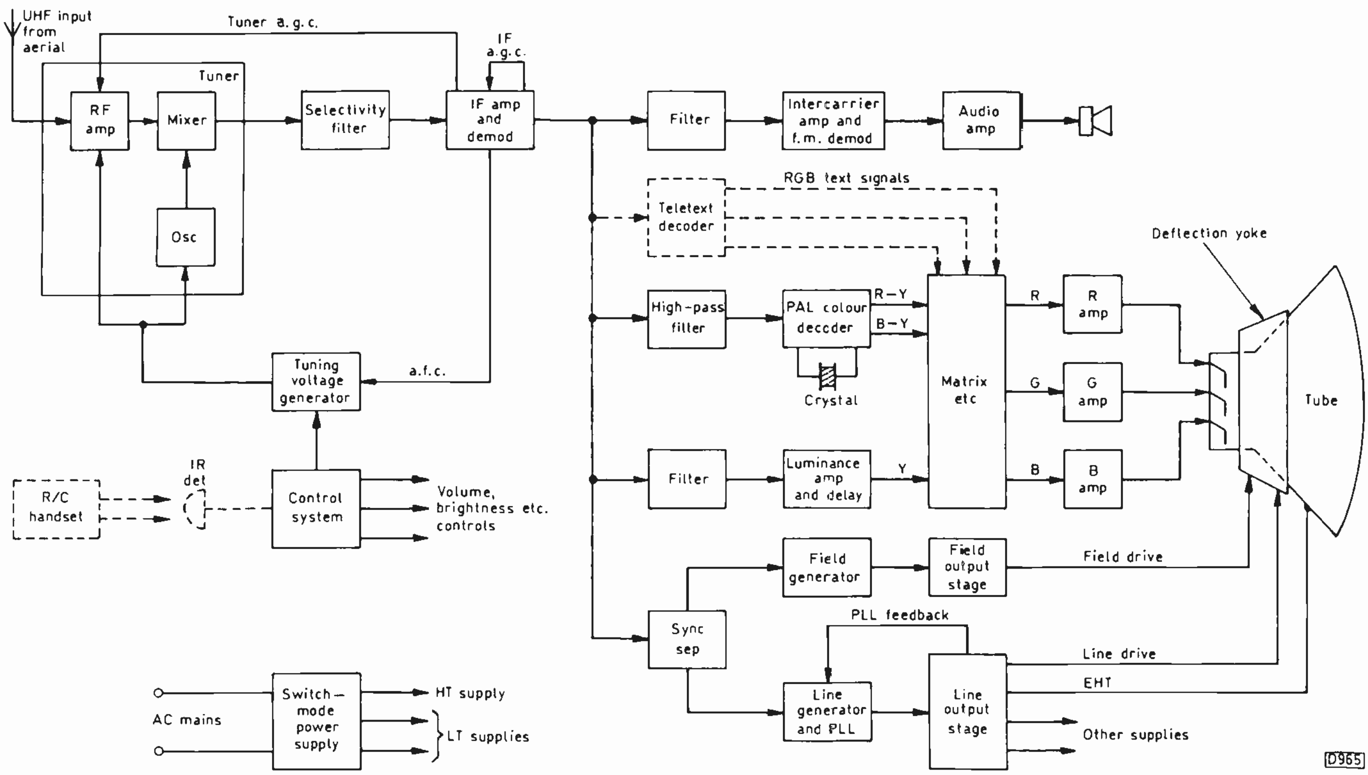


Fig. 1: Simple block diagram of a basic colour TV receiver.

"on" to "off" times). They are used to open and close an electronic switch, the line output transistor, once per scanning line. Each time this switch closes, a d.c. voltage is applied to an inductance consisting of a combination of the line output transformer and the line scan coils. The latter are wound on the tube's neck and produce electromagnetic fields to deflect the three beams in the tube.

When the line output switch closes, the d.c. voltage which is then present across the line output transformer's primary winding gives rise to a linearly increasing current flow through the winding. This is turn produces a linearly rising magnetic field in the neck of the picture tube. The scanning beams are thus deflected to the right (viewed from the front of the tube). About 25µsec later they have reached the right-hand edge of the screen, at which point the line output transistor is switched off. This action results in a rapid collapse of the magnetic fields in the transformer and the deflection yoke (scan coils). Consequently the beams rapidly return ("fly back") to screen centre. By using a capacitor to tune the line output stage, the flyback action is converted to a half cycle of oscillation. This means that the beams pass through screen centre to the left-hand side of the screen. The energy has not yet been dissipated: the flyback is followed by a clamping period which has the effect of returning the beams towards screen centre. At the point where the scanning energy has decayed to zero the line output transistor is switched on again. The process continues at the line scanning rate, while all the time the beams are being more slowly deflected from the top to the bottom of the screen by the field (vertical) deflection system, thus scanning out a series of parallel lines. As the scanning lines are drawn out on the screen, the three superimposed beams are modulated by the RGB signals to build up the full-colour pictures.

The line output stage also produces various supplies for the receiver, in particular the tube's e.h.t. (final anode) supply. The reason for using the line output stage for this purpose is to make optimum use of the energy generated in the stage, thus reducing the set's overall power consumption. We'll return to this in a moment.

Field Scanning

The efficient switching system used for line deflection is possible because at 15.625Hz the line output transformer and scan coils are virtually pure inductors able to generate within themselves the required sawtooth current waveforms. The same is not true of the field scan coils which, at 50Hz, are largely resistive. They therefore have to be fed with a carefully shaped sawtooth waveform.

Again the field timebase starts with an oscillator/timing pulse generator which is locked to the transmitted sync pulses. The precision-timed pulses are used to control the charging and discharging of a capacitor, which thus produces a sawtooth voltage waveform with a rise time of about 19msec and a flyback time of about 1msec. This waveform is usually amplified by a class B power amplifier that's not unlike the audio output stage used to drive a loudspeaker. In this case however the load is the vertical scan coils, whose linearly falling and relatively fast rising currents create in the picture tube neck the required alternating magnetic field to deflect the scanning beams vertically. The flyback this time returns the beams to the top of the screen.

We shall look at some alternative field scanning arrangements later in this series.

Power Supplies

A TV set's power requirements are many and various. The signal processing and decoding sections require a stabilised, low-voltage supply. The field and sound output stages are operated at somewhat higher voltages and have a higher current requirement. Logic and control systems call for closely-regulated 5V and 12V lines. The RGB output stages need about 200V, at low current. For tuning a very closely-stabilised 33V supply is required. The line output stage has the highest current consumption, not because of its scanning action – this process is highly efficient – but because it generates the operating voltages and currents for the picture tube. The line output transformer, throbbing with magnetic energy, is harnessed for this: secondary windings and an overwinding provide the tube's heater power, its first anode and focus voltages and, in particular, the final beam accelerating voltage (the e.h.t.). With a large tube this voltage requirement is typically 25kV, with a current drain of 1mA or more when the picture is bright. This 25W demand is met by an overwinding and voltage-multiplier arrangement. Until a few years ago the voltage multiplier was a separate unit (the tripler): with the advent of the diode-split transformer the multiplier system is built in, made up of several series-connected cells each consisting of capacitance, inductance and a diode. The transformer also generally provides the supplies for the RGB output stages, the field output stage and the low-voltage supplies – in fact it may provide virtually all the supplies required by the other parts of the set.

The line output stage itself requires a stabilised h.t. supply of typically 140V. This is provided by a switch-mode ("chopper") d.c.-to-d.c. converter that draws power from the domestic mains supply. It acts as an efficient converter, very often producing some of the other supplies required by the set. In fact in a few designs it generates the e.h.t. Stabilisation is provided by a feedback loop which controls the on/off switching of the circuit, whose main elements are a switching transistor and a transformer – very similar in fact to the line output stage, but generally without the tuning.

Control Systems

We've left ourselves with little room to consider this important aspect of the TV receiver but will have plenty to say later. A simple manually-operated set doesn't need any form of internal "management" system. Those with remote control may have anything from a simple decoder/matrix chip to a full-blown microcontroller i.e. with associated bus lines, data memories and interfacing chips. We'll look at examples of these in a later installment, along with the serial data formats they use.

Next Month

The next installment will start at the beginning again, with a close look at TV tuners, including those used for satellite TV reception.

Satellite Notebook

Nick Beer

Some more modification and fault notes as *Television* keeps its finger on the pulse of the retail satellite TV world.

Cambridge/Finlux/Ferguson Interaction

A letter from Ian Radley, Managing Director of Cambridge Computer Ltd., in the September issue commented on the interaction I previously mentioned in this column between the Cambridge manufactured Finlux SR5100 and the Ferguson Model 51P7 (TX98 chassis). With a view to helping readers who encounter the problem I attempted to discover what the modification is that Mr. Radley says Ferguson has devised. Ferguson wasn't able to advise on a specific modification for interaction with the Cambridge/Finlux equipment but pointed out that the well known remote control modification for this chassis cures a very similar problem encountered with an Amstrad satellite TV receiver.

Ferguson Modification

The modification is to use capacitive coupling for the output from the SL486 IR amplifier chip IC984. To do this proceed as follows. (1) Withdraw the chassis and remove the front control panel assembly to gain access to the IR amplifier. (2) Remove the IR amplifier's screening plate. (3) Cut the print close to pin 11 of IC984. (4) Solder an 0·1μF disc ceramic capacitor between pin 11 of IC984 and the adjacent solder pad in the track to pin 2 of PL311 (the capacitor bridges the cut made in the printed track to pin 11 of IC984). (5) Make sure that the value of R195 is 1·5kΩ – if not, replace it with a resistor of this value. (6) Refit the screening plate, reassemble and test (at various distances from 4 to 24ft) to confirm that a cure has been achieved. There's a similar modification for Models 14M2 and 36K2 (TX89 chassis).

Is this the modification to which Ian Radley referred? I tried to obtain confirmation but haven't managed to do so to date. Perhaps he'll reply to this article.

Salora 5902/ITT Nokia SAT1100

This is undoubtedly one of the best Ku band satellite TV receivers around. A review appeared in these pages when it was launched a few years back. Now however, with the main requirement being for IRDs, the 5902/SAT1100 is no longer so popular with customers. As a result some of these receivers are becoming available second-hand and, more to the point, some brand new ones are available from Sendz

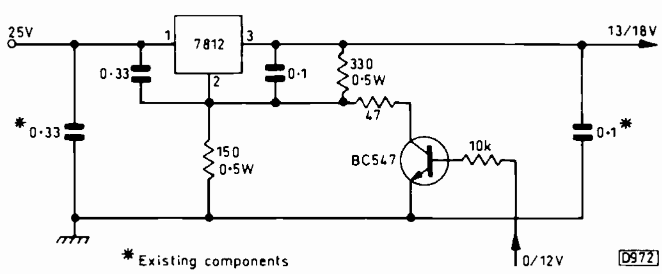


Fig. 1: Modification to provide a switched 13/18V supply from the 5902/SAT1100 receiver.

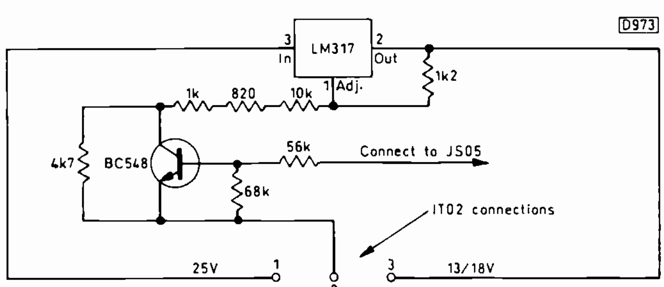


Fig. 2: Alternative modification to provide polarisation switching with a Marconi LNB.

Components. It's a receiver that is well worth consideration by anyone who wants to play around with satellite TV reception, possibly feeding it from a couple of dishes. As it was marketed for Astra reception it doesn't have facilities for driving a motorised dish.

One important point is that despite what it says in the instruction book in the box with the units from Sendz not all of them will, as supplied, control the polariser in a Marconi type LNB, i.e. provide d.c. voltage switching.

The units supplied to the retail trade were designed to drive an electromagnetic polariser via a barrel plug. There was an alternative version, supplied to Granada, designed to supply a Marconi LNB. I was contacted by someone who had purchased a 5902 from Sendz and, from me, a dish kit with a Marconi compact horn LNB. He said he could receive only the horizontally polarised channels because the receiver permanently delivered 18V d.c. from the LNB sockets. The instruction book said that selecting P0 or P7 would give 13V or 18V. It didn't – why? Because the LNB supply came from a straight 18V regulator – the switching option wasn't fitted. I contacted Nokia satellite technical who provided details of two possible modifications that provide a solution.

The first uses the input select button on the remote control unit for polarity switching. It has the disadvantage that the second LNB input can no longer be used. To carry out the modification proceed as follows. Cut the wire to pin 8 (input select) of the tuner and connect it to chassis (pin 1). Replace the 7818 regulator in position IT02 with a 7812 and the extra components shown in Fig. 1. Mount the regulator on the heatsink using an isolator. Make two cuts in the earth print connected to pin 2, one at each side, to provide a print land for the connection of the added components. The 0/12V switching signal required is obtained from the PCB at the back of the receiver. Connect it via a 12cm length of insulated wire.

The second method, which I feel is better, uses P0 and P8 (polariser control) to switch between polarities. Proceed as follows. Remove the 7818 regulator IT02. Replace it with an LM317 regulator and the circuit shown in Fig. 2. Mount the regulator on the heatsink, using a mica washer – you will have to drill the heatsink. The extra components can be mounted on a small piece of Veroboard which will stand upright in the IT02 position. Note that the pin connections of the LM317 and 78 series regulators differ.

When testing don't be mislead by the fact that the open-circuit voltages, i.e. without an LNB connected, will be higher than 13/18V.

Ferguson SRV1/Pace SS9000

Last month I described a problem with the tuner used in this IRD – the symptom was patterning. Ferguson has now identified the cause, which is failure of C416. It's a very small 2·2μF electrolytic in a green plastic sleeve, towards one corner above a square i.c. Heat from this chip is thought to be the cause of the problem. You can check by applying slight heat to the capacitor – place the tip of a soldering iron close to it. The result is likely to be that the beat pattern lines change from horizontal to vertical. A high thermal stability capacitor with suitably small dimensions is available from RS Components – stock code 116-830 (it's a Panasonic component). In view of the cost of the tuner it's very helpful to know the cause of this fault – well done Ferguson.

Here's another bit of advice from Ferguson. If the power supply in this unit runs at the wrong speed check that C12 (33nF) is fitted.

TV Fault Finding

Reports from Philip Blundell, AMIEIE, Steve Cannon, Chris Watton, Brian Storm, Ed Rowland, G. Bakawala, Graham W. Rees, Alan R. Bayly, Graham Richards, Alfred Damp, Richard Newman, John Edwards and Richard J. Avis

Alba CTV2

Beware the coffee-coloured resistor! The only snag is that this set is full of them. You may have come across this type of resistor being supplied to the trade by one of the wholesalers over the past few years. They fail if used in high-voltage situations. In this case the set was dead and R81 (100kΩ) was open-circuit. It provides a start-up feed for the TEA2018A chopper control chip IC5. **P.B.**

Philips GR2·1AA Chassis

This set was dead with the standby light flashing. In fact the power supply was running but the line output stage wasn't. The start-up voltage at pin 16 of the TDA2579 timebase generator chip was low at 5V because the feed resistor R3455 had risen in value from 1kΩ to 5kΩ. It's a safety resistor, part no. 4822 051 10102. **P.B.**

Sony KVA2512 (AE1C Chassis)

A common dry-joint fault with this chassis produces the following intermittent symptoms: the picture rolls, goes black-and-white with a pulsing picture, or line twitching occurs at the top of the screen. The remedy is to resolder the chassis can connection on the digital video panel. Remove the panel from the motherboard and take off the can on the copper side of the panel. The dry-joint occurs at the lower, left can connection, looking at the copper side with the can to the top. The video processing around this part of the board relies on the can as its chassis connection. Sony has issued a modification sheet on this fault. **S.C.**

Ferguson TX100 Chassis

The customer's complaint was that the field collapsed when the set had been on for an hour. But it wasn't a field fault, instead a rather curious power supply fault. When I'd had the set on for about half an hour a slight whining noise from the power supply developed. This increased over a period of fifteen minutes, then the field collapsed. Checks showed that something was wrong with the supply to the field output stage – in fact all the secondary outputs from the power supply were quite low.

By this time the power supply sounded like a jumbo jet taking off about thirty yards away, and in an attempt to persuade me to switch the set off gestures were being made and things were being thrown in my direction. The set was duly turned off and, after a bit of thought, I switched on again and went in search of the cause of the offending commotion. Though the sound came from the chopper transformer it seemed unlikely that this was responsible: I could count on one hand the number of faulty chopper transformers I've had in sets of any make. But all fingers pointed at it, so out it came. A larger, black type from a scrap chassis was half-heartedly fitted. This involved a bit of a crush as some redundant pins for a non-existent socket got in the way. I soldered the transformer in at thirty degrees to the PCB just to prove the point, honest, and prove the point it did. Not a squeal was heard and the voltages remained steady for hours.

It was time to order a new transformer from Ferguson. After all, it's a safety component that has to be the same as the original. When the package arrived and was opened my face fell in despair. The transformer was of the larger, black type that just didn't want to go in. I was about to lob the jiffy bag that had contained it when something fluttered out. Yep, it was the mod. kit. The packet contained a few components that had to be changed, and one sentence in the fitting instructions met with great elation. "Remove the redundant pins, if fitted, near the transformer mounting holes." They were out in a flash, the new transformer was fitted and the mod. kit worked absolutely. Another "top banana" repair had been successfully completed. **S.C.**

NordMende Prestige 72

This set didn't tune correctly and Band IV couldn't be selected – the channel numbers reached only 23. Any method of programming had no effect. I wondered whether the memory chip was full or faulty but a replacement back-up battery restored normal operation. **C.W.**

Philips CTX Chassis

This set was dead. There was 320V at the collector of the BUX84 chopper transistor but the voltage at the collector of the BF422 driver transistor Tr7353 was only 7V instead of 100V. As this transistor was clearly without drive we moved back to the TDA2577 timebase generator chip IC7375 which also controls the chopper. Its supply pin 16 was at only 0·6V instead of 9V. A resistance check from this point to chassis produced a reading of about 2Ω. C2395 (100μF) was short-circuit. **C.W.**

ITT CT3326/TX3326 (Monoprint B Chassis)

If the set is dead check whether there's 115V at the collector of the BU508D line output transistor. If so, connect a scope to this point via a x10 probe. Look at the waveform. There should be 1kV flyback pulses spaced 64μsec apart. If there's a second pulse spaced about 20μsec after the main pulse, whose amplitude is reduced to about 400V, and the waveform is unstable then in my experience the line output transformer is likely to be defective.

If the 115V feed to the line output stage is missing check C701 (4·7μF) in the power supply. This frequently goes open-circuit to give the no results symptom. **C.W.**

Panasonic TC21M1R (Z4 Chassis)

This set would come on with field collapse. The field scanning would then open out but the set would shut down at irregular intervals. During these irregularities the field drive from board C remained constant, so attention was turned to the LA7837 field output chip IC451. Suspicious as always of the small yellow capacitors in these sets I checked the ones connected to this i.c. and soon found that C462 was slightly leaky. A 470pF replacement restored normal operation. **B.S.**

Panasonic TC21M1R (Z4 Chassis)

This set came in dead, i.e. there was no operation. When the optocoupler in the power supply was overridden a blank raster appeared, with no sound. The main microcontroller chip was totally inoperative, so our next line of investigation was to check around the oscillator, resets, feeds etc. This eventually led to removal of the ST24C02A EEPROM chip IC1202, which restored normal operation. A replacement was put on order. **B.S.**

Hitachi CPT2174 (G6P Chassis)

This set had just run out of an extended warranty when it began to suffer from intermittent loss of colour. As application of slight pressure to any component in the vicinity of the chroma delay line DL501 made the colour come and go we replaced this item, to no avail. We eventually discovered that pin 30 of the HA51338SP timebase generator/colour decoder chip IC501 had never been soldered – the pin was making barely perceptible contact with the print. The amazing thing is that the set had given no previous trouble. **E.R.**

Philips 2A Chassis

There was a half-inch gap at the left-hand side of the screen and just the slightest hint of bent verticals. Adjustment of the width control didn't improve matters and we eventually discovered that the cause of the trouble was the "lower" of the two diodes in the EW diode modulator circuit, D6610 (BYW95C). **E.R.**

Alba CTV10

Not long after replacing IC402 to cure a dead-set fault we were surprised to receive a call from the owner of this receiver to say that the same thing had happened. Well it wasn't quite the same this time. On the previous occasion the standby light had come on. This time the set was totally dead, with the 650mAT fuse F401 blown. Checks in the power supply showed that a section of the bridge rectifier, D404, had gone short-circuit. A new fuse and diode completed the repair. Fortunately the customer didn't take it too badly when he was told that he would have to pay again – probably because we did the job for next to nothing. Incidentally we noticed that the symbols for D403 and D405 are printed the wrong way round on the underside of the panel (at least in the set we had) though they are shown correctly on the component side. **E.R.**

Philips CP110 Chassis

This one was unusual. The complaint was that the picture "pulsed on and off". Sure enough the picture blanked out and then returned at roughly one second intervals. The h.t. supply was rock steady at 140V. Scope checks around the TDA3562A colour decoder chip showed that it was blanking its RGB outputs. Heating the chip cured the fault so a replacement was fitted, but this made no difference. Now this set uses auto grey-scale correction and the circuit for detecting the black level is on the c.r.t. base panel. Checks took me to transistor Tr7413 on this panel where I found that R3415 (470kΩ) in its base bias network was open-circuit. **R.N.**

Philips FL1·1 Chassis

This nearly new set had been got at by another dealer. When it was switched on all the LEDs on the front lit up. None of the functions operated but there was a flash from the screen at switch-off. The set couldn't be put into the service mode. Checks around the control panel then showed that the data lines were low and inactive. This is available only as a complete replacement panel, so a new one was ordered. Fitting it restored normal operation. The correct options for UK use have to be programmed in. When this was done as per the manual the set could be tuned. The on-screen diagnostics then revealed that there was a fault in the Nicam decoder which had to be replaced. Further faults were found in the audio stages, and after replacement of three more chips normal sound was obtained. All this because someone had had a go! **R.N.**

Decca/Tatung 140 Series Chassis

This set produced a loud hum at switch on. I found that C808 and C810 (both 100μF, 25V) in the chopper circuit had dried out. Replacements cured the hum but the verticals were ragged. This was cured by replacing the h.t. reservoir and smoothing capacitors C822 and C826 (both 47μF, 250V). **R.N.**

Saisho CT147R

We get these sets in because the power supply has died. I usually find that R621 and R622 have changed value. Fitting replacements of the correct value completes the repair. **G.B.**

Sony KV2022UB

With a dead set check the mains fuse and chopper transistor. If they are faulty fit replacements. But don't switch on: check R513, R514 and R516 first. **G.B.**

Ferguson TX90 Chassis

The cause of a dead set that blows fuse FS51 on the secondary side of the mains transformer is usually a leaky line output transistor (TR112): check by removing it. If the set "hums" at switch on when a new line output transistor has been fitted then I'm afraid that the line output transformer also needs to be replaced. If the set trips when a new transformer has been fitted it's because the power supply is at maximum and can't be set. Replace TR107 – I usually use a BD809 here. Note that the secondary fuse is FS102 in the small-screen models. **G.B.**

Toshiba 210T6B

If the set is dead with the standby light permanently on first check that the 5V (always) supply is present at the collector of QA15 (BC557A). If this supply is present but there's no voltage at the base and emitter of this transistor the M50747-205SP microcontroller chip ICA01 is faulty. **G.B.**

Decca 120 Chassis

There was a loud low-pitched whistle from the line output stage area with uncontrollable high-level sound not tuned to a station. Rather misleading this. It's a line output stage fault: change the tripler. **G.B.**

Ferguson 1790 Chassis

This monochrome portable produced only a white raster whichever channel it was tuned to. But at either side of the tuning point a noisy, unsteady picture could be obtained. The contrast control had no effect. Checks around the

MC13002P multi-function chip IC2 showed that there was no line pulse input at pin 15. The cause was a track break between pin 7 of the line output transformer and diode D8. Absence of the pulses affected the a.g.c., the clue being no voltage at pin 8 or 9 of IC2. This may save someone replacing IC2 unnecessarily, as I did! **A.R.B.**

Ferguson TX85 Chassis

This set caught me out! The TIP791A chopper transistor TR6 was short-circuit and both the 2·2Ω surge limiter R88 and the 800mAT mains fuse FS1 were open-circuit. These items and the TEA2018A chopper control chip IC4 were replaced. At switch on everything seemed to be fine, with a good picture etc., though there was a faint whistle from around the power supply. I was then distracted. On my return five minutes later the power supply had self-destructed again. TR6 felt very hot and because of the low whistle previously mentioned the penny dropped. Check the snubber network I thought. Sure enough R101 (1·2kΩ, 5W) was open-circuit. When this and the other items had been replaced the set finally worked correctly. **G.R.**

Sony KV2704UB

The initial problems with this large set were to do with the channel change and function buttons. This was put right by fitting a new set of user push-switches, but the set would not memorise any newly tuned stations. We soon found that the −25V line was low at −5V. The 10μF, 63V capacitor that smooths this supply, C818, had dried up and gone open-circuit. **G.R.**

Matsui 2180T/Saisho FST212

If you have a dead power supply and you've checked R512 (0·47Ω), R518 (1Ω), Q104 (2SC2271) and Q105 (2SC536), check for bias at pin 2 of the STR58041 chopper chip IC501 before condemning this device. One or both of the 150kΩ bias resistors R503/4 may be open-circuit – probably R504. **G.R.**

Orion 14ARX

Loss of field sync (picture rolling) was the problem with this set. A replacement TA8808N chip (IC401) provided a cure. **G.W.R.**

Hinari CT14

Uncontrollable brightness with flyback lines was the fault condition with this set. We traced the cause to Q301 which was short-circuit collector-to-emitter. **G.W.R.**

Indiana 100 Chassis (Perdio/Bush/Alba)

This chassis is used in various Perdio, Bush and Alba models. A Perdio P2101 that came in recently produced a blank raster with lack of height when it was switched on. After trying the tuning I managed to get a picture and sound but there was still lack of height, while a one-inch flyback blanking line occasionally came down the picture. Since all four stations had to be tuned in I decided to check the voltage across the TAA550 33V stabiliser. The reading was 21V. As the 15kΩ feed resistor was o.k. I replaced the TAA550 stabiliser. Everything now worked correctly, including the height. When you look at the circuit diagram carefully you see that the 33V line also feeds, via a couple of resistors, the field ramp generator (pin 2) in the TDA4505 chip. **G.W.R.**

Salora K Chassis/Hitachi CPT2188

The problem with this set was that the display and tuning didn't work. Voltage checks around the SAA1294 control chip led us to CC107 (220μF, 16V) which was short-circuit. **R.J.A.**

Toshiba C2000B

The customer complained about lack of width. Quick checks showed that the h.t. voltage was low at 93V instead of 107V while the h.t. adjustment control R851 had no effect. We subsequently found that the 2SC1195 series regulator transistor Q801 was open-circuit base-to-emitter. In this condition one would have expected the receiver not to work at all. **R.J.A.**

Ferguson TX90 Chassis

This set produced a grainy picture, as though the tuner's gain was low. As a new tuner made no difference attention was turned to the SL1432 chip and the SAW filter. These two items weren't responsible either! We eventually found that C106 (10nF) which couples the output from the tuner to the SL1432 chip was faulty. **A.D.**

Saisho CT141/Matsui 1420A

The complaint was of intermittent no results. When the set was checked on the bench however it was dead. After removing the chassis we found that there were various dry-joints around the chopper transformer T501. When these had been resoldered the set came to life, but when the back was refitted it went dead again. Further investigation showed that the h.t. supply rose to only 46V. When the load was removed it reached 80V slowly, 30V less than the correct figure. We eventually found that C504 (0·047μF) was virtually open-circuit. **A.D.**

Hitachi G8Q Chassis

This set displayed a bright white raster. We found that the 4·7μF reservoir capacitor for the supply to the RGB output transistors, C720, was open-circuit. **A.D.**

Mitsubishi CT2531BM (Euro 4 Chassis)

There was normal sound but no raster. As the tube's heaters were alight we turned up the first anode control and found that the cause of the trouble was field collapse. A quick check showed that the 24V supply was missing at pin 7 of the AN5521 field output chip IC401. This supply is derived from the line output transformer. We found that the 0·82Ω safety resistor R563 in the relevant rectifier circuit had failed. Somewhat to our surprise a new resistor restored the full field scan. Normally the resistor goes open-circuit when the chip fails. A long test run proved that all was o.k. **J.E.**

Ferguson ICC5 Chassis

The symptoms were severe EW bowing and line pairing. We found that the TDA4950 EW modulator driver chip was too hot to touch. A replacement cured the fault. Comparison with a new chip showed that the defective one had a short between pins 5 (EW output) and 4 (chassis). **J.E.**

Letters

SATELLITE TV INSTALLATIONS

I'd like to make a few points in connection with Derek Stephenson's interesting and informative Satellite TV Installation Guide in the November issue. First the frequency limits quoted for the Ku band (11·7-12·5GHz) exclude the FSS section of the band (10·9-11·7GHz): all the Astra transmissions and many others are in the FSS part of the band.

Derek Stephenson's assertion, in relation to satellite TV i.f. signal attenuation in cable, that long cable runs can result in grainy pictures could be misleading. A weak i.f. signal will produce sparkly not grainy pictures – the video is still f.m., though downconverted. The effect of poor carrier-to-noise (C/N) ratio at the receiver is subtly different from that produced by poor C/N ratio at the LNB, but the symptom remains basically that of sparklies rather than graininess. The relationship between C/N ratio at the LNB, LNB gain, cable losses and C/N ratio at the receiver is complex. There is however a quick and easy way of finding out whether a long cable run calls for a line amplifier. Attenuate the i.f. input to the receiver by about 6dB (with the line power bypassed): if this results in any visible degradation of the picture produced by the signal from the weakest transponder a line amplifier will usually help. I've found that far more line amplifiers are installed than are needed, and have even found them causing cross-modulation.

Satellite TV i.f. signals are in practice a good deal less in need of additional amplification than is generally supposed. This is because modern LNBs have very high gain and thus output while modern receivers operate satisfactorily with very weak signals. A lot of signal can be lost between the LNB and the receiver before any ill effects are noticed.

I've just carried out a simple experiment in my living room to prove the point. My Astra dish is an 80cm Lenson Heath with an STC LNB. On the Eurosport channel this combination produces +18dB/mV at the LNB and +13dB/mV at the end of the downlead. I found that you can attenuate this signal by 33dB before sparklies begin to appear. The receiver, a Pace clone, appears to have a threshold of about –20dB/mV. This doesn't mean that there's 33dB to throw away, because allowance must be made for signal degradation, poor propagation in bad weather, transponders on low power etc., but it does mean that i.f. downlead losses of say 15-20dB don't necessitate the use of a line amplifier. The figures will of course vary depending on the particular combination of dish, LNB and receiver. Severe downlead losses with a steerable dish might affect reception of the very weakest signals.

The i.f. signal 'surplus' of about 30dB gives rise to some surprising effects. For instance a screwdriver applied to a receiver's i.f. input socket will often pick up enough signal from a nearby radiating source, e.g. another working receiver, to give a good picture. When the LNB is powered from a source other than the receiver it's possible to cut the i.f. cable and get a good picture when the ends are held half an inch apart. If the braid is trimmed back the i.f. signal will 'jump' much farther than that.

The fact that receivers need much less signal than LNBs provide is exploited by i.f. distribution systems. Even when all allowances have been made, only –15dB with respect to the LNB's output is required at each receiver outlet. Where the system uses receivers at the head end it's normal practice for the LNB to feed six-eight receivers via a splitter that might lose 12dB.

On the subject of r.f. patterning I was surprised that Derek Stephenson regards this as sometimes unavoidable even when there's only one receiver and one VCR. Surely we've progressed beyond that? Even in a domestic installation where the satellite receiver, VCR and TV set are simply daisy-chained at u.h.f. it should be possible to avoid patterning. Choose the channels carefully, and pay attention to the signals coming from the terrestrial TV aerial. The latter signals should be filtered and attenuated as necessary. In an extreme case – and always with distribution systems – daisy-chaining should be abandoned. Instead, all modulator-produced signals and possibly all terrestrial inputs should pass through channel-pass filters, levellers and combiners.

Bill Wright, Wright's Aerials,
Rotherham, South Yorkshire.

I would like to clarify a point in my Satellite TV Installation Guide in the November issue. I referred to television satellites that provide a 24-hour service as being in geosynchronous orbit. Although this is true, it may have been more appropriate to have used the term geostationary. This is the term used where the orbital inclination of the geosynchronous satellite is zero, i.e. equatorial.

Derek Stephenson,
Wirral, Merseyside.

PHILIPS VR6870 VCR

Two reports in the December VCR Clinic relate to power supply trouble with the Philips VR6870 VCR. John Edwards refers to C112 while Mick Dutton refers to C2311. Neither of the capacitors so designated is contained in the power supply module. I think that in both cases the reference should be to C2011, which is always the prime suspect with any power supply trouble in this machine. Although the service manual gives the value of C2011 as 10μF, voltage not specified, you usually find that a 33μF, 40V capacitor is fitted. This may have been a modification, with 10μF used in only early production machines.

Power supply trouble in my own VR6870 was traced to the fact that C2011 had fallen in value from 33μF to 1·8μF. A 33μF, 63V replacement that I happened to have to hand lasted only a week before the trouble returned. A permanent cure was achieved by using a low-impedance h.f. electrolytic capacitor specifically designed for use in switch-mode power supplies – they are available from Maplin. I used the lowest value in the range, 47μF, 50V. The critical factor is probably the low impedance rather than the capacitance value.

R.R. Hamilton,
Ashtead, Surrey.

PHILIPS 2A CHASSIS

In reply to L.P. Watkinson's letter (December) on power supply failure with this chassis I would like to suggest that if he's still having trouble he tries replacing the chopper transformer. Since I wrote my article on this chassis (see December issue, page 102) I've had a rogue set that blew the BUT11A chopper transistor about once a fortnight. I suspected that arcing of some sort was the cause. The fault usually seemed to occur when the set was switched on from cold. One morning I was able to see the cause of the problem when I switched on the set before the workshop

Help Wanted

Can anyone supply an M193AB1/M193CB1 chip as used in the Hitachi Model CBP260 (NP9A chassis)? David Paines, 2 Sycamore Crescent, Bawtry, Doncaster DN10 6LE. 0302 710 797.

Can anyone provide a circuit diagram or possibly a manual for the Telequipment Serviscope type S32A? Iain Ferguson, 188 Sheepcote Lane, London SW11 5BP.

Can anyone supply a complete manual or a photocopy of it for the NordMende Model 1434 colour portable (F10/11 chassis)? H. Mellor, Gatesgarth, Back Lane, Airton, Skipton, North Yorkshire BD23 4AL. 0729 830 417.

Does anyone have a surplus scope that wouldn't cost a fortune? John R. Taylor, 14 Lastigar, Westray, Orkney KW17 2DJ.

Can anyone supply a LOPT for the Matsui Model MB10 CTV receiver, no. FCA-030/4221051034? H. Pirie, 31 Inver Park, Lochinner, Lairg, Sutherland. 05714 372.

Wanted: Video drum and head for a Pye DV464/05 and a complete Pye CF1 14in. chassis for Model 37KF1140/05L. Reasonable prices paid. J.C. Bailey, 29 Peal Road, Saffron Walden, Essex CB11 3ET.

Can anyone supply a working mains transformer for the Decca Bradford chassis? Expenses paid. R.W. Archer, 55 High Oaks, St. Albans, Herts AL3 6DS.

Wanted: Play idler or working cassette deck for a Fidelity AVS1600. G.B. Ramsden, 16 Copley Drive, Sunderland, SR3 1PG.

Wanted: The Macdonald servicing books (complete set or odd books); a B&K or similar CRT tester/rejuvenator, working or not; a circuit, manual or mains transformer for the Russian valve C1-5Y scope, or a reasonably priced scope, preferably dual-trace. Malcolm Lambert, 1 Dundale Farm Cottages, Dundle Lane, Bells Yew Green, Kent TN3 9AQ (0892 824 657).

Can anyone supply servicing/operating information for the Telequipment/Tektronix S51B and S51E scopes? Photocopies would do. Stephen Shaw, PO Box 1404, Randfontein, 1760, S. Africa.

Wanted: Circuit, kit or module for combining separate line and field sync pulses and video to form a composite signal for a monitor. John A. Slimmon, 30 Buzzacott Lane, Furzton, Milton Keynes, Bucks MK4 1JE.

Wanted: 12V battery leads for the Thorn 1590/1690 monochrome portables and main smoothing blocks for the 1500 chassis. R.E. Bailey, 51 Robin Gardens, Waterlooville, Hants PO8 9XF.

Wanted: Any information on the Cotron 12in. monitor, Bluebest Electronics 12in. monitor, tapes and information for the Technicolor Video Showcase Model 335E and any *Television* PCBs from 1976 onwards. Peter Redpath, 47 Corbett Road, Waterlooville, Hants PO7 5TA (0705 253 595).

lights: there was a flash from beneath the chopper transformer. I could see no evidence of arcing when the transformer was removed, but a replacement cured the fault – the set has been back with the customer for some months with no further failures.

Other dealers have since reported this fault, so it may be becoming more common as these sets age.

Richard Newman,
Croydon, Surrey.

TECHNICAL TRAINING

There was quite a lively exchange of points of view when Ferguson's Regional Technical Manager Bernie Hinton called in at our workshop recently. After we'd complained about their out-of-stock spares and he'd complained about our tea, the subject eventually turned to technical training.

We maintained that as the manufacturers make the equipment that we are expected to service and keep in good running order they have a duty to keep the industry up to date as far as technical training is concerned. Bernie thought somewhat differently. He made the point that it's certainly the manufacturers' responsibility to familiarise the trade with the workings of their products, but not to have to provide training on recent developments from first principles. That, he maintained, is the job of the technical colleges and the various trade associations. We responded to this by telling him that any form of basic training on newer technologies is, unless it comes from the manufacturing side of the industry or the pages of *Television*, virtually non-existent. The discussion continued, and the two points of view were expanded upon until Bernie beat a hasty retreat when threatened with another cup of our tea!

Before leaving he did however tell us about Ferguson's ICC5 chassis Servicing Guide videotape. As we've rented and sold many sets that use this chassis the £28 cost seemed to be a very modest investment. So we ordered the tape from Ferguson. When it arrived a few days later we played it through and found that the contents are entirely technical, with no commercials. The information is meaningful and has proved to be very effective in practice. Although the commentator's accent is difficult to place – it could come from anywhere between Bangkok and the Balls Pond Road – we must say all credit to Ferguson for producing this tape.

L. Milner, Service Director,
Lyles (Worthing) Ltd., Tarring, Sussex.

MAINS PLUGS

I'm sure you've all read with interest previous letters about sleeved mains plug pins and British Standards, and about who should fit what, when, where and how. But how many of us really look at mains plugs, especially when making home visits?

In recent months engineers I talk to regularly have expressed concern about an associated problem, that of multi-adaptors. Some of these are so poorly made that contact pressure is feather weight. Although the plug seems to be held tightly, most of the pressure comes from the spring on the safety shield at the socket front and the tightness of the plastic moulding. The result of course is arcing, which as we all know sees off fuses and other components, especially in modern TV sets.

Back to mains plugs. Some engineers change the plug if it isn't wearing shorts (sleeved pins) while others just check that the fuse isn't rated at 13A. Some try the connections. It's worth making the following checks: (1) Check for corrosion or bad tarnishing on plug pins, fuse end caps and the fuseholder. (2) Check the fuseholder tension. If the metal has been getting hot it can deteriorate and become soft. (3) Check that the fuse is correctly rated and is a snap fit or at least held under tension. (4) Ensure that the fuse-holder is firmly attached to the live pin and the terminal: these are sometimes riveted and can become loose. (5) Make sure that the conductor is firmly held in the terminal: don't overtighten as the conductor can shear off, especially if it's not tinned or doubled back. (6) Ensure that the screws are gripping metal and not the plastic insulation. (7) Finally, check that the cord grip is doing its job and that there's nothing cracked or missing in the plug.

It takes only a minute or so to do this, in any order that suits you. If you follow this procedure every time and make sure that the customer isn't using dodgy adaptors you could save on silicon and fuses, not to mention hassle, the need to rework jobs, etc.

Mark Thomason,
Stretford, Manchester.

SANYO ED1 CHASSIS WITH NICAM

Steve Cannon had some very interesting information to impart in his article on Nicam reception problems (October), in particular on modifications introduced by various manufacturers. My problems have been with the Sanyo Models 2572 and 2872, but no one seems to have a solution. The symptom is a tone at about 750Hz superimposed on all received Nicam broadcasts. Both Mastercare and Sanyo investigated the sets concerned.

The ED1 chassis uses standard Toshiba Nicam chips (TA8662N QPSK decoder, TC6011 PCM decoder and TD6710 DAC), the only exception being the LC3664 PCM RAM chip. Toshiba provided a lot of help and made a number of suggestions but had not come across this fault.

Does any reader know of a service sheet or modification note relating to this problem? Perhaps extra screening or an additional earth connection is all that's required.

Tony Thomasson, GM0GAT, 1 Eastside Green,
Westhill, Skene, Aberdeenshire AB32 6XY.

SUBSTITUTE REPLACEMENTS

I recently had occasion to use the telephone hotline of a leading UK satellite TV receiver manufacturer. The helpful voice immediately identified the cause of the fault as being Q3, type FXT749, but then went on to point out that there's no suitable substitute. I don't know whether this is a relabelled device but the fact is that it's completely unknown to retailers, wholesalers or the reference books on this side of the channel. Pace did offer to supply one at 16p. Quite reasonable, but the minimum invoice for foreign orders is £2.50. This still keeps the cost of the repair within reasonable limits but the paperwork is another matter altogether (pro forma invoice, bank draft etc.), not to mention the resulting delay. Someone at Pace offered to help by slipping an FXT749 into an envelope and sending it off (it does cost less than a stamp). But while waiting I fitted a BC640, which seems to be doing the job

So just when can substitutes be fitted, and what is the position regarding pattern parts? Suppliers of pattern parts all claim 100 per cent compatibility, but when is this really the case and how can we tell other than by trial and error? Maybe other readers or suppliers would like to comment.

Sotires Eleftheriou,
Pantin, France.

Long-distance Television

Roger Bunney

October was a very poor month for DX reception. Signal propagation via the F2 layer was considerably less than in October 1991, there was some Sporadic E propagation but tropospheric lifts were lacking. As I write this on November 5th a prevailing high-pressure system is giving enhanced Band III reception from central Europe, and CST (Czechoslovakia) ch. R10 has been logged in South Wales. Meteor scatter (MS) propagation helped with what was otherwise a dull month and there's the promise of the Leonids meteor shower in mid-November, which is usually an active time. Here's the SpE log for the period:

5/10/92	TVE (Spain) chs. E2, 3; NRK (Norway) E2; SVT(Sweden) E3; RUV (Iceland) E4.
6/10/92	TVE E3.
7/10/92	TVE E2, 3, 4; RAI (Italy) IA, B; C+ (France) L3.
8/10/92	TVE E3.
9/10/92	TVE E3.
10/10/92	DR (Denmark) E3; +PTT (Switzerland) E2,4; RAI IA.
11/10/92	TVE E2; RAI IA.
12/10/92	TVE E2; RAI IA.
15/10/92	TVE E2, 3, 4; CST (Czechoslovakia) R1, 2.
17/10/92	ARD (Germany) E2; TVE E2, 3; JRT/HTV (Yugoslavia) E3.
18/10/92	RTBF (Belgium) E3; DR E3; TVE E2, 3, 4.
19/10/92	TVE E2, 4.
20/10/92	TVE E3.
21/10/92	TVE E2; DR E3.
24/10/92	TVE E2, 3, 4; DR E3.
25/10/92	ARD E2; DR E3; TVE E2, 3, 4.
26/10/92	TVE E3; DR E3.
27/10/92	JRT/HTV E3; TVE E2, 3; DR E3.
28/10/92	RAI IA.
29/10/92	TVE E2, 3.
31/10/92	RAI IA.
3/11/92	RAI IA; JRT/HTV E3.

F2 reception was as follows:

12/10/92	Weak unidentified E2 signal.
20/10/92	Weak R1 signal at 0930.
27/10/92	Unidentified E2 signal.
29/10/92	Unidentified E2 signal.
2/11/92	E2 signal at 0950.
3/11/92	E2 signal at 1045.

There was tropospheric reception on the 7/8th when Scandinavian Band III/u.h.f. signals and signals from Denmark, Germany and the Benelux countries were received at good strength over much of the South and East, extending along the East Coast into Scotland. Cyril Willis had perhaps the most exciting reception, MTV (Hungary) ch. R10 at 1300 on the 8th. This was suspected tropospheric ducting – there was also an unidentified ch. R12 signal. Confirmation of MTV was by means of a caption seen during the news.

At long last the EBU has listed the French Besancon Lomont 60kW ch. L3 and Ajaccio, Corsica 8kW ch. L4 transmitters.

My thanks to Roger Fussell (Torpoint), Cyril Willis (King's Lynn), David Glenday (Arbroath), Tim Anderson (St. Leonards), Peter Schubert (Rainham), Brian Williams (Penarth) and Simon Hamer (Powys) for sending in reception reports.

News Reports

Poland: Our thanks to Stanislaw Pazur for the following information. Top Canal opened on August 1st using ch. E57 with PAL stereo at 5kW, broadcasting from 1400-0200 local time. At other times the station transmits the UK Super Channel. It has no licence and is known to cause interference to the Warsaw TVP-2 channel some 70km distant. Tele 24 in Lodz is another unlicenced station, supported by the Wrocklas TV Echo group. TVP-1 is currently transmitting half an hour of PAL tests a week.

On October 24/25th TVP celebrated its 40th anniversary, with special programmes via Eutelsat II F3 at 16°E. It's expected that TVP will start regular TV transmissions via this satellite from March, intended for exiles throughout W. Europe and the nearer CSI regions.

Russia: RTR, Moscow now produces and links all programmes from the studio floor to the transmitter site in PAL form, converting to SECAM at the final stage. The former state broadcaster is still using 100 per cent SECAM.

Switzerland: A fourth service is being planned but will be unable to achieve 100 per cent coverage due to channel congestion in the border areas. Telecine Romandie ch. E69 has closed down – it operated from the slopes of Mont Blanc.

Rumania: Up to half an hour of commercials is now being carried daily by TVR-1. The TVR-2 network may be privatised as an independent commercial network called Canal 2.

Africa: The Zambian, Tanzanian and Namibian governments have announced that they would welcome the establishment of independent radio and TV networks.

Spain: Increased competition has hit RTVE. There are now 82 radio amateurs licensed to use the 50MHz band.

Russia: Andrew Emmerson recently returned from Moscow, bringing with him details of a couple of 2GHz MMDS (microwave distribution) systems in operation there. Kosmos TV uses satellite TV channels such as MTV, Super Channel, MBC, BBCWS and Lifestyle. These transmissions are scrambled – local unscrambled channels are also included in the package. The receiver-decoders have remote control and balcony-mounted 0·5m panel aerials are used. A similar operation is run by JV Skjyline Greenfield in another part of the city.

Satellite TV

Hughes Aircraft is to build the Astra 1E satellite which is to be launched by Arianespace in 1995.

The Ku band Intelsat K craft at 21·5°W is now in operation, providing transatlantic DTH TV transmissions. Scrambled services can be received from Montreal to Santiago using dishes of 90cm diameter or less. Both NTSC and PAL are used. There are four TV channels, several radio channels, over 3,200 teletext pages and business data circuits. Channels at present being carried are RAI Europlus and the German Teleplus. Intelsat has opened a new tracking control and monitoring station at Beijing.

RTT (Tunisia) is now available via Eutelsat II F3 at 16°E on the 11·659GHz vertical downlink.

ABC (Australia) has signed an agreement to use a Palapa B2 transponder to provide a C band Asian TV service whose coverage will include South China, Cambodia, Vietnam, Burma, Papua New Guinea and Hong Kong. The Australian government has agreed to provide nearly $6m and a further $4m is being sought to cover start-up costs. It's estimated that over 20,000 dishes a month are being installed throughout East Asia to receive the growing number of C band TV services.

The M-Net International pay-TV service has joined with BBCWS TV to provide a 24-hour scrambled service to the African continent downlinked from Intelsat 601 at 27·5°W.

Closer to home the BBC has commenced digital audio broadcasting (DAB) tests via the Olympus satellite. The Telecom 2A satellite now has eight SECAM-system channels and four that use D2-MAC – this is a compromise between the French government and Canal Plus.

Books

Peter Schubert has drawn our attention to a book entitled *The Languages of the World*, which he found on a visit to his local library. It sells for £5·95 and provides examples of virtually every language now in use. Peter points out that it should help greatly with the identification of DX signals where only a caption has been seen. The book was compiled by Kenneth Katzner, is published by Routledge and Kegan Paul and has the ISBN 0-7102-0861-8.

Meteor Burst Communications is the title of a new work on the theory and practice of meteor shower/ping communications. It covers the basics through to discussion of working systems such as the Alaskan Air Command installation which exploits MS pings to link radar data from the more distant sites. Written by Jacob Z. Schankder it's published in hardback by Arftech House (other details not known).

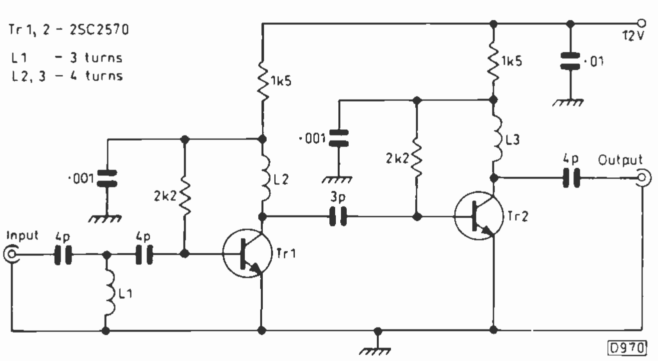


Fig. 1: Wideband u.h.f. amplifier circuit using 2SC2570 transistors.

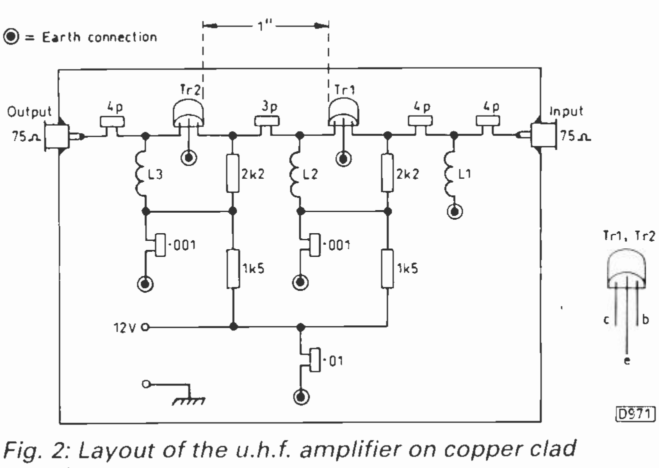


Fig. 2: Layout of the u.h.f. amplifier on copper clad board.

Wideband UHF Amplifier

Bandula Gunasekera of Colombo, Sri Lanka, an experienced DXer, has sent us the details of the wideband u.h.f. amplifier shown in Figs. 1 and 2. He uses it for both TV-DXing and domestic reception. Initially the project was based on the use of BFR91 transistors, but the 2SC2570 finally adopted has only slightly reduced gain at a fifth of the price. I'm assured that the circuit works very well, offering excellent performance.

It's a two-stage design which Bandula laid out on copper-clad board. There should be no problems provided you adhere to the usual u.h.f. constructional techniques. Note that the collector coils L2 and L3 are formed from the leads of the 1·5kΩ resistors, using a meter probe to wind them. No interstage screening was found to be necessary, the circuit being inherently stable. The transistors are mounted an inch apart. If the copper clad board approach is adopted I would suggest the use of the traditional 1kpF feedthrough capacitor as an input terminal for the 12V supply, with others as the anchoring points for the 1·5kΩ collector feed resistors. I'd personally favour fitting the board inside an aluminium diecast box or other compact metal case. Bandula says that he's unable to measure the gain/noise performance but "excellent results have been obtained". Our thanks to him for sharing these details with us.

Satellite Finder Computer Program

We've previously reviewed John Breeds' Satmaster satellite finder computer disc, a program that offers all the information required to set up a motorised system anywhere in the World. This sells for £35. John has now introduced the Sat-Pro, an extensively updated version intended for professional installation engineers worldwide. Particular reference is made to the expanding markets in Africa and the Middle East. There are rainfall statistics, polar and apex angles per town and improved layouts. Rain fade margins are calculated automatically and the disc can be used with a laser printer. All this in addition to the Satmaster information. Both programs were written by Derek Stephenson. The price of £69 for the 3·5in. disc and manual, plus £1 UK post, £2 to Europe and £4 elsewhere, reflects the fact that Sat-Pro is aimed at the professional market. For further details phone 0793 750 620 or write to Swift Television Publications, 17 Pittsfield, Cricklade, Swindon SN6 6AN.

Teletopics

TOWARDS TERRESTRIAL DIGITAL TV

BBC Engineering and Thomson-CSF/Laboratories Electroniques de Rennes (TCSF/LER) have demonstrated that it's possible to transmit at least one digital HDTV service in a standard 8MHz TV channel. The two organisations recently collaborated in a successful experimental digital TV transmission using a novel modulation technique that makes very efficient use of the signal spectrum available. It was part of a major programme which aims to bring digital HDTV to the public via terrestrial transmitter networks.

The tests involved broadcasting standard definition digital TV signals in a conventional 8MHz TV channel from a low-power transmitter at the BBC's Crystal Palace mast. The signals were successfully received at the BBC's Engineering Research Department at Kingswood Warren and a number of other sites in South London and Surrey. Further tests are expected to use full HDTV sources.

The modulation technique used and the transmitting and receiving equipment (modem) were developed by TCSF/LER to convey about 60Mbits/sec in a single 8MHz u.h.f. channel, i.e. sufficient digital data for two HDTV channels using a combination of signal compression techniques. The achievement of such a high spectral efficiency – about 7·5 bits per Hz of signal bandwidth – is a major development. Two separate 30Mbits/sec signals are transmitted in the channel, one with horizontal and the other with vertical polarisation. Instead of using a single carrier with its sidebands as in a conventional transmission, each 30Mbits/sec signal employs OFDM – orthogonal frequency division modulation. This involves the use of 512 closely-spaced carriers spaced 90° apart so that their sidebands, whilst overlapping, don't interfere. Each carrier is digitally modulated, using 64-state QAM (quadrature amplitude modulation), i.e. each carrier cycle can represent one of 64 states, determined by eight amplitude and eight phase values. Use of this modulation system in conjunction with digital compression techniques being worked on will in principle enable two HDTV programmes to be transmitted in a single 8MHz channel.

The successful tests show that this modulation technique has potential for major improvements in spectral efficiency in a wide range of applications. Other advantages include an inherent immunity to multipath propagation (ghosting): because the delay between the original and a reflected signal is generally much shorter than the gap between the original signal pulses (the data rate for each carrier is relatively low at around 60kbits/sec) the two cannot be confused.

The carriers can be spaced across the channel bandwidth in a way that minimises interference from PAL TV transmissions: those that would be close to the PAL luminance, chroma and sound carriers are not used, leaving notches in the OFDM spectrum. The BBC tests showed that the system could tolerate a PAL signal at –12dB power with respect to the digital signal (i.e. about a sixteenth as strong) in the same channel without any effect on picture quality. A PAL transmission would suffer from considerable intereference under these conditions.

The OFDM technique was first tested by the BBC in 1990 and proved highly successful for experimental digital audio broadcasting (DAB) with both fixed and mobile receivers. The original bit rate used was about 11Mbits/sec in an 8MHz channel – the DAB system using the OFDM technique has now been successfully developed under the auspices of Eureka Project 147/DAB, transmitting about 2·5Mbits/sec in a 1·5MHz bandwidth. The much higher bit rate and spectral efficiency of the system developed by TCSF/LER represents a further technological breakthrough in the application of OFDM, making the technique attractive for HDTV use. There is pressure for the u.h.f. channels 35 and 37 to be reserved for digital TV using these techniques should Channel 5 not go ahead.

SONY MINI DISC LAUNCHED

Sony has now launched its Mini Disc audio system, which can both record and play back high-quality digital sound on 2·5in. magneto-optical discs. There are three models initially. Model MZ1 at £500 is a record-capable Walkman which includes a two-line, 24-character LC display to show the title, artist and time information. A title function enables users to add artist and track information on recordable blank discs. Other features include shuffle play and a stereo microphone input. The SCMS anti-copy system is used. A nicad battery that comes with the MZ1 provides a playing time of around 75 minutes. Model MZ2P at £400 is a playback-only Walkman. Model MDXU1RDS at £850 is a player/CD autochanger controller. All models incorporate a new 4Mbit RAM as part of an anti-shock system: if the player is jolted it continues to provide an output while the laser tracking system realigns itself – the RAM stores ten seconds of music. A 60-minute blank recordable disc costs £9: 74-minute discs are promised for later in 1993. There are at present around 250 prerecorded discs at CD prices. Sony promises a 1,500-title catalogue by Christmas 1993.

SATELLITE TV

According to the *Financial Times* satellite TV monitor there were some 71,000 receiver installations in October, an increase on September but well down on October 1991 when 100,000 dishes were sold or rented. According to manufacturers the equipment supply shortage that has been affecting sales is now over.

Cambridge Computer (1 Crompton Way, North Newmoor Industrial Estate, Irvine, Scotland KA11 4HU – 0294 222 100) has launched a new version of its Gemini LNB, designed for SMATV applications. The new Gemini dual LNB has separate outputs for horizontally and vertically polarised signals. The LNB is Astra and Eutelsat compatible, has a minimum conversion gain of 50dB, a typical noise figure of 1·2dB and a typical cross-polar rejection figure of 20dB.

Philips has expressed concern that versions of its BSB receivers with unauthorised modifications for PAL reception have been on sale. The company points out that such modifications could affect BEAB approval.

PORTABLE TV SYSTEM

A Hampshire inventor and the physics department of Loughborough University have patented a new portable TV system that can produce 3-D pictures with stereo sound. The Goggle Vox uses two miniature LCD screens which are worn as a pair of goggles. Its weight is 400g. A development called Microsharp, which can magnify pixels without reducing picture quality, is incorporated. Goggle Vox can be used to display video pictures or computer graphics. Sharp and Nintendo are amogst the companies said to be interested in the system.

NEW SONY TAPE SYSTEM

Sony has launched a new digital audio tape system that's known as the Non-Tracking (NT) format. It can store up to two hours of digital stereo sound on a cassette the size of a postage stamp (30 x 21·5 x 5mm). The cassette weighs 2·3g and uses metal-evaporated tape. Helical tape scanning is used, but the tape isn't wrapped around the head drum: instead, when the cassette is inserted the drum slots into its top. The NT cassette has built-in guides and pinch rollers.

The sampling frequency is 32kHz and the frequency response 10-14,500Hz. Quantisation is 12-bit non-linear. There's no tracking system during recording or playback. The player has a three-head drum that reads the recorded data twice and processes it in a RAM.

The first NT machine, the Scoopman Model NT1 at £545, is aimed at the dictation market. Cost of a 90-minute cassette is £10.

HONG KONG TO TYNESIDE

Hong Kong's largest TV manufacturer Kong Wah is to set up a plant at South Shields, Tyneside capable of producing 1,000 wide-screen, Nicam TV sets a day. Production is expected to start in September and the company is already engaged in discussions on UK component sourcing. When fully operational the plant will create 280 jobs. The company's decision to set up production facilities in Europe is based on fears that EC quotas may be tightened: European sales account for half the company's turnover, about £1·6bn in 1991.

HSE REGULATIONS

Two new sets of health and safety Regulations, which will implement European Community directives in the UK, have been laid before Parliament. They come into force on January 1st. One affects manual handling of loads at work and the other work with display-screen equipment. The Health and Safety Executive (HSE) has published guidance booklets on the two sets of Regulations. Copies of the Health and Safety (Display Screen Equipment) Regulations 1992, SI1992 No. 2792 (ISBN 0-11-025919-X), at £1·90, and of the Manual Handling Operations Regulations 1992, SI1992 No. 2793 (ISBN 0-11-025920-3), at £1·50, are available from HMSO or booksellers.

MORE DATA DISCMEN

Sony has launched three more Data Discman units. Model DD-DR1 is an electronic drive unit, without an LC display, that links up with IBM and compatible computers. Price is £300. The DD-8 at £280 has a fixed 4in. LC display, an auto-scroll facility and bookmark. It weighs 450g. Model DD-10EX at £380 has a 3·5in. flip-up LCD.

SOLDERING IRON FUME-EXTRACTION KITS

Antex has introduced a fume-extraction upgrade kit for its range of yellow soldering irons. The kit fits Models CS, XS, XSD, CTSC and XSTC. It consists of an extractor tube, 1·8m of flexible tubing, cable clips and a cleaning brush. Used with a pump and filtration system, fume-extraction soldering irons are the most effective way of removing harmful soldering gases as required by COSHH regulations.

CD-I OUTDATED?

US computer games publisher Electronic Arts claims that the CD-I system, which is based on 8-bit technology, is out of date. It recently demonstrated a 32-bit multimedia player which is to be displayed at the January Consumer Electronics Show and is expected to be on sale in the USA by Christmas 1993. It has been developed by 3DO, a consortium that includes Electronic Arts and Time Warner. The player is being made by Matsushita.

VIDEO NEWS

The latest camcorder from Mitsubishi, Model HS-CX6 at £900, includes a novel feature – it uses a monochrome c.r.t. in the viewfinder to display colour pictures. The system works as follows. The composite video signal is split into its RGB components and processed. Each signal is then applied to the c.r.t. sequentially, at a 150Hz rate. A fast-switching RGB filter in front of the c.r.t. produces the colour image. Mitsubishi says that the colour 'truefinder' gives better resolution than a colour LC display.

The forthcoming Super Nintendo game *King Arthur's World* will be the first to feature Dolby Surround Sound. It is expected to be released in Europe this spring.

Philips has introduced a four-head LP VCR with Nicam at £400: other features of the VR7225 include automatic 16:9/4:3 switching and NTSC playback.

Hitachi Denshi has introduced a high-sensitivity three-tube colour camera, Model Z-ML1. High sensitivity is achieved by the use of the new 2/3in. MS Hiselvicon pick-up tube which has a photoconductive film target with avalanche multiplication – this was jointly developed by NHK and Hitachi. The tube is thirty times more sensitive than a standard Saticon tube. Its low output capacitance, used with a low-noise preamplifier, enable high-quality pictures to be produced even in high-gain modes (+9 or +18dB). The tube uses twist-field technology to maximise resolution in the centre and corners – a resolution of 700 lines is achieved. Other significant features include iris automatic close, Peltier-effect cooling to prevent condensation and masking to facilitate colour adjustment.

IN BRIEF

The Live '93 consumer electronics show is to be held at Olympia on September 16-20th. . . Fujitsu has developed an LCD screen that provides a six times wider viewing angle than conventional LCD screens. The improvement is achieved by using spherical instead of rectangular liquid-crystal cells. . . Philips has introduced an aerial-plus-amplifier, Model AE100 at £42, for use with pocket LCD or portable TV sets.

All About Electrolytic Capacitors

Ray Porter, M.Sc., C. Eng., MIEE

Aluminium electrolytic capacitors are widely used where high capacitance values are required. Regular *Television* readers will have noticed that a significant number of equipment faults are caused by their failure. This article provides a historical background then goes on to describe the construction, limitations and failure mechanisms of these components in their miniature PCB-mounted form. With this information electronic project constructors and service engineers will be able to choose the component best suited for a particular purpose – where this is not dictated by physical size or the pitch of the leadout wires.

A Century of Electrolytics

The electrolytic capacitor, or condenser as it was then known, was invented a hundred years ago in Germany. It was first used as a filtering element in battery eliminators during the Twenties, when electronic engineering was almost totally concerned with radio broadcast and receiving equipment. These early versions had a "wet" electrolyte and had to be vertically mounted. This limitation was lifted in 1928 when "dry" electrolyte, i.e. impregnated paper, started to be used.

As a result of enhancements in both design and the manufacturing processes used there have been improvements in performance, size and reliability over the last ten years. Compact, modern consumer electronic products continue to require the most that components can give by way of performance however. Thus component failures do occur.

Construction

Fig. 1 shows the general form of construction. The aluminium electrolytic capacitor consists of two layers of aluminium foil which are separated by paper that's impregnated with an electrolyte gel – the capacitor derives its name from this. The foil and paper sandwich is spirally wound and then enclosed in an aluminium or plastic tube.

Only one of the foil layers is an actual electrode of the capacitor – the positive plate or anode. By etching its surface the effective area of the anode is increased one hundredfold, thus increasing the capacitance value obtained in comparison to that achievable using plain foil. The second electrode, the negative plate, is the electrolyte which is in contact with the anode foil. The second foil serves only to provide a contact with the electrolyte. Aluminium oxide, which is formed on the capacitor's anode electrochemically during manufacture, serves as the dielectric. The relative permittivity of the aluminium oxide is about eight: its thickness, which depends on the forming voltage applied during manufacture, is about 1·5 nanometres per volt. It's because of the dielectric strength of about 1MV per mm and the moderate relative permittivity that the aluminium electrolytic achieves the highest CV product within a particular volume of any form of capacitor.

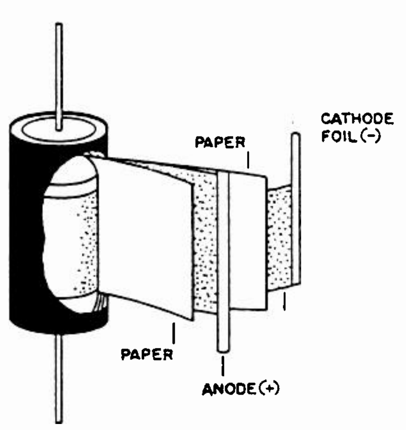


Fig. 1: Basic construction of an aluminium electrolytic capacitor.

Equivalent Circuit

The equivalent circuit, which explains the major features of the electrolytic capacitor, is shown in Fig. 2. Shunt resistance R represents the effect of d.c. leakage. A very small amount of power is dissipated in R, but this causes negligible heating compared to that dissipated in the equivalent series resistance ESR. Ripple or a.c. passing through the capacitor produces a power loss in the ESR. This results in heating within the capacitor. The ESR also explains why the capacitor can't behave as a short-circuit at high frequencies. The very wide use of switch-mode power supplies has increased the demand for low-impedance, high-frequency capacitors with high ripple current ratings. Suitable types always have a low ESR, for reasons that will be explained later. L is the self-inductance, which is the result of the physical geometry of the capacitor and its terminations. The magnitude of L is such that electrolytics are ineffective as capacitors at radio frequencies. At these frequencies the inductive reactance is large.

Variations of Characteristics in Use

Fig. 3 shows show the characteristics of aluminium electrolytics vary with applied frequency, changes of internal temperature, increases in applied d.c. voltage and the passage of time. This information can be used as a guide in assessing the suitability of an electrolytic capacitor for use under arduous environmental and electrical conditions.

Effect of Temperature Increase

Increased temperature within an electrolytic capacitor produces a capacitance change that may make it unsuitable for use in a timing circuit. But the most important long-term effect of increased temperature is that the capacitor's life is reduced. This occurs because the electrolyte evaporates, its vapour passing through the end seal which is usually a rubber plug. The loss of electrolyte reduces the capacitance and increases the ESR, since less plate area is then in use. These changes in electrical effectiveness result in equipment failures because filtering and coupling deteriorate. The deterioration reaches the point where correct circuit operating conditions are no longer maintained.

Increased ambient temperature also leads to increased internal temperature. It has been found that because the electrolyte evaporates more rapidly at high temperature the life expectancy of an electrolytic capacitor at 60°C is twice that at 75°C, while at 85°C life is again halved. Extreme increase in internal temperature produces increased internal pressure. This is relieved by a controlled thickness vent in the can, a diaphragm in large cans or by expulsion of the rubber end plug in miniature electrolytics.

Ripple Current Rating

The permissible ripple current is limited by the capacitor's internal temperature which rises because of dissipation due to the ESR. It has been found that temperature rise in °C is equal to:

$$(I^2 \times ESR \times 1{\cdot}1 \times 10^5)/\text{can area in sq. mm.}$$

Thus a larger can and/or a lower ESR results in a higher ripple current rating.

Forward Voltage Rating

The forward voltage rating is related to the voltage used while forming the dielectric during manufacture and is the maker's recommended maximum value. At one time the use of an electrolytic capacitor at less than its rated value resulted in deterioration of the dielectric. Use of high purity aluminium foil has solved this problem, and now the effect of using an electrolytic capacitor at less than its rated value is to increase the dielectric's reliability in accordance with a fifth power law, e.g. failure rate at 80 per cent of the rated voltage = $0{\cdot}8^5 = 0{\cdot}33$ times the failure rate at 100 per cent. Thus the life expectancy of the dielectric is increased three times by a 20 per cent reduction in the applied voltage.

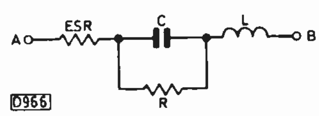


Fig. 2: Simplified equivalent circuit of an electrolytic capacitor. A and B are the terminals, C is the effective capacitance, R is the shunt resistance (insulation resistance) through which d.c. leakage current flows, ESR is the equivalent series resistance and L the capacitor's self-inductance due to its terminals, electrodes and geometry.

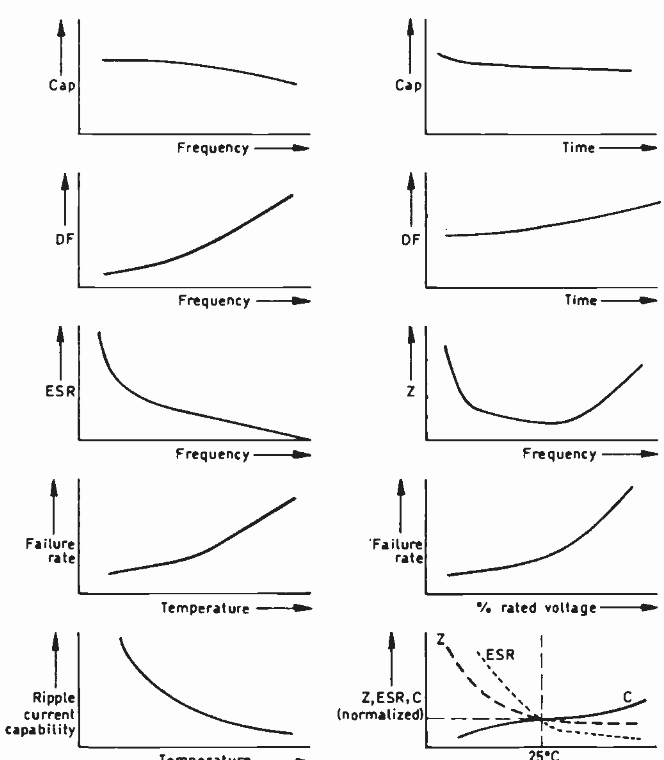


Fig. 3: How the characteristics of an aluminium electrolytic capacitor vary with temperature, frequency, time and applied voltage.

Reverse Voltage

Up to 1·5V is an acceptable reverse voltage for aluminium electrolytics. Non-polarised types often have seals at both ends of the can. Because of this the electrolyte vapour leakage is twice that with a single-ended type. So it's worth considering the use of a polarised type even where no bias voltage is normally present in the circuit concerned.

Application of a higher reverse voltage for a long time will result in a loss of capacitance. But application of a significantly higher reverse voltage for a short period of time won't cause failure either in the reverse direction or when the capacitor is subsequently used with the correct forward voltage. Be careful about applying incorrect d.c. voltages to electrolytics: their failure mode can be explosively dangerous when internal pressure is released after an excessive temperature rise.

Expected Life

Manufacturers seem to regard the life of components used in consumer electronic products as being a minimum of three-five years. This is checked by testing at maximum temperature for up to 10,000 hours. But degradation limits with bottom-of-the-range electrolytics are specified for only 500 hours – see Table 1. This means that significant deterio-

ANSWER TO TEST CASE 361

- SEE PAGE 214 -

You probably worked out the solutions to George's problems, but here they are. First, although the nominal operating voltage of a camcorder may be say 6V, as in this case, the conditions are not as simple as those for a torch bulb or a transistor radio! Operation of the control circuitry is closely geared to the characteristics of the on-board battery provided: at the point where the camcorder cuts out there has to be enough energy left in the battery to operate the unlace and tape-eject mechanisms.

By the time that George's 6V supply had worked its way via a fuse, four plug-socket connections and several metres of thin flex it was, on its arrival at the voltage-sensor within the machine, somewhat depleted. This was especially the case at certain stages of the camcorder's operation, when it was taking almost 1A from its supply. We replaced the flex with a thicker type and suggested to George that he added one more cell to his battery to boost the supply to 7·2V. This did the trick.

The cause of the hum problem was stray pick-up of 50Hz radiation from the mains supply. This can occur when a camcorder is electrically floating because it's fed from a mains-isolated power supply. The solution was simple: to earth the camcorder's chassis line. George's customers' Magic Memories were flowing again the very next day.

Table 1: Typical electrolytic capacitor characteristics.

Voltage rating:	10V	16V	25V	35V	50V	63V
Dissipation factor for capacitors with values between 0·47µF-1,000µF						
105°C type	0·19	0·16	0·14	0·12	0·1	0·1
Low ESR type	0·15	0·1	0·08	0·07	0·06	0·05
ESR of a 220µF capacitor at 120Hz (Ω)						
105°C type	1·15	0·97	0·84	0·72	0·6	0·6
Low ESR type	0·5	0·4	0·32	0·28	0·22	0·21
Maximum ripple current at 120Hz (mA)						
105°C type	260	320	430	480	540	580
Low ESR type	380	450	600	700	900	1,100
Case size, diameter x length in mm						
105°C type	8 x 11	10 x 12·5	10 x 16	10 x 20	12·5 x 20	12·5 x 25
Low ESR type	10 x 16	10 x 16	12·5 x 20	12·5 x 25	16 x 25	16 x 31·5

Life test data: permitted dissipation factor

105°C type, after 500 hours	1·5 x initial value
Low ESR type, after 2,000 hours	2 x initial value

ration will occur after say a year if the capacitor is operated with a high internal temperature.

In the UK, ambient temperatures for consumer equipment are normally 20-30°C. The ambient summertime temperature in China is around 40°C, which must shorten the life of electrolytics used there. Long-haul travellers are advised to keep their camcorders cool!

Manufacturers consider the end of an electrolytic capacitor's useful life to be when 40 per cent of the electrolyte has evaporated and escaped through the end seal, but catastrophic failure as described below may occur before this point is reached.

Failure Modes

The most common cause of failure when electrolytic capacitors are being tested for useful life expectancy is a short-circuit through the dielectric because of voltage stress. Open-circuits occur because of mechanical failure of the joint between the foil and capacitor terminals and are much less common. In field servicing the most common cause of failure is the absorption of hydrogenated hydrocarbon cleaners, which attack the aluminium foil, through the end seal. Current "green" practices in industry are to use no-wash or water-washable fluxes while soldering, which should reduce this type of field failure.

Typical Characteristics

Table 1 lists typical electrolytic capacitor characteristics in relation to voltage rating. This shows that capacitors with the same voltage rating and type of construction have the same dissipation factor. A capacitor that will provide better reliability can thus be chosen, since use of one with a higher voltage rating will result in longer dielectric life because of the voltage derating factor while the drying-up process will be slower because the internal temperature will be lower. Internal temperature is reduced because high-voltage capacitors have a larger case size and a lower ESR value. Because of the heat-handling capability of higher-voltage capacitors their ripple current rating increases with voltage rating for a given capacitance value.

Acknowledgement

My thanks to Sprague Electric and Rubycon for supplying performance and life data for their ranges of miniature aluminium electrolytic capacitors.

GLOSSARY OF TERMS

Dissipation Factor (DF): The ratio of the effective series resistance (ESR) of a capacitor to its reactance at a specified frequency.

Effective Series Resistance (ESR): This is the "lumped" element that's used for purposes of calculation to explain the power loss within a capacitor when it passes a.c.

Etching: An electrochemical process that roughens the surface of the aluminium foil, thereby increasing its surface area in comparison with unetched foil.

Quality Factor (QF): The ratio of capacitive reactance to ESR at a specified frequency. It's the inverse of DF.

Working Voltage: The maximum d.c. voltage that can be applied to a capacitor for continuous duty at the maximum rated temperature.

Camcorner

Reports from Brian Storm and David C. Woodnott

Panasonic NVM7

Intermittent flashing was the complaint with this camcorder. Sure enough after about twenty minutes the colour content of the camera picture started to flash and break up. Scope checks around the camera process board, after first removing multiple screening cans etc., showed that the R – Y and B – Y signal outputs from the Y and C processor chip IC304 were fluctuating severely. Farther back in the signal chain, at the other side of the 1H and 2H delay CCD chip (VCR200), things settled down a bit. Replacing this item cured the fault. **B.S.**

Panasonic NVM7

This M7 was dead: the power supply wouldn't stay on because the 16V and –8V camera supplies were missing, their absence activating a power-off circuit. The root of the problem seemed to be a badly scorched chopper transistor, Q1003, for the 16V and –8V supplies. After fitting a replacement 2SD1293M there was a wisp of smoke from the camera section. Fortunately I was able to switch off before Q1003 expired again. The cause of this latest problem was a charred luminance 1H delay CCD chip (VCR0199) on the camera process board – it had gone short-circuit to chassis. **B.S.**

Philips VKR6820

This is an earlyish Panasonic clone. The report was of no playback sound though I couldn't find anything amiss. A call to the customer provided the answer. There was no sound on holiday in Sweden! He'd not tried it back home. Unfortunately this is one of the very few machines in which the 5·5MHz sound carrier is not a switchable option on the r.f. unit. **D.C.W.**

JVC GRC7E/Ferguson 3C03

The reported fault was no focus: the lens unit was well and truly jammed. It's quite a common fault with these camcorders. As a replacement optical block is expensive it's worth having a go at carrying out a repair, though repair is probably not the right word as the action required is to strip the optical assembly from the camera head and "unscrew" the primary lens. This involves removal of a piece of "sticky tape" that locates the mating edges of the separate lens parts. Mark both surfaces to help with reassembly,

If it's now possible to unscrew the primary lens all is well. If not, apply a minimum of force to the primary lens by holding the camera body and pressing the lens hood against a firm surface. If you're lucky a click will be heard (and felt) as the lens assembly assumes its new position.

Once the primary lens is free, remove it from the rest of the assembly. Check whether the multiturn threads of the lens and its housing are damaged (cracked). If all is well, reassemble the primary lens to the main assembly, noting that the correct threading of these parts will allow full rotation of the assembly. Refit the "sticky tape", align the lens sections and check the zoom and focus rings for freedom of operation. Set up as required – back focus, A/F tracking and focal distance.

This procedure can be carried out with certain other JVC models – indeed with most early models from most manufacturers, including the latest full-size machines with manually adjustable focus and zoom lenses. **D.C.W.**

Panasonic NVMS1

The report said auto-focus sticking. Investigation showed that this full-size camcorder had been dropped on its optical block end. In fact the primary lens was coming away from the rest of the unit, the result being that it jammed in certain positions. Now a new optical unit for one of these machines costs around £200 trade. When you add the labour charge, this repair for what is really not too serious a problem can be quite expensive, at least from the customer's point of view. Can it be done more cheaply? – how often do we hear these words! Well yes it can, but only by dismantling the primary lens and drilling a small (0·8mm!) hole to accommodate a securing screw. Result, a satisfied customer.

But don't do this sort of thing if you have anything better to do! An interest in model building means that I've assembled a range of small hand tools that are occasionally pressed into service for jobs like this. If you do wish to attempt the odd mechanical repair you will need very small drills, taps etc. – model making suppliers are a good source. **D.C.W.**

Sony CCDV88

The fault report with this handycam was of odd coloured lines and patches floating up the picture. The cause was a dirty flying erase head. Nearly fooled me – the video heads were o.k. **D.C.W.**

JVC GRC1

I expect everyone has had the no colour fault with one of these early camcorders. This one was no exception – the culprit was the MCM1068A chip IC8. Good results were obtained after setting up the chroma circuits. **D.C.W.**

Panasonic NVMS70

If the problem with one of these camcorders is intermittent operation and/or intermittent viewfinder and LCD displays replace both clock oscillators on the operation PCB. One runs at 32kHz, the other at 4MHz. This can save much searching and time. **D.C.W.**

Amstrad VMC100

These record-only camcorders can be difficult to service without the special jig that allows a playback mode to be entered. This one reportedly left loops of tape and ejected the cassette at random. It certainly lived up to its reputation! It would run for a while, stop, eject the cassette (complete with a loop of tape) then refuse to do anything.

When I removed the case to see what was going on I discovered that the capstan stopped intermittently, producing the fault symptoms. If pause was selected in the record mode the machine would sit there with the capstan running until record was again selected, when the capstan would cease to rotate. The cause of the problem was a faulty BA6431F capstan drive chip. **D.C.W.**

Test Report: Fluke Model 12 DMM

David Botto

The Fluke Model 12 digital multimeter can fairly be described as being at the leading edge of DMM technology. It's a brand new design packed with an impressive range of facilities. The dimensions – 3·46 x 7·05 x 14·23cm, or 1·35 x 2·75 x 5·55in. if you prefer it that way – are such that it fits easily in one hand. On my scales the weight reading, including battery, was a fraction under 10oz.

To replace the battery (a standard 9V NEDA 1604/IEC 6F22/PP3) you remove four screws from the back after which the front of the instrument can be lifted off. Battery life is specified as 650 continuous hours with an alkeline battery, 450 hours with a carbon-zinc battery. To economise on battery life, if the meter is left switched on but is unused for more than 45 minutes it goes into the standby mode and the display blanks.

Battery replacement gives you an opportunity to inspect the innards of the Fluke 12. You'll find that the meter is well made from top-quality materials. The case is formed from grey, high-impact plastic that looks as though it will stand up to life in the service department. A slight upwards tilt when the meter is placed on the bench makes it easier to read the display. An anti-skid pad on the lower part of the base ensures a good grip on the work surface.

The liquid-crystal readout is of the 3 3/4 digit (4,000 count) type, updating four times a second. I found that the thick, solid, jet-black, 15/32in. high digits are easy to read at distances of up to three feet. The two test prods are well-built with finger guards, Hard Point tips and extra-long connectors that plug into recessed, well-insulated sockets at the front edge of the meter. For range and function selection there are a stout three-position slide switch and four tough-looking push-buttons. These are labelled with an equals sign, an M, a circle/square dot symbol and a capacitor respectively.

Resistance and Continuity Checks

For continuity and resistance checks you push the slide switch to its far right position. A diode symbol appears in the display. To change from resistance to the diode range you press the button with the equals sign. According to Fluke the open-circuit voltage across the test probes is less than 1·5V in the resistance mode, 2·4-3V in the diode mode. I found that this is so, getting readings of 0·693V in the former mode and 2·6V in the latter. A small-signal diode registered 1·704MΩ one way and infinity the other in the ohms range. Thus the majority of components can be checked in-circuit in this mode.

Provided the resistance is less than 25Ω the beeper keeps operating while making continuity and resistance checks. I found this particularly useful when checking PCB tracks.

The resistance ranges cover from 0·1Ω to 40MΩ.

Short-to-open and open-to-short transitions can be captured and visually displayed. After connecting the test probes to the circuit you press the M button. M then appears in the display, which shows either an open- or a short-circuit condition – see Fig. 1. When a transition is detected the meter gives out a beep and the transition is captured in the display. With further changes the meter beeps but the display doesn't alter – to reset the display and return to the capture mode you press the M button again.

There's also an effective diode and semiconductor junction test. A good junction shows about 0·6V one way and OL the other.

V-Chek Mode

When I first started servicing a senior engineer who knew his business told me that "after measuring resistance a multimeter should be immediately switched to its highest d.c. voltage range – your next check could be an h.t. line measurement". This proved to be good advice: the one time I ignored it the result was a cloud of black smoke and a written-off analogue meter. Thanks to advanced microprocessor technology however you can ignore this rule when the Fluke 12 is in its V-Chek mode.

Whenever the meter detects a voltage greater than about 4·5V while you are carrying out continuity or resistance checks and the meter is not in the manual range the V-Chek symbol appears: the meter then switches automatically to fast-autoranging a.c. or d.c. voltage, the readout indicates the a.c. or d.c. voltage present and the symbol LoZ (low impedance) appears as a reminder. A beeper momentarily sounds as each measurement is made, though you can disable the beeper by pressing the equals button when you switch the meter on. It's quite an experience to measure 0·5Ω then immediately connect the probes to the mains supply and read off 250V a.c.!

In the V-Chek mode you can carry out all the basic a.c. and d.c. voltage and resistance/continuity checks required – provided you are working on circuits, such as power supplies and other sources, with a low output impedance. The reason for this is that in the V-Chek mode the meter's input impedance is only 2kΩ. So this facility shouldn't be used for voltage measurements where a 2kΩ load could damage the circuit.

I found that the V-Chek setting was the only one needed for the majority of trouble-shooting tests. It saved me much time and frustration.

V-Chek can be disabled by pressing the button with the circle/square dot symbol: this symbol then appears in the display and the meter is locked to the selected manual setting function. But in practice I never found it necessary to do this.

Voltage Measurements

The basic voltage ranges are selected by setting the slide switch to its centre position. For a.c. press the equals button. There are a.c. and d.c. voltage ranges from 4V to 600V, the input impedance being 10MΩ on the d.c. ranges and 5MΩ on the a.c. ranges. When you switch the meter on it switches automatically to autorange – and the autorange is fast. You can lock the ranges for manual operation by pressing the button with the circle/square dot symbol which then appears in the display.

There are also 4,000mV ranges which can be entered only in the manual range mode. These are for convenience when using certain accessories.

Current measuring ranges are not included. So far as I'm concerned this is not a serious disadvantage as I rarely use DMM current ranges. I do what most service engineers do – measure the voltage across a handy resistor and mentally calculate the current using Mr. Ohm's well-known law. This saves a lot of unnecessary and often destructive component desoldering and resoldering.

Min/Max Operation

Many DMMs have a min/max function. The Fluke 12 goes a big step farther. You set the meter to the required voltage or resistance range and connect it to the circuit. Then press the M button. This symbol is now displayed and autorange is disabled.

When the reading changes by more than about 50 digits the meter beeps a brief input "change alert" signal. When a new minimum or maximum reading is recorded the meter emits a longer beep. You can then press button M and the meter will cycle through the maximum, minimum and present reading. To exit min/max and erase the stored readings press button M for two seconds or change the measurement function.

But this isn't the end of the story. You can also measure the elapsed time between the minimum and maximum readings, something that's a real boon when there is an intermittent fault and you don't know how often it occurs. It works as follows.

First you enable the min/max elapsed clock by holding down button M and moving the slide switch from off to either the voltage or the resistance/continuity position. Then connect the leads to the circuit. All that's now required is to press button M. The M symbol appears in the display and the time is set to 00.00. By continuing to press button M the DMM steps through the min/max/present reading sequence.

The meter doesn't go into standby after 45 minutes in the min/max mode.

Capacitance Measurement

The Fluke 12 has the best DMM capacitance measurement range I've yet come across. With most DMMs 20µF is the maximum value that can be measured. With the Fluke 12 you can check capacitance values from 0·001µF to virtually 10,000µF. This wide, fully-autoranging coverage removes the need for a separate capacitance meter. I do however feel it's a pity that small capacitance values in the pF range can't be checked.

The red lead must be connected to the capacitor's positive lead when checking electrolytics. If a capacitor retains a slight charge, due to dielectric absorption, the letters dISC appear in the display until the capacitor is completely discharged. It's important that capacitors are discharged before making checks.

In the capacitance ranges the meter has a full four-digit 9999 readout.

Safety and Overload Protection

The meter is designed to Protection Class II requirement of UL1244, ANSI/ISA-S82, CSA C22.2 No. 231 and VDE 0411 plus IEC 1010 overvoltage category III. All inputs are overload protected up to 600V.

Ranges and Accuracy

A brief specification for the Fluke 12 is shown in Table 1. The manufacturer states that the meter is calibrated using standards and instruments whose accuracy is traceable to the US National Institute of Standards or to nationally accepted measuring systems. Accuracy is guaranteed for a year after calibration provided temperature recommendations are observed. The meter has a two year guarantee.

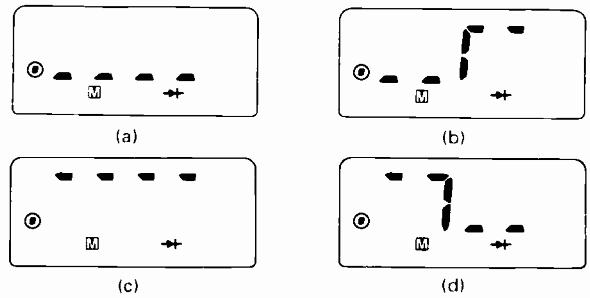


Fig. 1: Displays for the short-circuit condition (a), a short-to-open transition (b), the open-circuit condition (c) and an open-to-short transition (d).

I found that the ranges are well within the claimed accuracy limits. For example, 5V d.c. applied to the meter could, in accordance with the stated tolerance of ±0·9 per cent, produce a reading of anything between 4·955-5·045V. My measurement with a 5V precision source produced a reading of 5·01V, which is pretty good. As another example −12V d.c. from a precision source produced a reading of −12·01V, an excellent result.

Conclusion

The 12 doesn't have a frequency-measuring function but, considering its extremely reasonable cost, that would have been expecting rather too much. In view of its advanced specification I expected the price to be right up in the top bracket. It's only £66·95 plus VAT. A well-written, detailed, user-friendly manual comes with it. An optional yellow rubber holster with tilt stand is available at £10 plus VAT. This is well worth having to protect the meter.

The Fluke 12 is available from Philips Test and Measurement, Colonial Way, Watford, Herts WD2 4TT – telephone 0923 240 511.

My thanks to Raj Sondi for arranging to lend me the meter for review. Sadly I now have to return it to Philips.

Table 1: Brief electrical specification.

Range	Resolution	Accuracy
4,000mV a.c.	1mV	±1·9% + 3
4V a.c.	0·001V	±1·9% + 3
40V a.c.	0·01V	±1·9% + 3
400V a.c.	0·1V	±1·9% + 3
600V a.c.	1V	±1·9% + 3
4,000mV d.c.	1mV	±0·9% + 2
4V d.c.	0·001V	±0·9% + 2
40V d.c.	0·01V	±0·9% + 1
400V d.c.	0·1V	±0·9% + 1
600V d.c.	1V	±0·9% + 1
400Ω	0·1Ω	±0·9% + 1
4kΩ	1Ω	±0·9% + 1
40kΩ	10Ω	±0·9% + 1
400kΩ	100Ω	±0·9% + 1
4MΩ	1kΩ	±0·9% + 1
40MΩ	10kΩ	±1·5% + 3
1µF	0·001µF	±1·9% + 2
10µF	0·01µF	±1·9% + 2
100µF	0·1µF	±1·9% + 2
1,000µF	1µF	±1·9% + 2
10,000µF	10µF	±10% + 90 (typical)

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

15/80H	3.63	2SC1573Q	0.25	2SD669	0.53	BC141	0.24	BD201	0.38	BFR79	0.37	CD4053	0.19	M51393AP	4.50	SG613		TA7063P	1.10	TDA1083	1.15	TDA4605	2.92
15/85R	3.72	2SC1675	0.08	2SD669A	0.52	BC147A	0.05	BD203	0.45	BFR90	0.59	CD4066	0.29	M51515L	1.95		18.24	TA7122BP	0.61	TDA1151	0.49	TDA4950	1.17
17052	3.10	2SC1685	0.13	2SD716	1.39	BC148	0.11	BD232	0.27	BFR90A	0.59	CD4069	0.17	M51521L	0.54	SGSIF344	5.04	TA7146P	5.44	TDA1170	0.96	TDA7240A	1.48
17053	2.31	2SC1740	0.11	2SD718	1.14	BC148A	0.05	BD234	0.24	BFR91	0.46	CD4070	0.13	M5218L	0.36	SKE2G202	0.63	TA7176P	1.25	TDA1170N	1.19	TDA7270S	7.96
17088	2.31	2SC1741	0.16	2SD734	0.23	BC148B	0.03	BD237	0.29	BFR96	0.51	CNX62A	0.69	M5231L	0.53	SKE4F104	0.94	TA7193AP	3.26	TDA1170S	0.87	TDA8140	2.31
17089	3.28	2SC1815	0.13	2SD762	1.23	BC149	0.03	BD238	0.10	BFW92A	0.84	CR3CM	2.54	M53216P	1.43	SKE4F210	0.84	TA7193P	3.97	TDA1180	1.24	TDA8153	4.95
17127	1.71	2SC1826	0.69	2SD774	0.23	BC149C	0.03	BD239	0.28	BFX85	0.32	CR02AM	1.69	M54532	1.24	SKE5F310	1.63	TA7205	0.00	TDA1190Z	3.96	TDA8170	2.55
1N4001	0.03	2SC1827	0.74	2SD787E	0.25	BC157	0.12	BD241	0.39	BFY50	0.31	CV12E	2.44	M54543L	1.28	SL1430	1.36	TA7205AP	0.91	TDA1200	0.88	TDA8180	5.19
1N4002	0.06	2SC1845	0.19	2SD837	0.90	BC159	0.05	BD243	0.37	BFY51	0.33	CX109	6.84	M54544L	1.46	SL1431	1.65	TA7205P	0.00	TDA1270	1.73	TDA8190	2.78
1N4003	0.04	2SC1846	0.28	2SD841	1.24	BC160	0.40	BD243A	0.41	BR100	0.13	DTA124EF	0.12	M54548L	2.45	SL1432	1.76	TA7207P	1.63	TDA1412	0.74	TDA9503	1.56
1N4004	0.06	2SC1923	0.13	2SD856	0.64	BC161	0.26	BD243C	0.31	BR101	0.95	DTA144EF	0.16	M54644BL	1.56	SL471	1.65	TA7210P	1.45	TDA1470	0.00	TEA1002	5.14
1N4005	0.05	2SC1942	2.49	2SD869	2.47	BC167	0.40	BD244A	0.33	BR103	0.37	ER1400	2.08	M54648L	5.04	SL490	2.31	TA7214P	3.63	TDA1470P	0.00	TEA1009	1.20
1N4006	0.05	2SC1959	0.10	2SD870	2.45	BC171B	0.13	BD244C	0.20	BR303	1.07	HA11235	1.73	M54898AP		SN29764AN	1.77	TA7217AP	1.40	TDA1506	4.45	TEA1014	1.81
1N4007	0.05	2SC1969	1.79	2SD871	4.95	BC177	0.13	BD245C	0.69	BRX44	0.99	HA11244	3.71		15.58	SN7474N	0.36	TA7222	1.24	TDA1510	1.42	TEA1039	1.73
1N4148	0.03	2SC1983	0.84	2SD880	0.33	BC178	0.10	BD246C	0.69	BRY56	0.41	HA11124A	0.70	M58485P	5.77	SN76013ND	7.75	TA7222AP	1.23	TDA1512	2.29	TEA2018A	1.15
1N4448	0.05	2SC2001	0.13	2SD882	0.29	BC182	0.05	BD278A	0.54	BSS38	0.69	HA11423	1.96	MB3730	2.31	SN76227N	1.03	TA7227P	1.47	TDA1515A	2.47	TEA2164	2.40
1N5061	0.22	2SC2029	0.33	2SD898B	2.39	BC182A	0.12	BD317	1.40	BT120	1.24	HA11440	2.83	MB3731	1.98	SN76666N	1.22	TA7230P	1.30	TDA1516Q	3.23	TEA2165	4.95
1N5402	0.05	2SC2073	0.49	2SD904	4.55	BC182L	0.05	BD318	1.12	BT129	3.16	HA1166X	3.28	MB3732	2.22	SN76705AN	1.65	TA7233P	1.72	TDA1518Q	3.05	TIC106D	0.53
1N5404	0.11	2SC2078	0.57	2SD973	0.36	BC182LB	0.05	BD380	0.33	BT139600	0.92	HA11713	1.20	MC13002	4.65	SR2M	0.66	TA7240AP	0.00	TDA1670A	2.72	TIC106M	0.58
1N5406	0.11	2SC2141	1.43	74LS00	0.20	BC183	0.05	BD433	0.26	BT151/500R	0.78	HA11741	6.60	MC13002P	4.65	STA341M	2.31	TA7240P	2.15	TDA1701	4.71	TIC45	0.57
1N5408	0.11	2SC2166	0.92	7805	0.23	BC184	0.08	BD434	0.28	BT151800	1.11	HA11745	5.25	MC1310P	0.82	STA401	2.23	TA7241	2.23	TDA1770	2.49	TIL100	0.50
1N914	0.03	2SC2168	0.87	7805T022	0.00	BC184L	0.03	BD435	0.36	BU205	1.03	HA13001	1.30	MC1327AP	1.57	STA441C	2.39	TA7243P	0.00	TDA1870	0.00	TIP110	0.33
1S1555	0.21	2SC2236	0.24	7808	0.24	BC184LC	0.09	BD436	0.31	BU208A	1.12	HA13108	2.67	MC1330AIP	1.22	STK0029	5.70	TA7250	3.28	TDA1904	1.17	TIP112	0.00
1S2076	0.28	2SC2271	0.21	7812	0.35	BC204	0.35	BD437	0.31	BU208D	0.82	HA13118	1.43	MC1350P	1.76	STK0039	5.52	TA7267P	1.96	TDA1905	0.90	TIP112H	0.56
2N2219A	0.26	2SC2274	0.21	7815	0.29	BC207B	0.22	BD438	0.16	BU326A	0.85	HA13119	1.63	MC1352P	1.40	STK0040	7.18	TA7270	1.50	TDA1908A	1.10	TIP120	0.55
2N2222	0.16	2SC2274K	0.21	7818	0.39	BC212	0.04	BD441	0.69	BU406	0.63	HA13403	3.96	MC1358P	1.23	STK0059	9.46	TA7270P	1.50	TDA1940	3.89	TIP121	0.40
2N2905	0.20	2SC2314	0.28	7905	0.33	BC212B	0.05	BD442	0.40	BU406D	0.99	HA1374A	4.95	MC14493P	3.79	STK025	9.37	TA7271P	1.89	TDA1950	1.89	TIP126	0.51
2N2926G	0.35	2SC2335	1.07	7912	0.41	BC212L	0.05	BD510	1.30	BU407	0.51	HA1377	1.36	MC14528BCP		STK043	0.00	TA7273	3.43	TDA2002	0.82	TIP132	0.44
2N3053	0.34	2SC2458	0.08	AA119	0.34	BC213	0.10	BD529	0.93	BU407D	0.94	HA1388	2.22		2.15	STK3042	4.82	TA7274P	2.15	TDA2003V	0.63	TIP137	0.46
2N3054	0.95	2SC2482	0.24	AA143	0.12	BC214	0.05	BD530	1.01	BU426A	0.87	HA1389	2.44	MDA2062	2.14	STK3062	8.62	TA7280	2.11	TDA2004	1.23	TIP2955	0.79
2N3055	0.42	2SC2547E	0.23	AC127	0.10	BC214L	0.08	BD535	0.41	BU426E	2.06	HA1392	1.56	MJ2955	0.94	STK4131	7.56	TA7281	0.00	TDA2005	1.23	TIP29C	0.29
2N3442	0.85	2SC2565	3.67	AC141K	0.44	BC237	0.04	BD536	0.46	BU500	1.03	HA1397	2.55	MJ802	1.65	STK4141	8.00	TA7299	1.93	TDA2006	1.02	TIP29E	0.52
2N3702	0.10	2SC2570A	0.28	AC176K	0.29	BC237A	0.07	BD675	0.29	BU508A	0.92	HA1398	2.26	MJE13005	0.79	STK4142	7.97	TA7313AP	0.60	TDA2009	2.22	TIP3055	0.69
2N3704	0.13	2SC2577	1.50	AC187	0.15	BC237B	0.04	BD677	0.31	BU508AF	1.20	HA1452	0.00	MJE2955	0.66	STK4162M	9.22	TA7317P	0.77	TDA2020	2.29	TIP30C	0.16
2N3773	0.99	2SC2581	2.38	AC187K	0.31	BC238	0.10	BD707	0.49	BU508D	1.23	HM6232		MJE3055	0.49	STK4171		TA7325P	1.63	TDA2030	0.00	TIP31	0.00
2N3819	0.33	2SC2632	0.28	AC188	0.29	BC238B	0.05	BD839	0.49	BU508DF	0.92		10.09	MJE340	0.38		10.50	TA7343AP	0.69	TDA2030H	0.59	TIP31A	0.31
2N3904	0.10	2SC2655	0.24	AC188K	0.65	BC239	0.03	BD901	0.45	BU508V	1.13	HM6251	9.24	ML237B	1.23	STK4181 II		TA7358P	0.75	TDA2030V	0.70	TIP31B	0.29
2N4444	2.60	2SC2671	0.49	AD149	0.50	BC252B	0.06	BD902	0.49	BU526	1.36	HM7103		ML923	3.82		12.47	TA75358P	0.66	TDA2040	1.63	TIP31C	0.28
2N6292	0.60	2SC2688	0.29	AD161	0.99	BC300	0.38	BD911	0.63	BU536	1.59		13.66	MN1405VKF		STK4181A		TA7607AP	1.89	TDA2170	2.47	TIP32A	0.35
2SA1015	0.09	2SC2785	0.16	AD162	0.92	BC301	0.23	BD912	0.67	BU608	1.54	ICH28I	1.20		10.75		12.09	TA7609P	1.90	TDA2270	1.71	TIP32C	0.36
2SA1016	0.17	2SC2791	5.28	AF124	0.74	BC302	0.35	BDV65B	1.12	BU705	1.56	KA2101	0.58	MN1435VX		STK4332	5.37	TA7630	0.00	TDA2525	0.00	TIP33	0.82
2SA1020	0.30	2SC3150	1.05	AF127	0.58	BC303	0.26	BDW84C	0.94	BU806	0.79	KBL08	0.45		13.20	STK4352	1.65	TA7630P	1.81	TDA2530	4.62	TIP33A	0.89
2SA1020Y	0.29	2SC3153	2.21	AF139	0.28	BC307	0.05	BDW93C	1.06	BU806A	0.78	KSR1004	0.08	MN1435VX3		STK437	7.01	TA7640AP	0.95	TDA2540	0.36	TIP33C	0.95
2SA1095	7.22	2SC3156	5.82	AF239	0.41	BC307A	0.05	BDW94C	0.45	BU807	0.49	L200CV	1.09		9.98	STK4392	6.12	TA7676P	4.13	TDA2541	0.69	TIP34	1.15
2SA1102	1.73	2SC3182	3.76	AF279	0.33	BC307B	0.05	BDX32	1.65	BU826A	1.53	LA1201	0.54	MN650	2.27	STK441	9.98	TA7680AP	3.97	TDA2560	2.47	TIP34C	0.86
2SA1143	0.17	2SC3225	0.36	AL102	2.48	BC308	0.05	BDY20	2.06	BU908	0.97	LA1230	1.86	MPSA42	0.22	STK459	7.73	TA7698AP	5.59	TDA2576A	6.51	TIP41A	0.29
2SA1175	0.49	2SC3795	1.27	AN245	8.23	BC308A	0.08	BF115	0.39	BUK444	2.04	LA1385	1.40	MPSA56	0.11	STK461	8.99	TA7705P	3.86	TDA2577	4.71	TIP41B	0.30
2SA1186	3.42	2SC380	0.12	AN3821K	7.01	BC308C	0.05	BF179	0.30	BUT11	0.66	LA3161	0.37	MPSA93	0.08	STK4843		TA7769P	7.26	TDA2577A	3.38	TIP41C	0.35

SPECIAL OFFERS – ENDS 31/01/93 OR WHILE STOCKS LAST

BU508A x 5	3.60	TDA 2594 x 2	3.60
BU208A x 5	3.50	TDA 3654 x 2	2.20
BU426A x 5	3.50	TBA 120S x 5	1.55
BY127 x 25	1.00	TDA 4601 x 2	2.50
IN4148 x 50	0.40	STK 5481 x 2	9.00
CO AXIAL AERIAL PLUG x 25	3.75	TDA 2595 x 2	1.50
'F' CONNECTOR (SCREW TYPE) x 25	3.00	KBL08 800V 2A BRIDGE/R X 5	1.00

2SA1208	0.25	2SC388A	0.57	AN5265	1.30	BC327	0.09	BF184	0.40	BUT11A	0.82	LA4140	0.35	MPSU10	2.54		11.19	TA8205	3.18	TDA2578A	2.47	TIP42A	0.33
2SA1265	1.89	2SC458	0.09	AN5435	1.24	BC327B	0.17	BF185	0.28	BUT11AF	0.82	LA4182	0.75	MR854	0.13	STK5211		TA8210H	3.96	TDA2579	2.85	TIP42C	0.35
2SA1286	0.33	2SC536	0.12	AN5512	1.60	BC328	0.06	BF194	0.14	BUT12A	0.82	LA4192	1.10	MSM584CH			12.63	TA8215	3.46	TDA2581	2.14	TIP47	0.49
2SA473	0.49	2SC710	0.12	AN5515	2.06	BC337	0.05	BF196	0.14	BUT56A	0.55	LA4220	1.25		14.91	STK5322	6.58	TA8691N	5.74	TDA2581Q	2.44	TIPL791A	1.13
2SA562	0.16	2SC867A	5.11	AN5521	1.60	BC337L	0.21	BF197	0.24	BUW11	1.00	LA4261	1.60	MVS240	0.51	STK5325	4.12	TAA550	0.25	TDA2582	1.61	TIS43	0.64
2SA634	0.52	2SC945	0.09	AN5612	2.88	BC338	0.05	BF198	0.16	BUW11A	0.87	LA4270	2.04	NE545B	3.10	STK5326	4.93	TAG626	1.01	TDA2591	1.15	TL011CP	1.32
2SA639S	0.62	2SD1051	0.46	AN5900	1.23	BC368	0.08	BF199	0.03	BUW41B	0.80	LA4282	2.06	NE555	0.21	STK5331	4.22	TBA120	0.51	TDA2593	0.72	TL071CP	0.36
2SA673	0.08	2SD1128	0.99	AN6310	4.55	BC369	0.14	BF200	0.37	BUW81A	2.93	LA4422	1.07	NE555N	0.35	STK5332	2.11	TBA120AS	0.61	TDA2594	2.14	TL494	1.12
2SA684	0.20	2SD1138	0.70	AN6326	3.50	BC372	0.31	BF240	0.10	BUW84	0.99	LA4440	1.51	NE592	1.85	STK5333	3.21	TBA120S	0.86	TDA2595	2.09	TMP47C432AP	
2SA733	0.16	2SD1207	0.21	AN6341	2.22	BC546	0.00	BF244	0.29	BUX84	0.33	LA4445	1.25	NE646N	2.10	STK5372	2.45	TBA120T	0.57	TDA2600	3.79		11.24
2SA769	0.99	2SD1265	0.74	AN6610	2.16	BC546A	0.05	BF245A	0.18	BUX85	0.74	LA4460	1.30	NP1106		STK5421	2.52	TBA120U	0.37	TDA2611A	0.62	TMP47C434N-	
2SA798	0.36	2SD1273	0.79	AN6671K	5.19	BC547	0.10	BF245B	0.39	BUZ71	0.50	LA4461	1.25		11.51	STK5422	4.70	TBA2800	0.66	TDA2611AQ	1.68	3555	
2SA872	0.13	2SD1275	0.66	AN7158	2.65	BC547A	0.03	BF255	0.10	BY127	0.09	LA4475	2.04	DA47	0.24	STK5451	6.62	TBA395	0.66	TDA2640	3.71		14.16
2SA872A	0.19	2SD1276	0.82	AN7161	3.13	BC547B	0.10	BF256	0.23	BY133	0.05	LA4476	2.17	DA90	0.09	STK5466	5.96	TBA520	0.82	TDA2652		UC3844	1.78
2SA940	0.64	2SD1279	4.74	AN7171K	3.74	BC547C	0.00	BF256LC	0.45	BY164	0.52	LA4500	1.63	DA91	0.14	STK5471	4.64	TBA540	0.00		12.09	UPA81C	0.69
2SA952	0.13	2SD1292	0.33	BA145	0.10	BC548	0.10	BF257	0.34	BY179	0.77	LA4505	1.73	R2540	2.07	STK5476	5.28	TBA540Q	0.74	TDA2653A	2.47	UPC1181H	0.86
2SA958	0.42	2SD1308	0.69	BA156	0.05	BC548A	0.28	BF258	0.03	BY184	0.31	LA4507	0.00	R2540X	1.86	STK5481	5.36	TBA560C	0.66	TDA2680	4.95	UPC1182H	5.77
2SA966Y	0.28	2SD1397	1.55	BA157	0.06	BC548B	0.17	BF259	0.30	BY20320	0.00	LA4508	2.04	R2M	0.66	STK5482	3.87	TBA570A	1.71	TDA3190	0.82	UPC1185H	8.25
2SA970	0.13	2SD1398	1.63	BA158	0.07	BC548C	0.11	BF324	0.10	BY206	0.12	LA4520	1.04	R3297	4.27	STK6962	2.22	TBA651	0.98	TDA3190P	1.08	UPC1188	3.71
2SA984	0.19	2SD1426	2.31	BA159	0.16	BC549	0.05	BF337	0.32	BY207	0.17	LA4700	3.41	R4050	2.06	STK7216	5.36	TBA750Q	4.95	TDA3300B	8.05	UPC1212C	0.80
2SB1010	0.33	2SD1427	2.81	BA317	0.05	BC556	0.00	BF338	0.38	BY210400	0.18	LA5112	2.30	R4051	2.22	STK7226	7.93	TBA800	0.49	TDA3330	6.00	UPC1225H	2.47
2SB546	0.51	2SD1432	4.73	BA318	0.03	BC556B	0.05	BF355	0.46	BY224600	4.95	LA5512	0.46	RB156	1.65	STK7308	4.70	TBA810P	1.61	TDA3541	0.92	UPC1228HA	0.54
2SB633	0.90	2SD1439	2.17	BA5102A	1.23	BC557	0.05	BF392	0.15	BY226	0.12	LA7223	2.46	RGP10	0.00	STK7348	4.48	TBA810S	0.64	TDA3560	4.50	UPC1230	2.14
2SB643	0.00	2SD1453	1.48	BA536	1.10	BC557B	0.05	BF393	0.16	BY227	0.13	LA7520	2.00	RGP15	0.41	STK7356	5.42	TBA820	0.53	TDA3561A	3.21	UPC1230H	2.15
2SB643S	0.19	2SD1497-02		BA5406	1.23	BC557C	0.10	BF419	0.63	BY228	0.36	LA7800	1.23	RGP15J	0.34	STK7358	5.30	TBA820L	0.53	TDA3562A	3.21	UPC1278H	2.06
2SB644	0.21		6.84	BA6109	1.38	BC558	0.00	BF422	0.13	BY229	1.64	LA7801	1.23	RGP30M	0.29	STR1096	3.94	TBA820M	0.33	TDA3565	2.14	UPC1318	2.47
2SB688	1.24	2SD1497-06		BA6209	1.27	BC558A	0.05	BF423	0.09	BY229600	1.23	LA7820	1.52	RM11C	0.36	STR40090	6.63	TBA920	0.49	TDA3566	3.30	UPC1335V	2.72
2SB772	0.33		6.85	BA6219	1.40	BC558B	0.05	BF435	2.56	BY229800	0.94	LA7830	0.99	S2000AF	1.15	STR4090	0.00	TBA950	1.63	TDA3571B	2.99	UPC1351C	1.65
2SB772Q	0.41	2SD1541	3.30	BA6222	1.15	BC559	0.10	BF450	0.18	BY238	0.30	LM1303N	0.85	S2055AF	1.75	STR4211	4.60	TBA970	4.00	TDA3576	11.55	UPC1353	1.30
2SB793	0.30	2SD1555	2.16	BA656N	0.81	BC560C	0.20	BF458	0.41	BY255	0.13	LM1877	1.40	S2530A	2.20	STR440	6.19	TCA270S	1.00	TDA3640	2.64	UPC1363C	1.02
2SB819	0.46	2SD1577	3.25	BA718	0.74	BC635	0.22	BF459	0.28	BY298	0.12	LM317T	0.46	SAA1004	1.10	STR441	5.77	TCA440	1.89	TDA3650	9.12	UPC1363CA	2.06
2SB861	0.79	2SD1649	1.74	BAS11	0.28	BC637	0.14	BF469	0.33	BY299	0.12	LM324N	0.24	SAA1121	7.13	STR451	6.84	TCA660B	0.41	TDA3651A	1.81	UPC1365C	1.65
2SB891	0.31	2SD1650	2.22	BAV18	0.07	BC639	0.12	BF470	0.28	BY476A	0.66	LM339N	0.14	SAA1174	4.95	STR50020	7.88	TCA800Q	1.60	TDA3653AQ	1.86	UPC1378H	1.07
2SC1008	0.16	2SD1876	4.47	BAV20	0.25	BC640	0.05	BF480	0.65	BYD14J	0.45	LM358	0.21	SAA1250	1.45	STR50103	4.50	TCA910	1.17	TDA3653B	2.97	UPC1391H	0.50
2SC1061	0.57	2SD1877	1.89	BAV21	0.47	BC879	0.37	BF493S	0.33	BYD33G	0.17	LM358N	0.21	SAA1251	3.20	STR54041	6.58	TCA940	3.30	TDA3654	1.48	UPC1394	1.23
2SC1096	0.48	2SD1911	3.54	BAW62	0.06	BC880	0.36	BF597	0.15	BYD33J	0.15	LM380N	0.79	SAA1293	0.00	STR5412	4.91	TD3F900H	6.37	TDA3810	2.47	UPC1420CA	5.13
2SC1114	1.12	2SD234	0.91	BAX14	0.27	BCY70	0.07	BF757	0.41	BYV10-40	1.74	LM386	0.45	SAA1351	7.99	STR58041	5.77	TDA1004A	3.30	TDA4420	1.23	UPC1488H	0.99
2SC1162	0.30	2SD313	0.41	BB105B	0.23	BD131	0.26	BF758	0.31	BYV95C	1.13	LM393N	0.26	SAA3027P	6.19	STR6020	5.07	TDA1010	1.26	TDA4427	1.99	UPC2002	1.09
2SC1213	0.13	2SD350A	1.19	BC107	0.13	BD132	0.20	BF759	0.33	BYV96D	0.22	M192B1	1.46	SAA5010	3.02	STR6020KIT	5.77	TDA1011	0.96	TDA4442	3.18	UPC324C	0.42
2SC124	0.42	2SD401	0.94	BC107B	0.19	BD135	0.21	BF760	0.23	BYW56	0.16	M21C	1.25	SAA5012	3.21	T6064V	2.55	TDA1011A	1.28	TDA4500	3.67	UPC4558C	0.41
2SC1306	1.12	2SD438	0.24	BC108	0.14	BD136	0.19	BF762	0.28	BYX55600	0.19	M293		SAA5030	6.23	T6076V	2.77	TDA1013A	1.40	TDA4501	4.93	UPC574	0.54
2SC1318	0.09	2SD468C	0.00	BC109	0.11	BD137	0.43	BF869	0.24	CA1310E	0.75		14.63	SAA5050	4.54	T9013V	5.07	TDA1015	0.96	TDA4503	4.12	UPC580C	2.47
2SC1364	0.28	2SD476	0.94	BC109A	0.11	BD139	0.28	BF870	0.22	CA3094	2.97	M490		SAB3013	5.28	T9034V	1.40	TDA1020	1.23	TDA4505E	4.50	UPD1937C	2.80
2SC1384	0.84	2SD525	0.74	BC109B	0.14	BD140	0.23	BF959	0.18	CD4001	0.13		14.92	SAB3021	5.97	T9035V	1.38	TDA1035SB	4.02	TDA4600	1.65	X0065CE	1.65
2SC1398	0.77	2SD551	4.34	BC109C	0.19	BD168	0.73	BF960	0.26	CD4011	0.20	M491	7.70	SAB3035	6.16	T9038V	5.91	TDA1035T	2.19	TDA4600/2	2.14	X2402	4.93
2SC1413A	1.32	2SD613	0.61	BC117	0.13	BD175	0.28	BF966	0.59	CD4013	0.33	M494	9.33	SAF1032P	5.01	T9053V	0.89	TDA1037	3.64	TDA46002D	2.88	ZPY120	
2SC1509	0.37	2SD636	0.13	BC119	0.36	BD179	0.33	BF970	0.68	CD4016	0.13	M50115AP	2.43	SAF1039	2.29	T9054V	0.85	TDA1044	1.51	TDA4600F	1.65		10.31
2SC1520	0.52	2SD637	0.12	BC139	0.31	BD189	0.39	BFR39	0.00	CD4021	0.41	M51102L	1.72	SDA2112	12.96	T9064	0.89	TDA1060	1.67	TDA4601	1.35	ZTX650	0.49
2SC1573	0.25	2SD667	0.25	BC140	0.20	BD190	0.30	BFR41	0.42	CD4052	0.21	M51231P	1.40	SG264A	9.48	T9065V	4.27	TDA1082	2.25	TDA4601D	2.34	ZTX753	0.88

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE, MODEL, LOCATION. REMEMBER TO ADD £1.00 POST & HANDLING U.K. MAINLAND ONLY. HANDLING CHARGE TO ALL EXPORT ORDERS AT COST. ADD 17½% VAT TO TOTAL

History of BBC Colour Television

Keith Hamer and Garry Smith

Our article last month described some of the experimental work on colour TV carried out by the BBC in the years before the start of the Corporation's colour service, the first in Europe, on December 2nd, 1967. In this complementary article we'll look at some of the experimental colour test transmissions radiated in the late Fifties and early Sixties.

Colour Test Charts

A black grille on a white background was originally used to check registration. Beam pulling occurred with the RCA 6474 camera tubes however, the result being poor registration. To help counteract this, a grille of white lines on a black background was adopted for adjusting the studio cameras, see the accompanying photograph. Since registration at the centre of the screen is more important a finer grille was incorporated in this area of the chart.

The only other test chart that was regularly used in the studio was a logarithmic grey scale. It consisted of a 20 by 16in. opaque chart that had two rows of ten steps, graduated in equal brightness level changes from white to black. The white in one row was immediately above/below black in the other row. This enabled allowance to be made for the effect of shading across the picture. The chart had to be evenly illuminated at the same lighting level as the studio set, with light of the same colour temperature. Two "scoops" mounted at each side of the chart provided light at an angle of incidence of 45°. A similar grey-scale test chart is still in use for colour camera alignment, though the method of lighting it has been modified.

Once the cameras had been lined up they were panned on to a live model sitting in the studio set, with correct illumination and make up. This enabled the accuracy of the camera line-up to be assessed. A live model was used because successful reproduction of facial tones is the most critical task of any colour system.

This was expensive, since the model had to be paid. The use of colour photographs as an alternative was tried, but this was not very successful. Photographic techniques for this purpose weren't good enough prior to the BBC's Test Card F, which was introduced in July 1967. It has a large flesh-tone area in the centre circle.

A special colour tuning signal was devised to let the viewers of the late Fifties know that an experimental transmission was about to take place. The central photograph, thought to be of Sylvia Peters, was included to show as much flesh tone as possible so that those with colour sets could adjust them as required – despite the inherent limitations of the photograph.

Mobile Colour TV

A great deal of knowledge had been gained by the time that the series of experimental colour transmissions ended in April 1958. Most of the programmes had originated in the studio however, and experience with outside broadcasts was minimal. It was therefore decided that before finally packing the cameras away some outside broadcast trials would be a good idea. The two colour cameras and associated equipment were transferred to a huge pantechnicon that, before the war, had housed one of the mobile Band I OB transmitters.

The first use of this mobile control room was at the Festival Hall on June 25th 1958, when a small interviewing studio was set up in the foyer on the occasion of an IEE soirée. Guests were invited to appear in front of the colour cameras. The interview style of production was relatively easy to do, but an attempt to get pictures of dancers on the floor was a complete disaster – the lack of camera sensitivity was all too obvious.

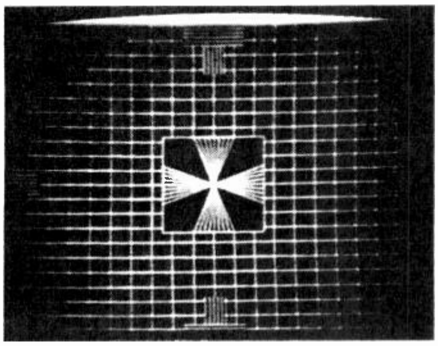
The Military Tattoo at the White City, West London from August 11th-13th 1958 provided an opportunity to probe the performance of the colour cameras. There was plenty of colour, movement and, at times, a mass of fine detail. One of the cameras was fitted with a zoom lens that had a focal length of 2·25-8in. The signal was linked by cable to Broadcasting House where a large audience of mainly BBC engineers viewed the Tattoo. During the three days the English climate contributed everything it could to the proceedings, causing many problems with lighting. As a result of these tests it was concluded that scenes shot outside in colour using the equipment then available would be unacceptable to viewers, mainly because of the widely varying levels of natural light. But a lot of valuable experience had been gained.

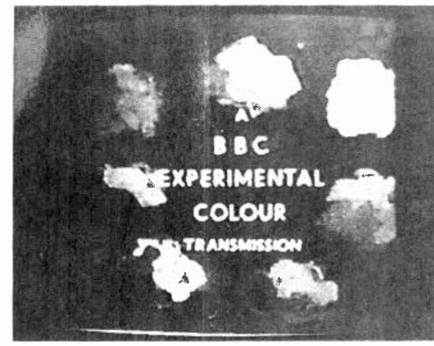
Later Developments

A regular series of experimental colour transmissions was radiated from the Crystal Palace transmitter from October 1958 till the early Sixties. Its main purpose was to provide a high-quality signal for the benefit of those in the industry engaged in colour TV research and development. The nature of the transmissions was agreed with BREMA, which had been consulted at the very beginning of test transmissions back in 1955. The first transmission of colour between Paris and London took place on March 27th 1960, and was demonstrated at the IEE.

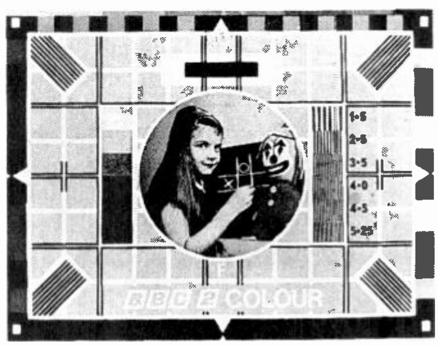
Until the autumn of 1960 the colour test transmissions took place in both the morning and the afternoon. Morning transmissions had to be discontinued from September 19th 1960 because of the start of extended schools' programmes. The morning transmissions, from Mondays to Fridays inclusive, had consisted of colour slides and Test Card C during alternate fifteen-minute periods. The afternoon colour transmissions took place on Tuesdays, Wednesdays and Thursdays and consisted of a thirty-minute programme with pictures from 35mm film. Subject to programme commitments, the transmissions began at approximately 4 p.m.

At this stage it seemed that the NTSC colour system would be adopted in the UK. PAL had still to be developed. By 1960 the NTSC system had been in use in the USA for some seven years, but it didn't seem to be making much progress there. One of the main problems was that colour TV called for highly skilled service engineers to repair the sets. They were in short supply. The BBC's research work from 1955 suggested that the NTSC system was a sound standard, though there were many problems to overcome. It could provide a sturdy signal and excellent picture quality. The main problems were with the colour camera.





Left: This white grille test chart was used in the Fifties to check colour camera registration. Centre: A special colour tuning signal that was transmitted in the late Fifties to enable viewers to adjust the extremely rare colour sets. Right: This very colourful artist's palette was radiated at the start of experimental colour transmissions in the late Fifties and early Sixties.



Left: One of the many colour slides that were used by the BBC to evaluate experimental NTSC, SECAM and PAL transmissions in the early Sixties. This one was also used during special test transmissions in the early Eighties. Centre: The original BBC colour Test Card F, which first appeared in 1967. Right: A frame from the BBC Colour Receiver Installation film that was transmitted well over a thousand times after its first showing in 1967.

Colour TV was demonstrated to the general public by the BBC for the first time at the Earl's Court Radio Show between August 22nd and September 2nd 1961, using the 405-line system. In the following year the BBC for the first time demonstrated, at the same venue, 625-line colour TV.

The first colour TV transmissions via the Telstar satellite took place on July 16th 1962. On September 3rd 1962 the BBC began field trials of 625-line monochrome TV from Crystal Palace using the u.h.f. bands. This was part of the long-term plans for the commencement of BBC-2.

Between July 8-16th 1963 the BBC demonstrated to representatives of the EBU and the East European OIRT three alternative colour TV systems, NTSC, SECAM and PAL.

The BBC-2 service began on April 20th, 1964, using 625 lines and u.h.f. channels. Just over a year later, on May 24th 1965, PAL replaced NTSC in the experimental colour test transmissions.

Start of Regular Colour Broadcasting

On March 3rd 1966 the Post Master General authorised the introduction of regular colour TV on BBC-2, to start towards the end of 1967 using the PAL system. In the same year the BBC provided facilities for colour TV coverage of the British General Election results programme for the North American networks. Transatlantic colour TV signals were transmitted via the Early Bird communications satellite. Studios 6 and 8 at the Television Centre were quickly transformed from being mere carcasses to being fully equipped for colour working. Arrangements were made for the News Operations departments, at Alexandra Palace, to switch to colour.

In 1966 preparations were made for all existing BBC-2 transmitters to carry programmes in colour. The BBC plan was to have 18 main transmitters and a number of relay stations in service by the end of 1967 so that about 70 per cent of the population would be able to receive colour transmissions. A further ten high-power transmitters were planned for 1968.

Two large colour OB units were ordered by the BBC for delivery in 1967 to give live colour coverage of various sports events, in particular Wimbledon. The installation of colour telecines and colour VTRs at the Television Centre and Alexandra Palace enabled the BBC to produce two hours of colour programmes each night from the start of the BBC colour TV service on July 7th 1967. The first transatlantic colour programme, using the BBC's field-store standards converter, was shown on August 31st. The full colour service began on December 2nd.

Apart from the extremely interesting trade test colour films, the colour receiver installation film (does anyone still have a copy?) and of course Test Card F, accompanied by some marvellous music, the first programme to appear in colour on saturday December 2nd was Billy Smart's Circus. This was at 6.30 p.m. Except for the news bulletins all the programmes on the first day of the full colour service were in glorious technicolour.

By December 1967 over 200 engineers and operators had been through intensive colour TV training. Around 200 producers, directors, designers, make-up and wardrobe staff also received special training. An experimental studio was set up purely to train staff and familiarise them with the techniques required.

The first use of the BBC's advanced standards converter was on October 12th 1968, to relay the Olympic Games from Mexico to Europe in colour. On July 22nd 1969 the BBC was presented with the Queen's Award to Industry for this converter.

Cameras

For its colour cameras the BBC chose to use a relatively new pick-up tube called the Plumbicon. It had been invented and developed by physicists and engineers at Philips, measured about 9in. long by an inch in diameter, and was considered to be sensitive, stable and capable of producing high-quality pictures.

The BBC Research Department had been testing two prototype Plumbicon cameras for several months prior to the start of its colour service. One camera employed three tubes, the other four. In each camera three tubes produced red, green and blue signals, the luminance (brightness) signal in the three-tube camera being derived from the three colour signals. The extra tube in the four-tube camera produced the luminance signal directly. Both cameras provided good-quality colour pictures.

Extension of Colour TV

On May 16th 1969 the Post Master General announced that colour was to start on the other two networks. These services commenced on November 15th, when BBC-1 and ITV were duplicated at u.h.f. with 625 lines. Initially the transmissions were available only in London, parts of the South East, the Midlands and North but they soon spread to most of the other regions. By 1969 BBC-2 was transmitting approximately thirty hours of colour programmes a week and BBC-1 planned to show almost 100 per cent of its peak-time programmes in colour. Viewers could select over a hundred hours of colour programmes a week from the three networks. These lucky people had to pay an extra £5 for a colour licence from January 1st 1968, making the total cost of the combined TV and radio licence £11.

Trade Test Colour Films – Can You Help?

Many short films (known as trade test colour films) were transmitted during the test periods when the BBC-2 colour service began in 1967. In fact well over one hundred films were shown. Some of them, such as *The Home-Made Car* which was originally made for British Petroleum, still survive. But many have long since disappeared. The authors would like to hear from anyone who may have such films available on video. If you can help, please write to Keith Hamer, 7 Epping Close, Derby DE3 4HR (0332 513 399).

What a Life!

Donald Bullock

I wish that I could repair TV sets as easily and rapidly as I could thirty years ago. A dozen a day was easy in those days. Now some of them take me ages, and I can no longer buy much with the money that comes in. The trouble is that today's sets are not only more complicated, they're also far too cheap.

When broadcasting in colour started we decided to get into colour servicing. We swatted up on the theory, and bought a new Commer van which we had brightly painted to proclaim our new service. The same week I bought myself a new Philips G6 from our wholesaler. The cost was the same as the van. We were very successful, and it wasn't long before I bought our property, The Chestnuts. Soon after that my Rolls Royce Silver Cloud sat in the drive.

But as the cost of everything else gradually rose, the price of TV sets fell – and fell. If things were the same today a new colour set would cost the same as a new van – several thousand pounds. They're cheaper than ever though, so we can't charge an economical price for repairing them.

Some day, when I feel up to it, I'll telephone the garage and ask them to call and collect my car for a repair estimate. Later, when I phone for the estimate – 'cos they won't phone me, the customer, only television repairmen do that – and they tell me it'll be hundreds of pounds I'll tell them that I'm not going to bother and could they drop it back? All at no charge of course. It'll be part of the service they offer. Some day. . .

Tim's Colour Portable

Earlier this week Tim Tapeworm danced in with an Hitachi colour portable, a CPT1644. "I want two opinions" he declared.

I looked behind me. "There's only one of me here at present" I said.

"A certain firm told me that the tube in this set has gone" he continued. "I want you to look at it too. There's no red at all in the picture."

"It might well be the tube" I said, "red guns lead a hard life."

The set turned out to be dead, though the tube's heaters were alight. When I advanced the setting of the first anode control I found that there was field collapse. But why no sound? A scope check at the tube base showed that there was no video either. As voltage checks indicated that the tuner was o.k. I decided to check the fusible resistors. A well-hidden one, R714 (1Ω), was open-circuit – it's tucked in between the line output transformer and its screening can. When this had been replaced sound and vision were restored. But there was no red.

I swapped over the red (Q851) and green output transistors on the tube base panel. As this made no difference I brought the scope back into action. Starting at the collector of Q851 I traced back through the connections and eventually found the red signal: there was a hairline crack in the print. When this had been bridged a good picture was displayed.

When Tapeworm returned he paid the bill with glee. "I'll give 'em 'it's the tube'" he said as he left, "Snoddies here I come."

"Oh dear" I muttered.

Another Colour Portable

Son Steven helps in the workshop these days. He finds the customers quaint and amusing. As I said to him, so did I – for the first twenty years. Then it began to wear a bit thin.

The other day Mrs. Midge danced in with her 14in. Decca colour portable (Tatung 120 series chassis). "It's dead Mr. Boll, er Mr. Bullock" she trilled. "We don't want to spend anything much on it 'cos it's only the one the cat watches. See what it is and let us know. Then we'll decide."

I looked at Mrs. Midge carefully. She wasn't a wicked woman, nor even a bad one. Just normal. What caused the problem was that I'm a television engineer instead of an ordinary trader.

When she'd gone I put the set on the bench and opened it up. As the 1AT d.c. fuse had died a violent death I made for the BU426A chopper transistor. It was dead short. After replacing these two items I switched on and the fuse went to heaven. I then found that the chopper transistor had accompanied it. An hour later, when I'd fitted new replacements and also changed the start-up resistors R808 and R810 which had both gone high in value, the set sprang to life. Mrs. Midge came back as I was boxing the set up.

"Twenty pounds" I said in response to her raised chin.

"Hmmm. That's more than we'd thought" she said thoughtfully. "Did it need expensive parts? I'll have to see what my husband thinks."

She phoned up later. "If we let you do it, will it last for a few more years?" she asked.

"Dunno Mrs. Midge" I said. "And whilst on the subject I don't feel too good myself."

A Bush 2114

Mrs. Grewsome came through the door with a huge dog that was almost as tall as her. "Come on in, Fletcher" she said. I looked behind her for her friend, but Fletcher was the dog. He was turning about wagging his tail with gusto. Down went my pen-tidy, then the telephone handset.

"Come come Fletcher, Mr. Butler doesn't want your antics I'm sure." I scooped up my pens and put the phone back on the hook as Mrs. Grewsome placed a Bush 2114 colour portable on the bench. "We don't know whether to have it fixed or get one of those okeydokeys from Crudds Foodstore. They're remote control and only £99. We've had this one for only three years. 'Ow long do the tubes last? My husband says it can't be much, probably the coil or a valve. 'E'd do it hisself, but his meter thing isn't working. Anyway, see what it is."

Later I pulled the set on to the bench. It was dead. I soon decided that a circuit was necessary, so I ordered one from Bush. When it came it was for a completely different set, a large table model. A phone call to Bush produced the information that two of their chassis share the Model number 2114. I could have the right one if I tried again. I did and the right manual came, so I'd bought two.

It soon became clear that the TDA4600 chopper control chip had failed. My experience with this chip led me to check a number of the associated components carefully. C820 (100pF) had decreased in value, as had C817 (10µF, 16V) and C802 (100µF, 16V). I then changed C810 (220µF, 160V) on the grounds of its appearance alone. This is the reservoir capacitor for the 110V h.t. supply: when it loses value there's general instability. Next I turned my attention to R801 (0·68Ω). It measured correctly but I changed it anyway.

Time to start the set up via the variac. Up came the h.t. voltage, as sweetly as I'd hoped. But there was no sound and no raster. After switching the Hameg scope on I made for the line timebase. The KTC2229 line driver transistor Q401 was delivering a healthy spike to the line output transistor, which was warm. I felt the line output transformer which also felt warm and healthy. But when I looked carefully at the tube neck I saw that the heaters were out. As the heaters themselves were all right I followed the wiring back towards pin 5 of the line output transformer and came to the low-value resistor R421. It was open-circuit. A new one restored the raster, but there was still no sound and vision and the controls for the electronic tuning didn't work while the display was very dull indeed.

The vertically mounted control panel, on the right-hand side of the main chassis, had a hairline crack across it. I fitted jumpers carefully. There was now life on the screen and the set was trying to tune but couldn't make it. Then I noticed that the LA7520 signals chip (i.f. etc.) IC101 had been fitted back-to-front in its socket. Turning it around made everything work normally – except that there was no colour. Crystal X501 had been got at. It was a 4·43MHz one instead of 8·86MHz. I looked one out and fitted it. Back came the colour. The set now worked perfectly and the results were excellent.

When Mrs Grewsome and Fletcher returned I showed them the results, told them that the set had been got at and that the bill would be £40. Fletcher leapt up, licked my face and knocked my pen-tidy and phone off the bench. Mrs Grewsome was less enthusiastic as she peeled four browns out of her purse. "Forty pounds to have a telly mended! Used to be no more than seventeen and sixpence."

Sales Pitch

The phone then rang. Steven answered it. "Bullock's Television" he said. Then he turned to me. "There's someone asking for Mr. Bullock."

"Well that's you" I snapped. "You're Mr. Bullock as well, aren't you?" But he got me to take the call.

"Is that Donald Bullock himself?" purred a soft, low voice.

"Sure is" I said.

"Then I've got good news for you" the purr continued. "We're Hill Samuel and we'd like to advise you on investing your money."

"I haven't got any. Perhaps you could advise me how to get some?"

She hung up.

A Sharp Video

Son Steven prefers repairing VCRs to TV sets and he's not doing too badly. I went out with Greeneyes the other day, leaving him to unravel a fault on a Sharp VCD801 that was on the bench. It would fail to record and erase sound intermittently. By the time that we returned he'd cured the problem. I asked him what had been the cause.

"As the machine laces, the erase head slides back. It's powered as soon as record is selected. The constant movement because of successive lacing and unlacing can put a strain on the feed wires, and in this case they'd fractured within their sleeving but sometimes came together as the head moved during lacing. Hence the intermittency."

"So how did you find that out?" I asked.

"Studied the circuit. As the leads go open, the audio and erase heads switch off. So no new sound is recorded, nor is the original sound erased. Technically speaking the vision isn't erased either, but it gets erased as the new pictures are recorded. I've soldered the leads directly to the small PCB on the erase head and the machine now works all right."

"Well done" exclaimed Greeneyes, "I bet your dad wouldn't have discov. . ."

"Wondered how long it would take you to suss out that little fault" I said brightly. Then, my memory not being what it was, I reached for my pen to write it down.

"Time you retired dear" said Greeneyes.

The Implications of COSHH

Nick Beer

The purpose of this short article is to alert those who may be unaware of it of the requirements of an Act known as COSHH – the Control of Substances Hazardous to Health (1988).

The Principle

The purpose of the Act is to provide protection against the hazards introduced by substances that may be encountered in the workplace. The most likely causes of hazards in our industry are the various aerosol sprays we use and solder/flux. Such hazards can easily be overlooked and can be quite surprising. When you do as the Act requires, stand back and take a look at each substance used and the processes employed, you begin to see that some things are more risky than they need be.

Requirements

The Act requires you to make a policy statement that you work to comply with it and that you document all the hazardous substances you use and the precautions to be taken – these are the two halves of the process of compliance. Obviously this is all useless unless you actually implement the requirements. This means that all staff must be given adequate instruction. Remember that the effects of hazardous substances may not be immediately apparent. The development over a long period of illnesses of the respiratory system and skin ailments are two of the most likely problems in our industry.

Around the Workshop

One major aid to compliance is that all suppliers of substances, such as freezer, foam cleaner, etc., must supply a health and safety data sheet detailing hazards and precautions. My suggestion is that you make a list of all the chemicals you use and where you obtain them then ask the suppliers to provide data sheets for all of them. These sheets can be placed in a file with your other COSHH information for reference and training. Make sure that everyone reads them first – some can be a real eye-opener.

For example how many of you would know what to do if you accidentally sprayed freezer in your eye? If an hour's reading means the difference between saving your health or not it has to be worthwhile – whether prompted by legislation or not.

So one letter or fax, with a list, is all that's required for this part of compliance. I note that CPC advertises the availability of such sheets in its 1993 catalogue.

Hazards

There can be numerous hazards and fire is a real possibility. In addition to explosive aerosols with their flammable propellants – how many of you have workshops where smoking is prohibited? – you are likely to find methylated spirit and isopropyl alcohol in fair quantities in the workshop. If you look at it sensibly, all workshops should have a smoking ban. The interesting point here is that COSHH doesn't relate to flammable hazards, but this is the first hazard that most of us see when we consider health and safety in the workshop.

Toxicity is the other main worry. Common sense is the main saviour here – good personal hygiene will prevent many problems caused by oral ingestion. We need to consider other possible modes of poisoning however. Skin contact should be avoided with some chemicals, particularly the foam cleaner types that can cause dermatological complaints. Use of gloves or barrier creams is suggested.

Inhalation is another problem in the workshop. Sprays are one concern, but the main one has to be solder fumes. The content of these does you no good at all. As an indicator of the extent of the problem, which many may otherwise regard as scaremongering, have you never felt nauseous with headaches etc. after a day in the workshop? And I mean headaches and malaise other than those caused by nasty faults and general ill health. How about fumes getting into your eyes when you lean over something you are soldering? Your eyes can sting and water for ages, and you can be temporarily blinded – I certainly have been. Most of the nasties come from the flux, but remember that solder contains lead (though COSHH doesn't mention lead specifically as it's subject to its own regulations) before you eat sandwiches that have been resting on top of the roll! On this point one should,wherever possible, try to eat and drink in a clean environment.

The answers to the fume problem? As a first step do as you were taught to do at college: don't lean over the job when soldering, aim the iron so that the fumes go away from you – and don't breathe them in. The true compliance answer however is fume extraction. There are two possibilities, local or tip.

Control Measures

In addition to identifying hazardous substances one has, if suitable and sensible control measures are to be implemented, to assess the risks that they present. The risk with a room full of tins of foam cleaner is greater than if you have one tin on each of three benches. The hazard itself is the same, the foam cleaner (specifically some of its ingredients), but its extent can vary. A delightful analogy was provided by Trevor J. Allen of the Health and Safety Executive when he said that "a tiger is hazardous: if we put him in a cage the risk has been reduced but remains the same – he's still a tiger!" The cage is the control measure you can apply.

I advise the use of common sense in implementing control measures. You can if you wish obtain the MEL (maximum exposure limit) and OEL (occupation exposure limit), determine the exposure level in your environment and then assess from these the risk provided by each substance. The problem with this procedure is determining your exposure rate. If you use common sense, provide adequate control measures and take care, you should comply with COSHH requirements and secure the good health of yourself and your colleagues.

What to Do

The first way of dealing with a risk is to remove it totally: find and use a less hazardous alternative. Where this isn't possible risk limiting control measures must be adopted. In the workshop these may include the following:

(1) Gloves and face masks are available at little cost in both long-life and disposable form from companies such as RS. Use them where a risk is present.

(2) One effective way of reducing the risk with chemicals is to reduce the quantities held in any one work area. For example, do you keep a 500ml bottle of isopropyl alcohol on your bench for head cleaning and dispense it by dipping a swab into it? This is an unnecessarily high risk: the potential for spillage and the escape of fumes from the bottle is greatly reduced by using a liquid dispenser of the type marketed by CPC and Seton. With these a measured amount is dispensed from a small container. This is a simple and reasonably cheap step to take.

(3) Solder fumes can present a dilemma. Fume extraction can be a costly business, but in any workshop is something that will have to be considered. A single iron can be vented by using a stand-alone unit – extractors built into bench lights are available from RS. The alternative approach, which is far more effective and practical where there are a number of users, is the tip extraction arrangement: tubes whose ends are mounted close to the tips of the irons are connected to a central pump and the fumes are exhausted via a filter. These systems, for up to ten stations, can cost around £1,000. RS can supply them and CPC lists one in its 1993 catalogue. The extraction systems use a special and rather expensive filter. This needs to be changed regularly, so there are running costs for the system.

(4) Display a copy of COSHH and employee responsibilities prominently on the workshop wall. Label all hazards and risks throughout the workshop effectively. A wall poster, "Hazardous Substances on these Premises", is widely available. Suitable warning signs are available from RS and CPC. The most complete range however is available from Seton, PO Box 77, Banbury, Oxon OX16 7LS (0295 269 955). Seton offers computer software for the management of COSHH data, and will provide a free "COSHH demo" disc if you ring 0800 585 501 (freephone) and state whether you want it in the 3·5 or 5·25in. size.

In Conclusion

As with all such regulations there are those who will consider it clever to ignore them. But we are compelled to comply with them. It's perfectly feasible, with thought and often at modest cost, to do so. Without such legislation it's more than likely that we would not employ the safety measures required. So it's a good thing that we are forced to consider how we can work more safely.

CD Player Casebook

Reports from Mike Leach, Nick Williams and Nick Beer

Yamaha YSTC11

This compact midi system came in because of no CD operation. When we ran the set in the workshop the CD player section seemed to work all right. Then after about an hour or so it stopped and wouldn't read another disc. Stripping the machine down didn't help us – it started to work again and wouldn't go off for another hour!

We noticed, by using the laser power meter, that in the fault condition no laser light was being emitted. The focus circuit seemed to be working, since the focus coil moved up and down in the normal way. A small spray of freezer on the microcontroller chip IC851 seemed to produce light from the laser and the player started to work again. Eventually it went off completely, and although laser light was present the disc didn't spin and the TOC couldn't be read. We changed IC851 but this made no difference. A quick word with Yamaha then threw some light on the subject – no pun intended!

If one of these machines suffers from a turntable motor problem, i.e. the disc rotates backwards or there's no rotation at all, or the machine stops while playing normally or won't read a disc even when it's rotating at the correct speed, the first item to check should be plug CNW1. The lead is usually brown in colour and is connected between the main panel and the laser assembly. The usual problem here is poor crimping of the leads. The plug and lead must be replaced, part no. MX601220.

Unfortunately this didn't cure our problem. We eventually decided to replace the laser assembly, and this did the trick. **M.L.**

Philips CD150

If the spindle motor runs at maximum speed and there's no TOC reading check whether the LA7905 –5V regulator is short-circuit. **N.W.**

Pioneer PDZ81M-PDZ84M

If one of these multiplayers searches all discs in the order 1-2-3-4-5-6, doesn't read the TOC and doesn't play, i.e. the fault mode is engaged, switch the unit off and put it in the test mode. Press TRK FWD-PLAY-PAUSE and use a frequency counter to check the VCO at test point PLCK. If the oscillator doesn't lock, or hunts up and down, the spindle motor is faulty. Part no. is PXM1001 – it's available from SEME. Note that a spindle height jig is mounted at the left-hand side of the laser assembly to help when fitting a new motor. Be careful with the flexi PCB – it's easy to break this – and place a paper clip over the two solder tags on it before removal to avoid damage to the laser. **N.W.**

Technics CDX50

The remote control handset worked intermittently. When we opened the unit up we found that the base of the IR driver transistor Q1 had never been soldered. **N.B.**

VCR Clinic

Reports from Philip Blundell AMIEIE, Nick Beer, Chris Hawkins, Steve Cannon, Graham Rees, Basil Davidson, Alfred Damp, John Edwards, and Michael Dranfield

Philips VR6490

When one of these machines comes in dead check whether R102 (330kΩ) in the power supply is open-circuit. It's a safety component, part no. 4822 116 52272. **P.B.**

Ferguson 3V39/JVC HRD110

I had quite a succession of VCRs and TV sets with damaged tuners and aerial amplifiers after the succession of thunderstorms last summer. This one was different however. When operating with its internal tuner the gain was so low that the signal could hardly be seen. A new tuner was fitted but this made no difference. As the voltages around the tuner were correct attention was turned to the SL1432 SAWF driver chip. Voltage checks at pins 3 and 4 produced 10V instead of 5·3V readings. A new SL1432 restored normal gain. **P.B.**

Sharp VCT310H

The problem was a hum ripple on the recorded picture. You could see the tipple on the AT9V supply. The value of the 2,200µF reservoir capacitor C905 was low. **P.B.**

Alba VCR6000X

This machine was dead with an open-circuit mains fuse. After replacing this with the correct semi-delay type we tested the unit and found that the tuning was very erratic – running at high speed through and about the correct point. The tuning voltage was varying of course, the cause of the trouble being leakage between print tracks. We cured this by cutting out the VT line and hardwiring it instead. On test we discovered that after a few hours' use the tuning on all channels would shift by a tiny amount. Use of freezer proved that C134 (0·1µF), which decouples the tuning line, was the cause of the trouble. As C133 and C135 are identical components that perform the same task at various stages of the d.c. line these were also replaced. **N.B.**

Ferguson FV52L

This machine was dead though the power supply worked, producing all its outputs. The machine started up when the flat lead from the power supply to the main servo-signals PCB was flexed. We soon found that the cause of the trouble was dry-joints on all the legs of TT64, which is mounted on the large, flat heatsink at the right-hand edge of this PCB. **N.B.**

Panasonic NV730B

This machine had an intermittent fault. Initially a perfect horizontal line would appear exactly two-thirds of the way down the screen during playback. It would then disappear, to be replaced by a line exactly a third of the way down the screen. Then both lines would appear simultaneously, with varying intensity. There was no noise near the lines, which were very fine – only about one or two TV lines deep. They looked like fine switching lines.

The tapes were not being marked, but to prove that the tape path was not responsible we checked and cleaned it thoroughly. Eventually we traced the cause of the trouble to an intermittently high-resistance connection between the centre of the drum and the discharge angle, which is at the bottom of the mechanism in this model. **N.B.**

Samsung SI1240/1260

The drum in these full-lace machines should spin as soon as a tape is inserted. This one just pulsed back and forth, making no headway towards achieving 1,500 r.p.m. The lack of drive was caused by the motor connector CN207 – it had tarnished pins all along its length. **N.B.**

Pioneer VR707/Philips VR6760

This machine was dead with no 5V output from the 5V regulator/reset generator IC7502. Its input was low at 3·8V, so no surprise that there was nothing coming out. The input comes from the collector of the BD136 transistor TR7004, which had a base-emitter leak. When a replacement was fitted IC7502 received its correct 6V or so input. But there were still no other voltages around IC7502, so the machine remained dead. Cold checks soon showed that there was a short to chassis at IC7502's output pin 5. Guess what had shorted – a little blue electrolytic, C2013 (150µF, 10V). There's a change! **N.B.**

Orion VCRL3

If rewind and fast forward are o.k. but the tape binds in play and/or the drum doesn't turn or turns intermittently, check the edge connector on the direct-drive drum motor and for dry-joints near the connector. **C.H.**

Daewo 3300FR

For no channels and/or no playback picture check for hairline cracks around the tuner/i.f. PCB. For poor reception or bad colours check IC105/6/7 by substitution. **C.H.**

Orion VD800

For intermittent jamming of the mechanism on this quick-start model, with the cassette having been extracted by force by the customer, check whether the left-hand loading arm guide roller is fouling the tape tension arm as well as the state of the three loading belts.

For painfully slow rewind and fast forward, remove, clean and lubricate the spool axles before condemning the capstan motor. **C.H.**

Akai VS18/19/21/22/35

We've repaired over a hundred of these machines and have found that a BD238 is a viable alternative to the 2SB1010, 2SB891 and 2SB1185 while a BD237 works all right in place of a 2SD1292. In three years we've had only two comebacks where the BD237/8 have blown. It's advisable to change C4 and C20 from 47µF, 25V to 100µF, 35V. For improved reliability change C6 from 100µF, 25V to 220µF, 35V at the same time. Before returning a machine check that the current flowing via fusible resistor FR1 doesn't exceed 250-500mA and that via FR2 150-500mA depending on function. We run these machines for at least three-four days before releasing them. **C.H.**

Sony SLV373

This fault caused an immense amount of head scratching until we made a call to Sony technical in Cumbernauld. Even though I sometimes struggle to understand their broad Scottish accents, "see you Jimmy!" and all that, they certainly came up trumps with this one. The symptom was diagonal dark bands on recordings only: the picture was perfect with E-E operation and playback of a prerecorded tape. Curiously, the fault clears when the top, right-hand PCB is hinged up. The offending component is L252. Apparently an incorrect type that radiates to the erase circuitry was fitted. Part no. for the replacement is 1-412-092-11. **S.C.**

Hitachi VTM822

There was severe warbling on record only, more noticeable in the LP mode. Surprisingly a new pinch roller and capstan motor failed to cure the fault, whose cause was eventually traced to the reel clutch assembly underneath. This item has been responsible for a number of faults we've had – usually no play, chewed tapes, no rewind or no eject. On this occasion however one of its cogs was vibrating. The vibration was travelling along the drive belt, affecting the capstan. That's our theory, anyway, and we're sticking to it! **S.C.**

Hitachi VTS80

The reported fault with this stock machine was no colour through the scart connector. Sure enough the symptom was as reported. To cut a long and embarrassing story short, the SVHS Euroconnector setting can be altered via the on-screen display menu. This selects whether composite video or separate luminance and chroma signals pass via the scart socket. The latter option is provided for TV sets capable of SVHS operation. As you may have guessed, someone had selected it – hence no colour on our non-SVHS receiver. **S.C.**

Akura VX100

We've had a couple of interesting faults recently with this model. Very weak video was cured by replacing Q318. Lines on the playback picture were cured by replacing the TL8819P dropout compensator chip IC304. **G.R.**

Hinari VXL8

No fast forward/rewind though you can hear the motors running was mentioned on page 566 in the June issue, in the servicing article on this model. Another cause is distortion of the rubber grommet on the stop lever. It sits upright next to the slide bars/operating levers which rest against it in the eject mode. Where this is the case a replacement grommet provides a complete cure. **B.D.**

Ferguson 3V44/JVC HRD140

This VCR came in with a jammed cassette, a bent cassette housing and the tape still partially wrapped around the drum, but the machine did its best to eject the cassette. To start with we straightened and retimed the cassette housing, then reset the deck timing. As we didn't trust the VCR completely we inserted a dummy cassette and watched the operation of the deck very closely. Everything worked well until eject was selected, when it was obvious that the cassette was ejected much too early – had it been a proper cassette the tape would still have been partially wrapped around the drum. My first thought was to replace the mode control switch. This machine uses a LED and sensor assembly however, with the light shining through holes in the cam gear. When this item was replaced the deck mechanics worked correctly. **A.D.**

Hitachi VT530

There appeared to be three separate faults in this machine. First no playback – the condition was described as "dirty heads". Secondly the E-E picture appeared to suffer from a.g.c. overloading. And thirdly the search tuning system didn't stop when a channel was found. All these symptoms were caused by one component however, CP205 (LC delay) on the YC board. **A.D.**

Ferguson 3V35/JVC HRD120

This VCR had developed an expensive taste for prerecorded tapes: because the bias oscillator ran in the playback mode it erased them as they were being watched. The cause of the fault was traced to Q503 on the video PCB. As it was leaky it held the Rec Start Low line at 3V instead of 9V in playback. **A.D.**

Sharp VC381H

Because the carriage left-hand microswitch was broken this machine would accept a cassette only half way. A new switch cured the problem. **J.E.**

Hitachi VT63

There were screaming and clanging noises when the tape was ejected. The machine then switched off. When we checked out the deck functions we noticed that there was no auto-stop at the end of fast forward. Both problems were caused by the fact that the left-hand tape sensor wasn't working. When the voltage at the EST pin on the carriage PCB was checked it hovered at around 4V instead of 9V, but the slightest movement of the carriage produced the correct 9V and normal operation. Careful positioning of the end sensor holder monitoring the EST voltage and securing it with a drop of Superglue solved the problem. **J.E.**

Sharp VC9300

There were no deck functions and the dew indicator was blinking. Pin 19 (dew sensor input) of the microcontroller chip IC801 was high because the sensor was open-circuit. It's mounted on the cassette flap opener bracket, near the pinch wheel. **J.E.**

JVC HRD540

This machine would play, rewind and wind fast forwards for a few seconds then stop, though the tape counter was working. Pressing pause cured the stopping. All was revealed when we consulted the service manual. The supply and take-up reels both have a rotation sensor. One supplies a pulse, the other only a 5V d.c. voltage. A call to our suppliers revealed that this part is in demand and was out of stock. Has it suddenly become a common fault? **M.Dr.**

BBC Model B Computer Fault Notes

Arthur Rumbelow, G3KKC

We'll start with some general notes then provide a list of faults we've encountered, many of them stock faults.

General Notes

Random long-term problems, especially with early machines, are mainly caused by degradation of socket connections. Faults of this type cannot be diagnosed. If the following procedure is adopted however many of these intermittent faults can be dealt with, thus saving hours of fault-finding time.

All mechanical connections should be cleaned and disturbed, i.e. clean i.c. pins with a fibre-tipped tool and check i.c. sockets for broken pins etc.

The wires to the push-on connectors between the switch-mode power supply and the main PCB were presoldered prior to being crimped on to the connectors. This has caused all sorts of problems due to high-resistance joints. The problems appear over a period of time as a result of the voltage at the PCB dropping, sometimes to less than 4·7V. In this condition random problems appear as the unit warms up, because the address multiplexers begin to lose their drive power. The solution to this problem is to solder all these crimped connectors. You can do this by pushing the insulation on the leads back to reveal the crimping, then soldering.

Acorn Computers, manufacturer of the BBC B, doesn't encourage people to repair the switch-mode power supply. Only a circuit diagram is provided in the service manual and spare parts are not available. It's worth checking a dead unit for dry-joints however, especially around the mains input filter T1. Also check the bridge rectifier and the 0·6W, 4·7Ω metal-film resistor R12 which provides the feed to the collector of Q2. This TO3 device, which is mounted on a vertical piece of metal, is unmarked. We understand that it's an Hitachi 2SC1942: the Telefunken BU225 seems to be a suitable equivalent (TVT lists the BU500 as an equivalent).

Faults List

The following faults relate to Issue 2 to 7 versions of the BBC Model B.

(1) Won't start up. Read/write pin 34 of the 6502A microprocessor chip IC1 was shorted to earth due to a fault in IC33 (74LS04).

(2) Won't start up, reset line (RST) incorrect. IC33 (74LS04) faulty.

(3) Machine apparently dead. Port B (in/out) of IC3 (6522) faulty.

(4) Large white blocks on the screen. Dry-joints on the power supply leads – crimping is not always reliable. Solder the leads – see above.

(5) Program crashes. Cause was hash on the supply lines due to a faulty power supply.

(6) No data loading on tape. LM324 chip IC35 faulty.

(7) No data loading on tape. Serial interface chip IC7 faulty.

(8) Machine apparently dead, but corrupted BBC logo occasionally appeared. The clue was that random teletext colours came up. A check on the 16MHz clock waveform showed that it was badly distorted though the frequency was more or less correct. IC43 (74S04) was faulty. Note that this chip must be a 74S04, not 74LS04, as the latter won't work. Interesting that with the fault present the waveform could be reshaped, and the machine would start up, by damping pin 2 of the chip with the scope probe.

(9) Continuous beep and no input from the keyboard. IC3 (6522) faulty.

(10) No RGB monitor sync. IC48 (74LS86) faulty.

(11) Keyboard generates incorrect characters, e.g. T instead of 9. Fault was caused by the 74LS30 chip on the keyboard.

(12) Corrupt data in Mode 7 after warm-up, e.g. characters wobble. A finger on the 16MHz crystal X1 made matters worse. IC37 (74LS04) was defective – it had become heat sensitive.

(13) Monitor displays multiple characters. IC3 (6522) faulty.

(14) Intermittent loss of reset. The 555 chip IC16's socket faulty: mount the chip on the board directly.

(15) Intermittent loss of reset. Another cause is a dry-joint on R21 (1MΩ), which is connected to pin 6 of the 555 chip IC16, due to poor flow soldering.

(16) Poor quality i.c. sockets with thin pins were used with Issue 4 boards. The pins snap off inside the socket housing – thus when resoldered the broken pins drop out of the PCB.

(17) DFS (disc filing system) faulty – machine comes on with logo and a continuous tone. Defective 8271 chip is generating a continuous IRQ. Fault can be found by removing the DFS ROM. Note that the old 0·90 DFS ROM looks for an 8271. If it doesn't find one it starts to loop and generates a continuous tone. This can be used for fault finding. Later types of DFS ROM move away if they don't find an 8271.

(18) Won't start up, continuous tone present. No 8MHz output at pin 7 of the video processor chip IC6. Replace this i.c.

(19) No loading from the cassette port. The 820pF capacitors C31 and C35 open-circuit.

(20) Incorrect writing from keyboard. 74LS251 chip on keyboard faulty.

**(21) Loss of the display when the machine has warmed

up. Faulty 6845 CRTC chip – the sync pulses read incorrectly.

(22) Shift or control keys on keyboard not working. Key F4 permanently on. Replace F4 keyswitch.

(23) IRQ line incorrect after a few hours. Cause was a heat-sensitive 6502A microprocessor chip (IC1).

(24) Noisy display with u.h.f. output. Scope at emitter of Q8 showed that very little luminance was present. Q8 (BC309) was faulty. Its emitter is normally at 1V, its base at 0·2V.

(25) Machine slowed down to about 700kHz instead of 2MHz. A faulty 6502A chip (IC1) was dragging the clock pulses down at pin 37. Replacing the i.c. cured the fault.

(26) Intermittent lock-up from keyboard. OS ROM chip IC51 had a faulty socket.

(27) Various weird RAM faults – strange displays, garbage on screen etc. Can be caused by IC14 (74LS245). This chip is provided with a socket on later issue boards.

(28) Mode 7 o.k., all other modes faulty. Input from keyboard prints twice, with two cursors. IC39 (74LS283) faulty – pin 4 low. See also (31).

(29) Faulty display with higher definition modes. IC39 (74LS283) faulty – pin 1 incorrect.

(30) Flickering display in 0 mode. Fault in the video processor chip's palette (IC6). Chip is earlier ULA type and is overheating. Replace with MkIII version.

(31) Mode 7 o.k., all other modes faulty. The disenable input at the video processor chip IC6 was incorrect. Cause of the fault was traced to an open-circuit track between pin 3 of IC38 (74LS86) and pin 9 of IC41 (74LS02). See also (28).

(32) Printer won't work. Pin 40 of IC69's socket open-circuit. Replace socket. See also (38).

(33) Printer won't function. Machine was a Model A with issue 2 board that had been upgraded to Model B specification. Pin 26 of the IDC connector on the old issue 2 board is shorted to earth – printer won't work in this condition. Cut print.

(34) Modes 0, 1 and 2 faulty – top half of display flashing. R10 (3·3kΩ) open-circuit. This resistor is connected to pin 11 of IC27.

(35) Incorrect data being sent and received via RS423. A comparison with a good machine showed that the mark/space ratio of the waveform at the baud rate generator was wrong. IC42 (74LS163) faulty.

(36) Interrupt request (IRQ) line down. Reading at pin 20 (CS) of the basic ROM IC52 was very low. The 74LS139 ROM select chip IC20 was faulty.

(37) Will not upgrade to DFS. Pin 12 in IC78's socket open-circuit. Replace socket.

(38) Printer not working. Pin 6 of IC27 (7438) low. Replace IC27. See also (32) and (33).

(39) DFS faulty: machine loads corrupted data from disc. IC87 (74LS123) faulty.

(40) DFS faulty: data is corrupted when saved on disc. IC80 (7438) faulty.

(41) DFS faulty: index header only is displayed, with corrupted figures. IC27 (7438) faulty. See also (49).

(42) DFS faulty: read/write incorrect. IC77 (74LS00) faulty.

(43) 80-column display at switch on. There are various causes for this fault. Usually the IRQ line goes low because the 8271 chip is faulty. Other possible causes are IC3 (6522) port A (keyboard) and the 6845 CRTC (c.r.t. controller) chip IC2.

(44) The machine ran but gave error messages when programs were loaded into memory, e.g. "error at line 251.4532234". Also the RAM test gave a "no room" message and the disassembler, when loaded, gave access to only one address at a time. Cause of the fault was the 68B54 Econet chip IC89.

(45) RAM fault. CAS 0 disappeared and the machine became a Model A. IC45 (74S139) was the cause.

(46) Poor field sync on monitor. Cause of the fault was IC41 (74LS02) which provides composite sync from the CRTC chip's separate field and line sync outputs.

(47) Loading problems with cassettes on issue 3 and 4 boards. Change the value of R75 from 82kΩ to 47kΩ.

(48) Caps lock wouldn't work, i.e. LED didn't light. Cause of the fault was IC32 (74LS259).

(49) DFS fault on issue 4 boards onwards: reads index header only, with corrupted titles. Link S9 not cut with factory fitted DFS.

(50) RS423 fault: the port refused to work properly when a simple acoustic coupler type modem was used. The modem supplies only data out and data in signals but the Model B requires a CTS signal as well. The operator had used the ?89 procedure in the Comunitel software to override this requirement. The Model B does however require a physical signal: to operate with a "dumb" modem, link together the CTS and RTS pins on the DIN connector.

(51) No writing from keyboard. IC4 (74LS30) faulty.

(52) Modes 3 and 6 faulty. The effect on the screen was ghost printing under the required text etc. IC36 (74LS10) faulty, with waveform at pin 8 when it shouldn't be present.

(53) Continuous multi-tone from speaker. IC18 (76489) was going unstable. This is a four-channel tone generator.

(54) Hangs up for no apparent reason. This may be a production fault – the clock pulse too narrow. Can be cured by adding a 100pF capacitor from pin 37 of the 6502A microprocessor chip IC1 to chassis. With issue 3 and 4 boards there are, near this chip, two plated holes that can be used.

(55) Hangs up with continuous tone. IRQ line and clock

AZ ELECTRICS

Part	Price
INTEGRATED CIRCUITS	
AN103	£1.60
AN214Q	£2.50
AN240P	£1.30
AN253P	£1.80
AN3821K	£6.75
AN3822	£7.50
AN5015	£3.30
AN5033	£5.00
AN5132	£3.95
AN5265	£1.35
AN5510	£4.50
AN5512	£1.95
AN5521	£5.50
AN5730	£3.20
AN5750	£2.50
AN5760	£2.00
AN5900	£1.50
AN6326	£4.00
AN6332	£4.40
AN6341	£2.75
AN6344	£6.50
AN6346	£4.50
AN6346	£4.50
AN6359	£5.50
AN6360	£3.75
AN6362	£4.25
AN6387	£5.50
AN6612	£2.20
AN6651	£0.60
AN6671K	£5.50
AN6677	£5.25
AN6884	£2.75
AN6912	£2.00
AN7111	£1.50
AN7112	£3.00
AN7116	£1.20
AN7143	£1.65
AN7148	£1.70
AN7158	£4.00
CNX62A	£1.50
AN7160	£6.00
AN7169	£3.50
AN7171K	£4.50
AN7205	£1.95
AN7213	£1.10
AN7218	£1.20
AN7220	£1.60
AN7222	£2.10
AN7223	£7.60
AN7224	£1.40
AN7225	£1.90
AN7273	£2.00
AN7310	£1.10
AN7311	£1.75
AN7315	£1.75
AN7324	£4.50
AN7410	£2.10
AN7415	£1.40
AN7420	£3.20
AN7818F	£1.60
B1403	£1.00
BA1320	£1.50
BA1332	£1.00
BA301B	£1.50
BA318	£2.50
BA328	£1.10
BA3308	£2.10
BA333	£1.40
BA3416L	£2.75
BA343	£1.20
BA3505F	£2.75
BA3704	£2.75
BA4210	£2.50
BA4220	£2.00
BA4236	£2.75
BA4402	£1.90
BA4403	£2.75
BA5102	£2.45
BA5204	£2.75
BA524	£3.00
BA5402	£2.40
BA5406	£2.50
BA6104	£2.50
BA6109	£1.80
BA6124	£2.75
BA6154	£2.50
BA6208	£2.75
BA6209	£3.20
BA6219	£1.95
BA6222	£3.10
BA6229	£1.85
BA6238A	£1.95
BA6239	£3.75
BA6259	£3.00
BA6301	£2.00
BA6302A	£1.80
BA6304	£1.70
BA6305	£1.75
BA681	£0.90
BA7001	£1.90
BA718	£1.80
BA728	£1.10
BA7767S	£5.00
BTT6018	£3.50
CNX62A	£1.50
HA11215A	£3.50
HA11223	£3.75
HA11225	£2.10
HA11226	£3.75
HA11235	£3.10
HA1124A	£1.75
HA11414	£2.50
HA11701	£3.10
HA11713	£8.90
HA11714	£3.50
HA11715	£3.20
HA11747A	£12.75
HA11749	£7.00
HA11750	£5.10
HA12005	£3.80
HA12017	£2.00
HA12026	£2.00
HA2413	£1.20
HA13001	£1.80
HA13402	£6.50
HA13403	£4.00
HA1350	£9.00
HA1368R	£2.55
HA1374	£6.00
HA1377	£2.00
HA1388	£4.00
HA1392	£3.00
HA1394	£4.00
HA1397	£5.40
HA1398	£3.50
HA1406	£2.00
HA1457	£2.10
HA4219	£2.70
HD14081	£0.25
HD4539	£0.70
KA2210	£2.30
L7805	£0.80
L7806	£0.80
L7808	£0.80
L7812	£1.00
L7815	£0.80
L7818	£0.80
L7824	£0.95
L7905	£0.80
L7912	£0.80
L7915	£0.80
L7918	£0.80
L7924	£0.80
LA1180	£2.60
LA1185	£2.60
LA1201	£0.95
LA1235	£2.50
LA1260	£1.75
LA1403	£3.75
LA3160	£1.90
LA3210	£1.90
LA3220	£1.00
LA3350	£1.50
LA3361	£1.50
LA3600	£1.50
LA3700	£2.50
LA4100	£1.90
LA4102	£1.20
LA4125	£2.00
LA4140	£0.70
LA4160	£1.25
LA4182	£2.10
LA4183	£2.75
LA4192	£1.70
LA4422	£1.30
LA4440	£2.70
LA4445	£2.50
LA4460	£1.70
LA4461	£1.80
LA4500	£2.70
LA4570	£2.20
LA5522	£2.20
LA5527	£1.95
LA6358	£5.00
LA7016	£2.50
LA7096	£4.00
LA7210	£3.10
LA7305	£6.90
LA7309	£3.75
LA7507	£4.00
LA7520	£3.25
LA7800	£1.50
LA7801	£1.25
LA7820	£1.90
LA7830	£2.50
LA7913	£1.30
LM1011N	£3.00
LM1017/M192B1	£2.30
LM1035	£5.75
LM1036N	£3.70
LM1112CN	£3.30
LM13600	£5.00
LM1868N	£1.50
LM1894N	£5.75
LM317T	£1.00
LM324	£0.80
LM339	£0.80
LM339N	£0.75
LM384	£3.60
LM386N	£0.80
LM556CN8	£2.50
LM6402G-2003	£10.00
LM641	£1.80
LM748CN 8 PIN	£1.25
LM748N	£2.00
M104	£7.00
M29381	£11.00
M490BB1	£12.50
M491B/BB1	£11.50
M50127AP	£6.00
M50453-012P	£6.20
M50560-01P	£2.70
M51014L	£1.95
M51164	£1.40
M51356P	£5.00
M51381P	£1.50
M51393	£4.25
M51513	£10.00
M51515L	£3.10
M51516	£4.00
M51903L	£3.50
M5213L	£3.10
M52184	£1.00
M52314	£1.10
M54519P	£1.00
M54543	£1.75
M54544L	£1.85
M54548L	£4.50
M58478P	£4.75
M58655P	£6.50
M58839	£8.00
M708	£5.50
M709	£4.75
MA150-E	£2.20
MB3106	£1.00
MB3730	£2.75
MB3731	£3.25
MC13002P	£5.00
MC1310	£1.25
MC1330P	£2.95
MC14001BCP	£1.10
MC14093B	£1.50
MC14426P	£2.20
MC14429P	£2.20
MC14497P	£5.50
MC14516BCP	£2.00
MC1458/UPC1458	£1.95
MC3359	£1.10
MCU2632	£1.90
MEA2050	£4.60
MEA2901	£3.00
MH27316	£3.00
ML232B	£4.50
ML237 (BTT6018)	£3.50
ML238B	£7.50
M293	£4.50
ML923	£4.50
ML923DP	£4.50
ML926	£4.20
MM314APL	£1.75
MM53108N	£1.25
MM5387	£2.90
MM5402	£1.50
MM5405N	£3.50
MM5456	£2.25
MM5457N	£2.50
MM5458N	£2.50
MM55108	£2.65
MM7317	£3.75
MM74C901	£1.10
MPD4011C	£2.00
MPD4069C	£1.10
MPD4081	£1.10
MPD4514BC	£5.00
MPD5521066	£11.00
MSL9378RS	£3.50
SAA1006	£2.50
SAA1025	£5.80
SAA1124	£3.95
SAA1174	£6.50
SAA1250	£2.60
SAA1251	£8.50
SAA1276	£4.50
SAA1290-02	£10.70
SAA1293-02	£8.00
SAA1293-03	£5.70
SAA3027	£6.00
SAA5000	£3.00
SAA5010	£5.80
SAA5012	£6.60
SAA5020	£5.80
SAA5030	£9.00
SAA5040A	£5.00
SAA5040B	£3.50
SAA5041	£9.50
SAA5050	£7.00
SAA5231	£9.00
SAB3013	£4.50
SAB3037	£11.00
SAF1032P	£6.00
SAF1039P	£2.00
SAS560	£3.50
SAS570	£3.00
SAS580	£3.50
SAS590	£3.50
SL1430	£2.80
SL1431	£1.60
SL1432	£2.00
SL471DP	£2.20
SL480	£3.30
SL490	£3.00
SL901B	£3.00
SL917B	£4.00
SN76670N	£1.25
SSA1075	£5.90
SSA1250	£3.50
ST082	£12.00
ST1195	£5.50
STA401A	£3.75
STA441C	£3.00
STK0029	£4.30
STK043	£15.00
STK082	£12.00
STK2029	£8.50
STK2125	£10.00
STK2250	£9.20
STK3041	£5.70
STK40090	£6.00
STK4121 II	£8.75
STK4141 II	£6.90
STK4142 II	£10.00
STK4151	£11.50
STK4171 II	£9.00
STK430	£6.00
STK4311	£10.20
STK433	£7.50
STK435	£8.00
STK4352	£5.80
STK437	£10.00
STK4392	£7.00
STK441	£10.50
STK459	£11.00
STK461	£10.50
STK463	£14.50
STK465	£12.00
STK5315	£6.50
STK5322	£6.50
STK5325	£5.50
STK5331	£6.00
STK5332	£3.50
STK5333	£4.00
STK5338	£6.00
STK5339	£4.00
STK5361	£8.25
STK5421	£6.50
STK5422	£5.00
STK5434	£6.50
STK5451	£5.30
STK5471	£5.25
STK5476	£6.00
STK5481	£5.00
STK5482	£5.20
STK5720	£7.00
STK5730	£5.25
STK6962	£3.20
STK6972	£6.00
STK7216	£6.10
STK7308	£5.75
STK7309	£5.30
STK7348	£5.00
STK7356	£6.50
STK7358	£6.50
STK772B	£4.75
STR1096	£3.60
STR3125	£5.50
STR40090	£6.50
STR4211	£5.95
STR440	£5.00
STR451	£6.00
STR454	£4.85
STR50020	£7.90
STR50103A	£5.50
STR5412	£5.95
STR58041	£6.75
STR6020	£4.90
STR8050	£14.15
SVM993C	£2.00
TA4180	£3.00
TA4193	£5.00
TA4194	£5.50
TA4301	£4.50
TA4345	£3.40
TA4350	£6.00
TA7120	£1.25
TA7137	£1.25
TA7176	£2.50
TA7176AP	£2.40
TA7193AP	£4.00
TA7193P	£6.00
TA7205	£1.75
TA7205AP	£1.25
TA7222	£2.25
TA7223	£2.50
TA7227P	£2.30
TA7230P	£1.65
TA7232P	£1.50
TA7233P	£2.10
TA7240	£2.50
TA7241	£2.50
TA7241AP	£3.00
TA7243	£3.30
TA7245	£4.50
TA7267P	£2.80
TA7270P	£2.50
TA7271P	£3.25
TA7274	£2.60
TA7280	£3.00
TA7280P	£3.00
TA7281	£2.75
TA7281P	£2.75
TA7299P	£3.00
TA7302	£1.30
TA7303	£1.10
TA7310	£1.75
TA7312	£1.75
TA7313	£0.90
TA7313AP	£1.40
TA7314	£2.00
TA7323	£3.25
TA7325	£2.00
TA7325P	£1.50
TA7328	£2.00
TA7335	£1.50
TA7335P	£4.20
TA7342	£2.10
TA7343	£1.75
TA7350	£2.10
TA7358	£1.50
TA7607	£3.50
TA7607AP	£2.40
TA7609P	£2.70
TA7614	£2.50
TA7628P	£2.40
TA7629	£4.00
TA7629P	£2.75
TA7630P	£2.00
TA7640	£2.00
TA7658	£2.00
TA7668	£2.00
TA7680	£4.80
TA7681AP	£5.75
TA7687	£2.00
TA7698A	£6.85
TA7698AP	£7.50
TA7705P	£1.50
TA7709	£2.50
TA7738	£2.50
TA78L010P	£1.75
TA8101N	£4.25
TA8102P	£4.25
TA8644	£5.50
TAA310A	£2.00
TAA550	£2.10
TBA120S	£0.50
TBA530	£1.00
TBA560	£1.00
TBA750Q	£4.20
TBA800	£0.85
TBA820M	£0.45
TBA920S	£1.00
TCA640	£3.75
TCA650	£3.95
TCA660B	£3.50
TDA1005	£2.50
TDA1010A	£1.10
TDA1011	£1.20
TDA1013	£2.75
TDA1013A	£1.90
TDA1015	£1.20
TDA1020	£2.50
TDA1022P	£4.50
TDA1035	£1.90
TDA1035T	£1.90
TDA1037	£2.90
TDA1044	£2.50
TDA1044U	£1.50
TDA1057	£2.00
TDA1082	£3.50
TDA1083	£1.70
TDA1151	£1.50
TDA1154	£2.70
TDA1170S	£1.20
TDA1180	£1.80
TDA1180P	£3.00
TDA1190	£1.90
TDA1270M	£4.10
TDA1365	£4.90
TDA1412	£1.00
TDA1470	£5.00
TDA1501A	£3.20
TDA1506	£8.50
TDA1510	£3.20
TDA1510A	£3.20
TDA1512	£2.70
TDA1515A	£2.50
TDA1520	£3.95
TDA1522	£1.50
TDA1670A	£3.00
TDA1701	£4.00
TDA1770A	£3.00
TDA1870A	£2.60
TDA1905	£1.40
TDA1908A	£1.75
TDA1940	£1.80
TDA1950	£2.50
TDA2002	£1.40
TDA2003	£1.30
TDA2004	£1.70
TDA2005	£1.70
TDA2005S	£2.95
TDA2006V	£1.95
TDA2020	£3.50
TDA2030	£1.10
TDA2030H	£2.00
TDA2030V	£1.75
TDA2040	£2.00
TDA2151	£3.00
TDA2161	£1.75
TDA2170	£3.00
TDA2270	£2.20
TDA2320	£0.90
TDA2510	£4.30
TDA2521/3	£9.75
TDA2522Q	£10.75
TDA2530Q	£4.25
TDA2532	£3.00
TDA2532Q	£3.00
TDA2540	£2.75
TDA2541	£2.00
TDA2543	£5.25
TDA2560	£3.75
TDA2600	£6.80
TDA2576A	£6.00
TDA2578	£3.00
TDA2578A	£2.80
TDA2579	£3.50
TDA2581Q	£2.50
TDA2581	£2.40
TDA2582	£2.55
TDA2590	£2.00
TDA2591	£2.70
TDA2593	£1.50
TDA2594	£3.00
TDA2611A	£1.00
TDA2640Q	£3.50
TDA2653A	£2.75
TDA2822	£2.00
TDA3190	£0.95
TDA3303	£7.50
TDA3330	£5.50
TDA3540	£4.00
TDA3541	£2.25
TDA3560	£4.60
TDA3562A	£5.00
TDA3562A	£5.00
TDA3565	£3.00
TDA3571BQ	£5.50
TDA3590	£3.00
TDA3651	£3.00
TDA3651AQ	£6.50
TDA3653	£4.00
TDA3654	£2.80
TDA3810	£2.90
TDA3950	£3.00
TDA440	£2.00
TDA4420	£2.45
TDA4422	£3.95
TDA4500	£3.80
TDA4501	£5.80
TDA4503	£4.50
TDA4505	£6.75
TDA4510	£4.40
TDA4600	£2.60
TDA4600-2	£2.60
TDA4601	£2.10
TDA4610	£4.50
TDA5101	£2.00
TDA7250	£5.50
TDA7606AP	£2.40
TDA8180	£6.00
TDA8190	£3.80
TDA8341	£3.00
TDA9503	£2.55
TDA9513	£2.95
TEA1009	£2.00
TEA1014	£2.00
TEA1039	£2.00
TEA2018	£2.10
TEA2018A	£2.10
TEA5101	£6.00
TLO11CP	£2.00
TLO72CP	£2.00
TMM 2114AP	£5.75
TMS1944AN2L	£2.00
TMS1952	£2.50
TMS1956	£2.30
TMS1965NL	£2.00
TMS3450	£2.10
TMS3615	£1.75
U410B	£1.60
U416B	£1.60
UA767PC	£1.20
UA78/10	£2.00
UA78M15	£2.00
UAA1006DP	£2.00
UC38445	£5.00
UPC1185H2	£5.00
UPC1225H	£2.75
UPC1230	£3.00
UPC1238V	£2.10
UPC1263	£2.20
UPC1288V	£2.95
UPC1361C	£3.90
UPC1362C	£4.50
UPC1363	£1.90
UPC1365	£3.50
UPC1377C	£2.20
UPC1378H	£2.00
UPC1379	£2.20
UPC1382	£1.50
UPC1394	£1.70
UPC1420A	£7.00
UPC1458	£1.95
UPC1513HA	£2.00
UPC1520CA	£2.48
UPC339C	£0.70
UPD4011	£1.75
UPD4066	£1.95
TRANSISTORS	
2N3773	£1.90
2SA1095	£5.50
2SA1102	£1.90
2SA1112	£0.95
2SA1124	£0.35
2SA1220	£1.10
2SA1386	£4.70
2SA564	£0.40
2SA673	£0.20
2SA942	£0.35
2SA985	£0.95
2SB1016	£1.50
2SB772	£0.40
2SB775	£1.60
2SB819	£0.55
2SB965	£2.30
2SC1413A	£2.50
2SC1826	£1.80
2SC1942	£2.10
2SC1983	£1.30
2SC2003	£0.25
2SC2027	£4.50
2SC2230	£0.50
2SC2238	£0.75
2SC2331	£1.00
2SC2335	£1.50
2SC2531	£0.26
2SC2564	£3.04
2SC2570	£0.55
2SC2577	£1.50
2SC2592	£0.95
2SC2621	£1.25
2SC2631	£0.30
2SC2632	£0.30
2SC2655	£0.60
2SC2958	£2.50
2SC2979	£3.00
2SC3153	£3.40
2SC3402	£0.40
2SC3519	£4.60
2SC3678	£2.70
2SC3715	£4.80
2SC458	£0.20
2SC789	£2.50
2SD1047	£2.75
2SD1051	£0.85
2SD1128	£1.50
2SD1138	£0.85
2SD1159	£0.75
2SD1207	£0.75
2SD1273	£1.00
2SD1275	£1.30
2SD1288	£1.70
2SD138	£0.85

MAKE YOUR INTERESTS PAY!

Train at home for one of these Career Opportunities

Over the past 100 years more than 10 million students throughout the world have found it worth their while! An ICS home-study course can help you get a better job, make more money and have more fun out of life! ICS has over 100 years experience in home-study courses and is the largest correspondence school in the world. You learn at your own pace, when and where you want under the guidance of expert 'personal' tutors. Find out how we can help YOU. Post or phone today for **FREE INFORMATION** on the course of your choice. (Tick one box only!)

Electronics ☐	TV, Video & Hi-Fi Servicing ☐
Basic Electronic Engineering (City & Guilds) ☐	Refrigeration & Air Conditioning ☐
Electrical Engineering ☐	Car Mechanics ☐
Elec. Contracting/ Installation ☐	Computer Programming ☐
GCSE/GCE/SCE over 40 examination subjects to choose from ☐	

Name: ____________

Address: ____________

P. Code ____________

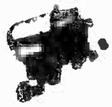
ICS International Correspondence Schools, Dept. EGS13 312/314 High Street, Sutton, Surrey SM1 1PR. or 041-221 7373 (24 hours).

WHERE CAN YOU BUY

3~~8~~9,000 DOMESTIC APPLIANCE SPARES ?

GENUINE AND PATTERN AVAILABLE

FROM JUST ONE SOURCE !!



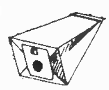
NOW AVAILABLE

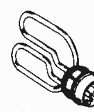
254 PAGE PATTERN SPARES CATALOGUE

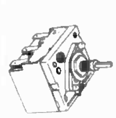
£4 To Non Account Customers

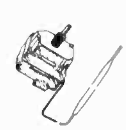
(Refundable On First £50 Order)

TO FIT THE FOLLOWING BRANDS









AEG	GOBLIN	PRESTIGE
AIRLUX	GORENJE	PHILIPS
ATAG	HOTPOINT	QUALCAST
ARISTON	HITACHI	ROLLS
BAUKNECHT	HOOVER	ROSIERES
BELLING	INDESIT	ROTEL/SPINNEY
BENDIX	ITT/NOVA	ROWENTA
BOSCH	KENWOOD	ROYAL
BRAUN	KEW	RUSSELL HOBBS
CANDY	KIRDY	SERVIS
CARLTON	MIELE	SOVEREIGN
CARMEN	MORPHY RICHARDS	SWAN
CREDA	MOULINEX	TEFAL
CREDA CORVETT	NEWPOL	TOWER
DEDIETRICH	NEVADA	TRICITY
DELONGHI	NILCO	VAX
ELECTROLUX	NILFIST	VORTICE
ENGLISH ELECTRIC	NUMATIC	WESTINGHOUSE
FAGOR	OSTER/SUNBEAM	WHIRLPOOL
FRIGIDARE	PANASONIC	ZANUSSI

ALL AVAILABLE FROM

DATAPART LTD

WHY NOT GIVE US A TRY?

SALES DESK 021 766 5551 24 HOURS

ELECTRON HOUSE 100 GREAT BARR ST BIRMINGHAM B9 4BB

FAX *FREE* 0800 373 459 24 HOURS

pulse at pin 37 of IC1 incorrect. Pin 15 of IC24 (74LS138) was short-circuit to chassis.

(56) Intermittent crashing. Replace IC51's socket.

(57) Cursor only displayed, flashing at top left-hand side of the screen. The IRQ line was low with incorrect waveforms around IC32 (74LS259) which was defective.

(58) Screen filled with approximately half-inch thick horizontal red bars interspersed with blobs of yellow. Poor chip select signal from IC26 to the video processor chip IC6. IC26 (74LS139) was faulty.

(59) Loud buzz on sound with screen flashing (no data displayed). IRQ line to the 6502A microprocessor incorrect. Pin 20 of basic ROM IC52 read 50Ω to chassis. The ROM decoder chip IC20 (74LS139) was faulty with a leak between pins 8 (chassis) and 12.

Test Case 361

A few months ago we introduced you to Victor the Video, our camcorder-toting customer with the handy screwdriver and the succession of obscure problems and faults. He's by no means the only one of his kind around here. George (Magic Memories) Green is another local videographer who operates the same sort of service as Victor. In fact the two are deadly rivals – their adverts glower at each other across the pages of the Monday-Ad and the Walmington News.

George is also one of our workshop's customers. But the engineers don't hide under their benches when he appears, as happens with Victor. On his most recent visit he brought with him a plywood box of his own making. It had a voltmeter on top and was festooned with black and red flex. During our discussion it transpired that he's an avid reader of the popular camcorder magazines. As a result of something he'd read in one of them he'd decided to make himself a battery box to free himself from the time limitations imposed by the nicad-type clip-on batteries that normally power his wonder machine, a high-band camcorder that cost him some £1,000.

The operating voltage for this particular model is 6V. So George had carefully assembled five high-capacity 1·2V nicad cells in his box and kitted it up with the previously mentioned voltmeter and flex. A plug at the far end of the flex matched his camcorder. Now five times 1·2 equals six, and that's the reading his little voltmeter gave when the batteries were charged. But the camcorder didn't work properly with his home-made battery box. Where could he have gone wrong? Had he gone wrong?

Even with a full charge George could get only a few minutes running time from his auxiliary power source, as he called it. The low-battery indicator in the viewfinder was on all the time that the box was connected and the camcorder would soon cut out, the exact moment often being when he put the machine into its record-standby mode. George's theory, based on his perusal of Your Camcorder, Video the World and Videography Weekly, was that the camcorder's low-battery cut-off point was set too high. Hadn't the Video Doctor himself, a sort of agony aunt on electro-mechanics in the pages of one of them, said so in his reply to Battery Blues of London N18? So could we check the cut-off voltage setting? Operation with the regular clip-on battery was o.k.

Certainly we could check his camcorder's cut-off voltage setting. We invited George to leave his battery box, lead, charger and all to help us in the investigation. What do you think came out of it?

This wasn't the end of George's catalogue of woes however. One of his assignments while he was having the trouble with his battery box was to record the Magic Memories of the local football club's seasonal booze-up. GG had decided to revert to mains operation of his camcorder for this occasion: the whole thing was held indoors, and he took care to keep his cable away from stumbling feet. There was no problem when he used the built-in microphone, but when the comedian came on our valiant videographer plugged in his super-directional electret gun microphone – a special offer in Your Camcorder – and got hum on the sound track, especially when he handled the microphone or its cable. On hastily reverting to battery operation he found that the hum had cleared. But when another plug-in microphone was used with the camcorder operated from the mains it worked happily without the hum problem. Was the gun microphone faulty? Or maybe the camcorder in some way?

We're sure you'll be able to work out the answers to these problems before checking with the solutions on page 195.

Published on the third Wednesday of each month by Reed Business Publishing Ltd, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Filmsetting by Marlin Graphics, 2-4 Powerscroft Road, Sidcup, Kent DA14 5DT. Printed in England by BPCC Magazines Division, Carlisle Web Offset, Cumbria. Distributed by IPC Marketforce, Kings Reach Tower, Stamford Street, London SE1 9LS (071 261 5000). Sole Agents for Australia and New Zealand – Gordon and Gotch (Asia) Ltd., South Africa – Central News Agency Ltd. "Television" is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed by way of Trade at more than the recommended selling price shown on the cover, excluding Eire where the selling price is subject to currency exchange fluctuations and VAT, and that it shall not be lent, resold, hired or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade or affixed to or as part of any publication or advertising, literary or pictorial matter whatsoever. ISSN 0032-647X.

ADVERTISERS' INDEX

The Euras System is the largest repair tips database for CD, TV and video in Europe.

Solutions at your fingertips.

The System has over 100,000 repair tips for 10,000 models from 250 manufacturers and is conveniently available as manuals, stand alone PC or videotext. The System now also boasts technical service data for computers from SAMS Computerfacts, available as manuals.

Euras International Limited
Heston House, 7-9 Emery Rd
Brislington, Bristol BS4 5PF
England
Telephone 0272 724475
Fax 0272 723374

SONY TUBES RE PROCESSED WITH ORIGINAL SONY GUNS

HIGH TEMPERATURE RE-PROCESSING of Sony, Mullard 45AX, 30AX, In-line, PIL, Mini (22.5) Neck and FST Tubes.

3701B22*		£25.00	A51-231X	ITT	£46.00	A51EAL00X	Philips	£58.00
3702B22*		£48.00	A51-570X	Mullard	£46.00	A51EBS00X		£58.00
370KRB22*		£48.00	A51-580X	Mullard	£46.00	A51JAR00X	Toshiba	£64.00
370LHB22*		£48.00	A51-590X	Mullard	£46.00	A51JKQ00X	Sony	£74.00
400EFB22		£58.00	A56-540X	Mullard	£48.00	A51JUH10X	Sony	£74.00
510YUB22*		£52.00	A56-701X	ITT	£48.00	A53JBW00X	Sony	£64.00
520SB22	Sony	£64.00	A66-540X	Mullard	£56.00	A59JMZ40X03		£85.00
560EGB22	Hitachi	£54.00	A67-701X	ITT	£56.00	A59EAK00X	Philips	£64.00
560DYB22		£54.00	A34EAC00X	Philips	£48.00	A64JKJ10X	Sony	£95.00
570HB22	Sony	£64.00	A34JBU10X	Sony	£64.00	A68JMT10X	Sony	£95.00
680DB22	Sony	£85.00	A44JEX10X	Sony	£78.00	A68JYK10X	Sony	£95.00
680EB22	Sony	£85.00	A44JFZ10X	Sony	£78.00	AXM37-001*		£48.00
			A49JHT00X	Sony	£64.00	AXT37-001		£44.00
			A49JLV10X	Sony	£74.00	AXM51-001		£46.00
						AXT56-001		£52.00

*** BRAND NEW TUBES AT COMPETITIVE PRICES — WHILE STOCKS LAST**

For tube types not listed please enquire. All Tubes Guaranteed 12 Months

All prices quoted are excluding VAT. Exchange CRT is required.

Callers welcome. Please phone first. Nationwide Delivery Available.

Very low Delivery Charge for Deliveries within M25 Area

FREE DELIVERY WITHIN UK FOR THE FOLLOWING TUBE TYPES – A51-570X, A51-580X, A51-590X

Christmas & New Year Greetings to all our customers.

D.I.Y. Television Tube Polishing Kit

Contains everything you need to Polish scratches and small chips on your CRT screens All you require is an electric drill. Written instructioins are provided. Guaranteed to work. Worldwide Delivery **Total Price £63.00 includes P&P and VAT** Available from Luton only

Your local stockist are

WEST ONE
Distributors Ltd
Chesham, Bucks.
Tel. 0494 778197

WELL VIEW
114-134 Midland Road.
Luton, Beds. U.K. LU2 0BL.
Tel. 0582 402499

WELL VIEW
Southampton, Hants.
Tel. 0703 449783

REMOTE CONTROLS

Ferguson Types

TV – 738, 739, 740 etc
TV/VCR – 734, 742, 748 etc
VCR – For 3V35 etc

£5.95

TV/VCR – Fastext 789, 785 etc **£6.95**

MANY OTHER TYPES AVAILABLE

NEW AND REGUN TUBES
VIDEO HEADS – ALL MAKES

TV AND VCR SPARES

CARRIAGE AND VAT NOT INCLUDED

Access

VISTA ELECTRONICS

BARCLAYCARD VISA

Unit 1B, Wingate Grange Industrial Estate, County Durham, TS28 5AH

Tel: 0429 837100 **Fax: 0429 837101**

FAX: 0274 722229

BESCO LTD

EX-RENTAL TV's & VIDEOS

NEW 'B' GRADE MAJOR BRANDS TV – VIDEO – HI-FI

PORTABLES ● FST's ● NICAM ● FASTEXT
SONY ● HITACHI ● PANASONIC ● ETC

Huge selections. Complete range.

All makes and models available.

★ New Stocks Every Day ★

VHS Video from £30
Television from £3

PICK YOUR OWN VHS VIDEOS
Lots of 10 £20.00 each

Working Ex-Equipment Panels

	IF	Converger	Decoder	Line Scan	Power	Frame
T20/22X		5	14	18	17	14
T26 X		5	16	20	17	X
Philips G11	14.50	5	12	20	20	11.50

All prices include Postage & Packing. But + VAT

★ *IF THE PANEL YOU REQUIRE IS NOT LISTED PLEASE ASK* ★

BRADFORD
16 Bottomley St
Manchester Rd, BD5 7JL
Ring Tony (0274) 308186

MANCHESTER
Unit 3, Mersey Rd.
North Ind Est., Failsworth
Ring David (061) 683 4612

Visa/Access welcome
Prices are Plus VAT & Based on Quantity
OPEN 6 DAYS 9-5

Buy direct off van
Like new
B grade stock

If you require only one item – then please read on

10" R/C portable col TV	£95
14" R/C portable col TV	£95
20" R/C colour TV	£119
20" Text colour TV	£139
21" FST Fastext	£159
21" FST Nicam	£225
21" FST R/C	£145
Long play videos	£119
Stereo midi systems	£135
Microwave ovens from	£50

DISCOUNT FOR QUANTITY

W TREE TRADE WAREHOUSE
UNIT 1 SUNSHINE MILLS WORTLEY RD LEEDS 12
TEL: 0532 638804/633421 FAX: 0532 3101275

COLOUR TRADE

ESTABLISHED 1973 – WHOLESALE ONLY

NEW 'B' GRADE

ONLY
LATEST
NICAM
FASTEXT
F.S.T.

MAJOR BRANDS
TV – VIDEO – HIFI
SATELLITE
COMPLETE BOXED – WITH STAND – HANDSET – BOOK – ETC – MINT

Phone 021-359 7020
FAX 021-359 6344
221-222 BRIDGE ST WEST, HOCKLEY, BIRMINGHAM B19 2HU

BRITAIN'S LARGEST INDEPENDENT

Wishes all our customers a Merry Christmas

PRESTON

439 OAKSHOTT PLACE,
WALTON SUMMIT
IND. ESTATE
PRESTON (M6 Junc. 29)
Tel: 0772-312101

LONDON

THE ROYAL LONDON ESTATE,
UNIT 2,
29-35 NORTH ACTON ROAD,
LONDON NW10
Tel: 081-961 5005

TV & VIDEO WHOLESALERS

BIRMINGHAM

208 BROMFORD LANE, ERDINGTON,
BIRMINGHAM B24 8DL
Tel: 021-327 3273 Fax: 021-322 2011

XMAS SPECIALS

New 'B' Grades

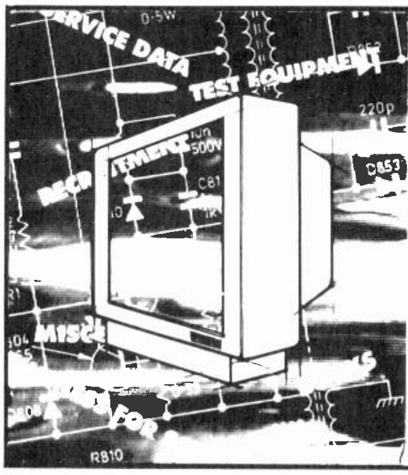
**Major brands now in stock,
don't miss out this Christmas
– buy now**

***RING OUR BIRMINGHAM OFFICE
ON 021-327 3273 for details***

CALL IN AT YOUR LOCAL BRANCH TODAY AND SEE OUR RANGE OF EX-RENTAL AND B GRADE STOCK

EXPORT ENQUIRIES WELCOME

CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED



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 £12.00 per single column centimetre (minimum 3 cm). Classified advertisements £8.40 per line, 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 be sent to The Television Classified, 11th Floor, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

PHONE 081-652 8339 FAX 081-652 8931

TUBES

REBUILT CRTs

VDU – MONITOR – TV

Image Burn-In Removed From Screen Phosphers

B.S.I. Certification

N.G.T. ELECTRONICS LTD.
120, Selhurst Road, London SE25 6LL

PHONE: 081-771 3535

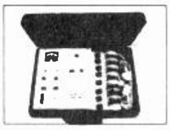
Britain's Oldest Established Tube Rebuilder

TEST EQUIPMENT

MÜTER · AT2 · BMR95 · BMR700

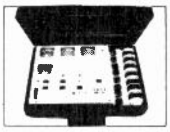
AT 2, Audi-Multi-Tester, 16 test-circuits for loudspeakers, tuners, amplifiers, headphones, tape recorders, mikes, boosters,

car radios, CD-players; measurment of millivolt, drift, watt, performance; with generator, radio, signal tracer/injector, 13 volt supply etc.



BMR 95

BMR 700



Regenerating Computers & Measurers for CRT's with cathode protection, gas clean-up aid, short repair; exhausted CRT's becomes bright and sharp again even if all other machines do not succeed.

United Kingdom: P & E Services, Llandudno, Tel. (0492) 549246, Fax 547880.
Ireland: Dönberg Electronics, Ranafast, Co. Donegal, Tel./Fax (0 75) 4 82 75.
New Zealand: TDON Ltd., Onehunga, Auckland, Tel. 6 68-9 07, Fax 6 68-4 99.
Germany: Ulrich Müter, Oer-Erkenschwick, Fax (0 23 68) 5 70 17.

WANTED

WANTED

Regular Supply of Ex-Rental Colour TVs and Videos.
Cash on Collection — Quick Service

Tel. 0742 312832

TRAINING

If you require a home study course in the fundamentals of electronics, either to begin a career, pursue a hobby, or refresh your knowledge, a BASIC ELECTRONICS course, from the Direct Personal Learning scheme, could be just what you're looking for. Contact:
K. Sparrow etc . . . 11 Claydon Green Whitchurch BRISTOL Avon BS14 0NG
Telephone: (0275) 835669

SERVICE DATA

E.C.S. INDEXES!

THOUSANDS SOLD WORLDWIDE

Edition 9 of the complete indexes now published containing approx 8,000 Faults listed in 12 Years of Television magazine.

Indexes are alphabetically listed by Make, Model, Fault, Ref and are now available for just:

£8.00 For Television & Satellite Faults
£8.00 For Video, Camcorder & CD Faults

Or £15.00 for both sets complete with chassis & similar model guides. *Please add £1.50 (UK), £3.00 (Overseas) to total order to cover post & packing.*

A LOW COST UPDATE SERVICE IS ALSO AVAILABLE. FULL DETAILS DESPATCHED WITH ORDER.

To secure your copy/s please make Cheques/Postal Orders payable to:

E.C.S.

31 Prenton Road West, Prenton, Birkenhead, Merseyside L42 9PY

SERVICE MANUALS

FOR MOST U.K., EUROPEAN, FAR-EAST & USA TYPES OF CTV – MTV – VCR – CAM – SAT – M/WAVE – AUDIO INCLUDING "UNUSUALS" – AND ALL AT REASONABLE PRICES.
VCR CIRCUITS ALSO AVAILABLE SEPARATELY FOR MOST MODELS.

PANASONIC NV-FS100, L20, NV-MC10, MC20, MC30 **£10.00 each.**
ORION – any VCR or VCP after 1985 – **£10.00 each.**
NEC PX1200k **£12/50,** any other U.K. NEC VCR – **£15.00.**
Other brands available include – Daewoo, Funai, Hinari, Kisho, Loewe, Memorex, RCA, Silver, Toshiba, etc. . .

WRITE OR TELEPHONE WITH YOUR REQUIREMENTS.
ALL U.K. ORDERS SUBJECT TO £1.00 P&P. NO VAT.

D-TEC
PO BOX 1171, FERNDOWN, DORSET BH22 9YG
Tel: 0202 870656

CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED

PARDON ME!

Did you know you don't have to buy junk at top prices?

UNIVERSAL TRADE SURPLUS (UNITRADE)

Offer as owners and sole UK distributor for Amstrad/Fidelity non computer reworked returns and dormant stock.

All reworked, repacked to 'A' stock status. WE DO NOT SELL JUNK!

AMSTRAD VCR9000 Twin speed LCD remote £115
BUSH 3114 14" remote CTV, non text £95
CTV with text £115
FIDELITY STV20 20" CTV with 100 channel satellite system built in. NEW £185
FIDELITY DD8900 double decker video £190
AMSTRAD 9340 Nicam VCR centre deck £160
AMSTRAD 9140 4 head VCR LCD £135
AMSTRAD 3000 latest 2 speed LCD £117
BUSH MS765 midi CD system. NEW £95
CROWN CD2005 remote CD midi. NEW £95
CROWN MCK40 midi remote, full size £45
CROWN MCK10 midi. NEW £30.50
BUSH MC800 ghetto blaster with surround sound speakers. NEW £39
AMSTRAD/FIDELITY MICRO 1000 micro CD/music system remote control £90
FIDELITY mini 2000 stack CD system £120

PLUS MUCH MUCH MORE!! PHONE FOR LATEST STOCK LIST

Remember, we give better than good service. Sorry no credit, cash on delivery or cash and carry.

PLEASE NOTE: WE DO NOT SELL UNWORKED PRODUCTS. ALL OUR PRODUCTS ARE WORKED, TESTED, REBOXED AND GUARANTEED TO 'A' STOCK STATUS.

UNIVERSAL TRADE SURPLUS (UNITRADE)

UNIVERSAL HOUSE, TERN VALLEY BUSINESS PARK, MARKET DRAYTON, SALOP. Tel: 0630 655797/655801 Fax: 655683

Open: Monday – Friday 8.00am-6.00pm
Saturday 8.00am-1.00pm
Regular deliveries nationwide, or small shipments sent by courier.

INCREASE YOUR SALES

OF THORN EX RENTAL GOODS WITH OUR TOP QUALITY REPLACEMENT BADGES. IDEAL FOR TV'S OR VCR'S (REMOVE TX SYMBOL FOR VCR's).

FERGUSON TX

THIS MONTH ONLY – SPECIAL OFFER

PRICE	EACH	PER 100
£	10p	7-50

PRICES ARE FULLY INCLUSIVE OF V.A.T.

ORDER NOW

SEND CQ/PO PAYABLE TO CHESHIRE TV & VIDEO SERVICES (ADD £1.50 P&P IF ORDER LESS THAN £15) OR PHONE NOW FOR IMMEDIATE DESPATCH QUOTING ACCESS/VISA NUMBER ON:

0925 753157
CHESHIRE TV AND VIDEO SERVICES
10 LYMMINGTON AVENUE
LYMM, CHESHIRE WA13 9NQ

TRANSFORMERS

TV LINE OUTPUT TRANSFORMERS

PHONE 081-948 3702 FAX: 081-332 0583

ALBA . AMSTRAD . BUSH . DECCA . DORIC . BLAUPUNKT . FERGUSON . FIDELITY . GEC . GRUNDIG . GRANADA . HITACHI . HINARI . INDESIT . ITT . KIMARA . NIKKAI . MATSUI . MURPHY . OSAKI . NORDMENDE . LOEWE-OPTA . REDIFFUSION PYE . PHILIPS . SANYO . SAISHO . SHARP . SONY . SOLOVOX . SUSUMU . TANDBURG . TELEFUNKEN . THORN . TRIUMPH . HUANYU . 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
Sat 10 am to 12 noon

T.V.s

FOR EXPORT GOOD WORKING T.V.s AND VIDEOS VHF/UHF. PAL 1, 11, 60, SECAM, NTSC, NTSC 4.43, 3.58, 50 Available. Also white goods are available.

Contact: Simon Pritchard, Intercity Industries Ltd,

Tel: 0902 791323
Fax: 0902 791123

MISCELLANEOUS

FERGUSON SV13 HI-FI.
£70.00 each
£600 for 10 plus VAT
Handsets available.
Leatherhead
0372 377822

Advertising in *Television* gets results

CAR RADIO CASSETTES

Do you turn away work on car radio cassettes because they have security codes.

Most radio cassettes can be decoded just by replacing the eeprom (memory IC) with that of a known code, or sending the original for re-coding.

All popular makes including Philips, Ford, Pioneer, Clarion, Grundig, Blaupunkt, Fisher, JVC, Alpine, Volvo, etc.

Send now for introductory offer, one of each of most popular eeproms + comprehensive eeprom/radio decoding list. Offer includes Philips X2402P: Ford MN010: Blaupunkt Boston CC20 9346: **£17.63**

Original eeprom re-coding service **£10.00**

Radio's sent for decoding from **£20.00**

Inc. of VAT and p&p

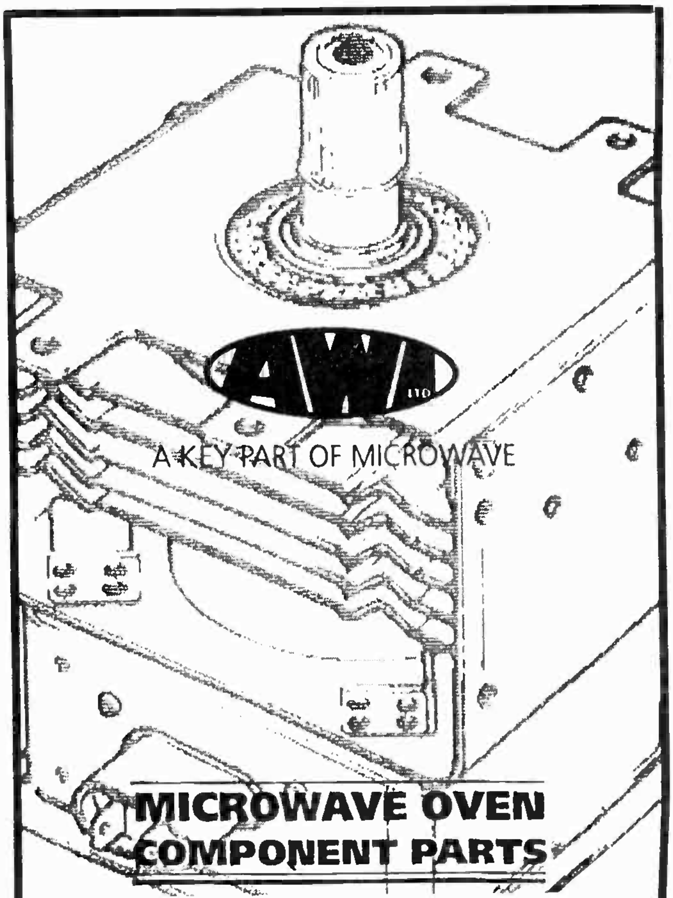
RADIO DECODING EQUIPMENT

We will beat any genuine written quotation for supplying a computer or software to decode radio cassettes, ring us first.

For technical or general information phone
0543 572 523 or 0831 806 574.
C.D.H. ELECTRONICS
3 Common Walk, Huntington, Cannock, Staffs WS12 4NB

C.D.H. ELECTRONICS

CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED CLASSIFIED



AWI Ltd., Samuel Whites Estate, Medina Road,
Cowes, Isle of Wight PO31 7LP
Tel: (0983) 296121. Telex: 86736 Sotex G. Fax: (0983) 296122
TRADE ONLY

RADIO CODE RE-PROGRAMMER MK 2

ATTENTION ALL SERVICE DEPARTMENTS.
For those of you who still do not have the equipment to decode radios, give us a call. Plug our decoder into your IBM or compatible computer and decode radios in a few seconds. You can start with basic system for as little as £395.00 + VAT. All leads, connectors, layouts and operating instructions supplied. All enquiries to:

Electronic Sound Systems
62 High Northgate, Darlington, Co Durham
Tel: 0325 484089, Mobile: 0860 221099
or Fax: 0325 465921

SOFTWARE

RELAY
OMAGH LTD — COMPUTER SOFTWARE

DO YOU RENT TELEVISIONS?
DO YOU STILL USE A CARD SYSTEM?
DO YOU FIND IT DIFFICULT TO KNOW YOUR ARREARS TOTAL AT ANY GIVEN TIME?
If you do then we recommend our computer TV and Video Rental package. This package includes
* automatic updating of each customer's record
* alphabetical print-out of each customer's arrears and payments missed
* total arrears immediately available
* easy to use and operate.

NEW HIRE PURCHASE PROGRAMME NOW AVAILABLE AS WELL.
These programmes operate on all IBM compatibles running under MS-DOS. Free demonstration discs available.

CONTACT **WILLIAM J THOMPSON**
Donaghanie Post Office
Beragh Co. Tyrone
Telephone Beragh 58214 (0662 7)

TUBES

TV TUBE REBUILDER
What ever make or type. Give us a call. Polish Service available. Discount offered on quantities & Regular orders. Also new tubes in stock at special low prices. Typical Types A51JAR, A51EAL, A59JMZ, A59EAK equivalent.

M.B. ELECTRONICS
Unit 6, Guild Hall Ind Estate,
Kirksandell Ind Estate,
Doncaster DN3 1QR.
Tel: 0302-891208

LINEAGE

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. 0532 496048.

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. 0666 823228.

PRIVATE RETAILER. has excellent part exchange colour televisions and videos to clear. Tel. 0494 814317.

VIDEOCRYPT DECODER. Service sheet with smartcard contact, details Eurocrypt card Interlace, £12.00. E.M.O., Ramsbottom, Lancs BL0 9AG. Tel. 0706 823036.

WANTED. KT66, KT88, PX4, PX25, transistors etc. If possible send a written list, prompt reply and payment. Billington Export, Unit 1E, Gilmans Industrial Estate, Billingshurst, Sussex. RH14 9EY. Callers strictly by appointment only, Phone 0403 784961 Fax 0403 783519.

TELEQUIPMENT D67A oscilloscope including probes leader LCT 910 C.R.T. checker, both perfect condition. £200. 05395 32984.

WANTED tube rejuvenator prefer B&K 490 model, cash waiting 0582 478448.

METERS. reconditioned. £1.00 slot meters for TV rental £6.95. Convert 50p slots to £1 using coin mechanism £2.95. 50p slot £2.95. Audiotech. Tel. 0790 3245.

EX-EQUIPMENT Television and Video spares available. Panels, Lopt, Tuners, Handsets etc. J.H. Services. 0243 820311.

TELEVISION CLASSIFIED LINEAGE *advertisements can be submitted on this coupon with a cheque made payable to Reed Business Publishing, Television Classified Room 11th Floor, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. The charge is £8.40 per line plus 17½% (minimum £33.60 + VAT.)*

TV01/93

For Issue Dated: ....or next available. Total insertions ....Total of Cheque £..
Name ....Address..
....Post Code ....Tel Num..Signature ....

Debit my Access/ Visa Card (delete)

Expiry Date..VAT Reg. No. 238 8937 10

MARCONI LNBs 1.2dB £35
LNB's WITH FEED HORN AND POLARIZER 10GHz TO 12.75GHz 1.2db s.n. £35. SEND FOR DATA.

HAND SETS
Model Nos. 4600, 6000, 8600
£5 As New

SEND FOR DATA D2 MAC SATELLITE RECEIVER, LNB AND DISH. £50 (£10 Post)

SATELLITE RECEIVERS — New Ferguson BSB Chassis with Tuner, Modulator etc £10
Hand Set £1.50 £4 Post

60cm SATELLITE DISH £35 Postage £5

Replaces 90% of Philips Handsets Philips Video RT/V Handsets with LDC display AV5661 AV5659 £6

PB500 Panic and Button Transmitter 180MHz £1.00
G11 CAP 250V, 470M £1.35

SATELLITE FINDER KIT AND LNB TESTER WITH METER BOX £25

SMALL SATELLITE TUNERS (950 to 1750 MHz), I.F. frequency 4000MH .... £9.00 each
VHF/UHF S.BAND TUNER £3.00
NEW PLASTIC CASE 32 C.H. SAT-RECEIVER (no hand set) .... £35 (Post £5)
NEW METAL CASE SAT-RECEIVER, 32 C.H. WITH DOLBY & CHANNEL C (no hand set) .... £35 (Post £5)
DAM MAINS CHASSIS AMSTRAD MONITOR C £10
UNIVERSAL TRIPLER. NEW TYPE £4.00
VIDEO LEADS 80p
AMSTRAD Line O.P. Transistors with Diode 2SD/453 .... £1.00
BU208A £1.00
VIDEO LAMPS. Long Lead 24p
HITACHI & GEC FRAME, Thick Film £6.00
FIDELITY SPLIT DIODE .... FCC2215AE...£20 FCC2015BE...£10 FCC2215BE...£10
K30 FRONT PANEL TEL-TEX TYPE £5.00
NEW G11 LINE OP PANEL £8.00
PHILIPS YEARS AHEAD
THE CREDIT CARD CALCULATOR Solar Powered £3.75
NEW PHILIPS SBC 1833 Solar & Battery Powered Calculator £8.00
THORN PANEL TX9 REC & REMOTE PANELS with Mains Trans £5.00
TX10 REC & REMOTE PANELS with Mains Trans £5.00
TX100 FRONT PANEL £5.00
TX10 TUBE BASE ON PANEL £3.00
TX91F £2.00
THORN PANEL No.515-353, 540.02, 565-01, 500/102, 515/173, 500/161 .... £5.00
THORN TX STEREO SOUND O.P. PANEL (I.C. TA7227P) £1.00
THORN VIDEO AERIAL AMP 01 M4-597-001 .... £6.00
ULTRASONIC TRANSDUCER 15p
IN LINE 12-35 VOLT SUPPRESSOR 4,000 MRD 20p

CAMCORDER SANYO NP22 6v 1300mah Rechargeable Battery Pack £6.00

NOT WORKING
NEW PROFESSIONAL SATELLITE RECEIVER
METAL CASE WITH METER, DOLBY CHANNEL C WITH POLARIZER SUPPLY
SEND FOR DATA AND PHOTO
NEW £20 £4 POST

BSB or D2-MAC 35cm DISH and LNB 11.7 to 12.7 £20

PHILIPS STEREO HEADPHONE £4.00

PHILIPS C.D. MECH. 691-30212 £10.00

SATELLITE UNIT
Video Out/Audio Out, L and R Polariser ± 35M/A and Decoder Socket
£10

Gas Soldering Irons New Type £10.00
Variety Nickel Cadmium Batteries from Telephone Type to Sub-C.50p per cell. Mainly in packs of 6 to 8.

Hand Set Tester with Repter £3

THORN FRAME IC TX100 etc IC TDA 3652 IS OBSOLETE REPLACEMENT TDA 3654 £2.00

SALORA Satellite Receiver XLE8901 with Aerial Positioner £70 Post £5.00 Send for Data

06D4-025-001 Mains input choke for TX9 £4

THORN M494B1 on Remote Panel £5

TX100 REMOTE PANEL No.564-13 IC M293B/and SAA5012 £10 etc

Philips Stereo Headphones No. SBC 3140 £4.00
144MHz Changed Over Relay Aerial 50p

NICAM UNIT — Ferguson made for ICC5 Chassis — home market and export — has circuit diagram and can be converted to most sets — £15.

THICK FILM HITACHI HM9205A £4.00

TX85 FERGUSON BATTERY MAINS CONVERTOR £8 each

TX9-TX100 FRONT PANEL £5 WITH REMOTE £10 NON REMOTE 8 push button £10

PHILIPS UNIVERSAL BATTERY TESTER SBC 1695 £5.00

BATTERY CONVERTER FOR TA185 FERGUSON TX85 £8.00

ONE I.C. K35 Decoder £10.00 PHILIPS Deck Calculator £7.00

REGULATED PWR. SUP. 500M/A 1.5V-12V DC switched + & — £5.00

ITT Tuner & IF. Can HF-module 2 UK £10.00

KT3-K30 IF £5.00 STR5481 £5.00

HEAT SINK COMPOUND (SILICONE) £4.00

STEREO SOLAR RADIO VHF AND MW £10.00

COST £25 PHILIPS METER ANALOG £9

G11 470 MFD 250v £1.35

LARGE Foacs Pots. Fits Pye, GEC, ITT, Decca 75p

BSB SAT/REC HALF COMPLETED. CHASSIS, TUNER AND MOD £5 + Post £3

PHILIPS NEW TYPE U/V HANDSET £10

GLASS BEADS Diodes 200v/1.2A 50 for £1.00

TX100 Push Button Unit 16 CH £10.00

WIRE PIPE stud detector £4.00

MICROWAVE leak detector £4.00

WIRE & PIPE detector £4.00

CAR ADAPTOR fused 3 Amp **Long Lead** with plug for TV etc 25p 500 off, 15p Each

CASSETTE MAINS LEADS 30p
SCART Socket, Print Type 20p

TELEPHONE EXT. LEAD 3 Metre 30p

LEAD SCART TO D PLUG 50p

G11 LOPT Panel £4.00
G11 Tip Switch £20.00
G11 IF Panel £3.00
G11 Decoder Panel £2.00
G8 Push Button Unit £2.00
G8 Con/Panel New Back Type £4.00

MIXED TOSHIBA HAND SETS FIVE FOR £12

SECURITY FLASHING LIGHT WITH RED & AMBER LENSES & MAGNETIC FACILITIES £1.00 EACH

BRIDGES RECTIFIER Mixed BR-31 to 34 2 Amp to 5 Amp .... 8 for £1.00

Have you got Acid Rain in your garden? PH METER £5.00
Video Power Supply for Amstrad. Last year mode. £1.50
Mains Transformer for Amstrad Video 25p (£1 post)

DAMAGED AMSTRAD 1640 Colour Monitor Chassis £6 + post £

DECODER C-CAM
PHILIPS MADE for K40 CHASSIS IC No. TDA 3590
£5.00

LATEST VIDEO
For Latest Philips, GEC, Pye and Hitachi, Front panel with memory chip and bush button and pots and LED's £6.00 NEW

TX90 MOD 3714B The Sweep Tuning System TX9139/001 £12.00

FERGUSON CHASSIS
IKC 2712 £20
IKC-2000 £20
ICK-2705 PAL/SECAM/NTSC £20
TX89 £20
TX98 £20

TX100 FRONT PANEL £5 8 Button

RGB. CONVERTER £20.00
TV – Video – Hi-Fi
Video in: R.G.B. out in black metal case with black knobs
56420A 20A/600V THYRISTOR £1.75

T6070V TX9 Transistor £1.00

1 METRE SCART LEAD £1.00

GEC, HITACHI DECODER PANEL
TBA510AS, TBA120, HA1215A, UPC1365 £10

SCART TO SCART LEADS
TX90 REMOTE PANEL IC TMS1000 AND M293 £12

SALORA SAT RECEIVER CONVERSION KIT
For models 24M60, 25M90, 28M90, SB1206E, SB1365
£15

LCD VIDEO AMSTRAD HANDSET for models 1900 £8 each

VIDEO SCART TO SCART ALL PIN, LONG LEAD £3.00 ALL PINS

ITT BG2032-642A TRIPLER £5.00

ITT/NOKIA RF IF MODULE £20

TX90 TX925 TX100 Mains Switch with Stand-by and Lead 50p each

COAX PLUG TO PHONO LEADS £1

5 Mixed AMSTRAD **VIDEO MOTORS** £5.00

SCART TO SCART LEAD £1

SATELLITE TUNER UNIT 2427611 with Base Band, Video Out £15.00

TV GAMES AERIAL VIDEO COMBINER SWITCH £1.50

UNIVERSAL VIDEO-RECORD KIT STEREO
This kit may also be used to connect a mono to stereo. £10.

TX10 8 way button unit £8.00
24v O 24v 3Amp MAINS TRANSFORMER £3.00
10 MIXED FERGUSON CIRCUIT DIAGRAMS £5.00
MSH1FCF09 £7.77

TX90 TO TX100 8 BUTTON UNIT £4.00

MIXED 20 BRIDGE RECTIFIERS (1 Amp to 5 Amp) £1.50

UHF Modulator MPM8010 30p

2433752 £20
2432984
2432871
2432301
2435016
2433952
2434393
2432211
T9048A
DST85B243
TFB3069D
K4 L.O.P.T.
K35 L.O.P.T.
K40
2433452
2432904
£10 EACH

SPLIT-DIODE
2433752 £20
TX100 Green Spot £15.00
TX100 Yellow Spot L.O.P.T. £10.00
TX90 White Spot L.O.P.T. £15.00
Split Diode 110° £12.50
Orion 65-3M
GEC 85-9793-6
TX9 Thorn 2432101-2 £5
2434141
2434492
2435066
2434493
EACH £10

DST 81N243
TFB4023AD £10.00
MSH1FPT131 £12.00
MSH1FBW27 £12.00
DST186N243 £10.00

TOSHIBA
DST 186N243 £10
TFB-4023AD £10
CP90 Philips Split Diode £10.00

36761
36881
2692120/10
37051
CTK Lopt
36212
33651
36072
36362
36402
36761
36831
36832
36833
36921/79
36922/79

TX85
2435701
2434393
2435016
2435014
£10

TRANSFORMERS
24357/01 £10
2435012 £10
FERGUSON
47003481 £10
AMSTRAD TVR3
LPTS £10
TFB3069D EQU
TFB4009AN

AT2036/00
AT2048/11
AT2055
AT2076/35
AT2076/38
AT2076/51
CVC 820
CVC 800

AT2076/55
AT2076/71T
AT2080/15
RCO ST CT3325
OT2041
FB165KA Orion
2076/51
2432461 2433451

SHARP MSH1FCF09
£10 EACH
0004-235 002-01
FIT MOST SETS New Thorn Hand Set Type u/v (£10)

BRIDGE RECTIFIERS 10 FOR £1.00
4 Amp for Video Power Supply

VIDEO MOTOR for VT568 type VC62DD8 £8.00
AMP TUNER IF for VT568 Hitachi & GEC £9.00

SATELLITE TUNER 950MHz-1750MHz £5.00

BURGLAR ALARM £2.00 with siren 9 VOLT

KIKUSYI
20 MHz OSCILLOSCOPE (5020) £200
40 MHz OSCILLOSCOPE (5042) £250
60 MHz OSCILLOSCOPE (7080A) £1000
DELAY PROGRAMMABLE

U/V TRIPLERS £2.50

TTT PANEL
CMC 301 CMC 113 CMC 302
CMC 115 CMC £5.00 303 CMC 96/4

12V/1 AMP POWER SUPPLY WITH MAINS PLUG £4

PHILIPS HALOGEN LIGHT. NEW. NO ON/OFF SWITCH. NO HANDLE WITH CORD. BLACK IN COLOUR £5

VIDEO LEADS 4 for £1

RELAYS 35p 5V-12V-24V-48V Large and Small

PHILIPS HAND SET G11 TEXT ULTRASONIC £10
G11 TEXT IN RED HAND SET £12.50
G11 HAND SET ULTRASONIC £10
PHILIPS RC5 EASY CONTROL £10

4600 TO 8600 AMSTRAD VIDEO HAND SET WITH LCD £10

SEL ITT IFB254F/2 Front Panel £15.00

TRV3 Amstrad Cassette Mechanisms. New with 2 motors and sound head. £15
TVR3 Power Supply. £5. Amstrad Television Tuner UHF. Small, Fits most Amstrads. £6.

NICAM MkII KIT MODULE £20.00 with data

DECCA — GEC — ITT 6 push button £5.00

25 Way Plug and Socket with Case £1.50

SENDZ
SEE BACK PAGE

PHILIPS SBC 522 RGB1 GENERATOR £90
PHILIPS SBS 850 ANALOG MULTIMETER £11.50
PHILIPS SBS 521 RF SIG GENERATOR £90.00
FERGUSON TX110 – IK2 and IK7 MANUAL £1 each

FERGUSON ICC5 STEREO O.P. PANEL ICs TDA8405 TDA8421 TBA1204 £10

Burglar Alarm Has time delay to set £2
Mains Transformer 240v in 110V to 120v out 1 amp £4.00 post £3

SENDZ COMPONENTS
TO ORDER SEE BACK PAGE

LA11440 £1.00

TAA7750 50p
HA 411485 £1.00
UPC1373 50p
M58657P £1.00
M491BB1 £3.00
M50441/550 £1.00
M58658P £1.00

Receiver TX100 Panel
I.C. No. SAB3035
—MAB8440P D066
—SAA1060
—PCF8571P

20 off £2.00 High Voltage Condenser
IN5 to 8NZ 1500V to 2KV

TX9 C.CAM Decoder £5.00

4 Types Fidelity front panels with i.c. & pats £2.00 each
BB 103 10p
BB 105A×12 £1.00
BB 105B×12 £1.00
BB 105G×12 £1.00
BB121a 10p
47 10p each

1A/1600V 10p
DG3P EQV—BY228 10 for £1.00
2 amp bridge rec. wire end 15p
SKE4G2/02 15p
Eqv. BYX71/600 500ns.

3 Way regulated adaptor 240V 6V/7.5/9V/300mA £3.50
Rank/Toshiba preh unit 0354 £9.50
4 Push button unit preh £1.00
6 Push button VHF/UHF for v/cap. GEC—Decca type £7.00
7 Push button for CVC5 ITT £8.00
KT3 12 Push button unit £2.00
KT3 (Export) 12 P.B.u £2.00
6 Push button Unit Thorn £1.00
6 Push button GRC £6.00
6 Push button PYE 731 £6.00
Hearing aid unit £3.00
Rank Z718 4 P/B/Unit MECH £4.00
7 Button Unit GEC with Lamps £7.00
697 Push Button Unit £6.00
Z916B panel £5.00
T513AP panel £5.00

TT14 GEC TEX-DECODER
13 IC Panel with cable form £9.50

PHILIPS
Decoder SAA IC 5020-5030 5040B-5050
K40 Text Panel £8.00

ICCS TUBE BASE ON PALEL £5.00
ICCS DECODER PANEL £15.00

DIODES

Bridge KBF-08	40p
BY 126	10p
BY 127	10p
BY 133	10p
BY 134	10p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206 – BY 407 Eqv.	8p
BY 208/800	8p
BY 210/400	5p
BY 210/800	10p
BY 223	60p
BY 224/600: 4.8A/600v bridge	50p
BY 226	15p
BY 227	15p
BY 228 1500v	20p
Flat BY229 black	15p
BY 229 Red	20p
BY 229/400	30p
BY 229/60p Tag	30p
BY 229/800	30p
BY 237	5p
BY 254	10p
BY 255	30p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 448	10p
BY 500/200 – 5 amp	8p
BY 527	10p
BY 602	10p
BYV 26C	10p
F247	10p
GP20G	5p
GRP80G (TX10)	30p
XK 3102	50p
BYV 28/200	20p
Bridge TX10 800/3 amps	30p
KBPC35-02 Bridge	£1.50
Bridge Rec. D35B10	40p
BYT71/800	12p

K35 Decoder £8.00
K35 Sound OP £4.00
Thick Film Daughter Kt3 33122-127-43891 £3.00
12 CH. K30 Tex Rec Front Panel with I.C. £5.00

Plug in
K4 Focus Pot £1.00
Fidelity Tube Base with transistor & focus pot £1.50
Transformer CVC 32 LOPT £4.00
TX10 Tube Base on Panel £3.00

PHILIPS HAND SET
K35-K4-K40, etc £10

Universal Tripler with small focus pot. Green type £7.00

Black Triplers

KT3 Triplers	£6.00
S.T.C. Universal Tripler	£6.00
ITT CVC 5-8-9	£3.50
Rank T25LE Tripler	£2.00
Rank 11TCP A-823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
8500 Thorn	£4.00
9000 Thorn	£7.00
9500 Thorn	£4.50
9600 Thorn	£4.00
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
G8 Tripler	£5.00
CVC20-32	£5.00
Decca 80 100	£4.50
Grundig TVK 52	£2.50
ITBQ Pye 731	£3.00
ITTHY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
ERO Tripler print type with focus P07 BG2087	£5.00
GEC 8 touch unti assy complete with all I.C.'s + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Sean Coils	£5.00
G11 100K tuner pots	12 for £1.00
KT3 IF panel	£6.00
KT3 line OSc transformer	£1.00
KT3/K30 infra-red receiver head	£1.00
K30 drawer unit with IC's (home)	£10.00
K30 drawer unit with IC's (export)	£10.00
KT3 AE Sockets	50p
KT3 receiver panel	£8.00
KT3 line driver transformer	50p
Oye, K30, GEC, etc. Pre-mains stand-by switch	£1.00
Suai Ferguson Decoder	£50
SRX200 Dish and LNB	£80
CEC Line O/P Trans. & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10.00
CVC 20/25/30/35/40 decoder panel (untested)	£5.00
CVC 40/45 IF panel	£5.00
40K Transducer	50p
Philips NE511N	£1.20
LM337M Reg.	30p
Focus Unit	£4.00

THORN CASSETTE HOUSING
PAS26805U £18.00

LITHIUM BATTERY
BR-2/3 Volts 20p

TUNER. SAT 2000 KHC £8

MIXED FUSES
1¼ AND 20mm and Black Print Type
100 off £2

International Rectifier EHT Diodes G770/HV34 6KV 3 for 8p
6A/600V Stud Diodes 20p
6A/1000V Stud Diodes 20p
BTW 92/800R £3.00
24A473 PNP C/P 10p

Voltage Regulators

+5V/UA78PO5SC	30p
−8V/79M08c	30p
+6V/78M06c	30p
LM 317T	30p
LM 337	30p
LM 342/18	30p
LM 340T 5.0	50p
+12V/LM 340T12	50p
+18V/MC78M18	20p
+24V/78M24	30p
MC 7724cp	40p
MC 7824	40p

Power Supply for Sinclair Spectrum +2 £5.00

MR 508	10p
MR 501	10p
MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	10p
BYX 38/300	25p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYT 71/600	15p
BYV 95B	10p
BYV 95C	12p
BYV 96D	10p
BYZ 106	10p
BPW 41	15p
BYW 56 2A/1000v G11	8p
BYW 29/50	15p
BYW 95C	10p

Bush Thyristor RCA 76122 £1.00
Transformer 240v/20v-500Ma Chassis type Transformer 75p
240v/12 Volts 500m/a 75p
CVC 20 tube base £2.00
Tube Base Rank & G11 £1.20

BRIDGES

KBL 005	30p
KBL 02	30p
KBP 04	30p
W02	15p
W004	15p
W005	20p
800V Bridges 2½ Amp	30p

K30 Drawer Ass with pots cable forme £1.00

TX10 Drawer Ass £3.00

Modulator for Ferguson Sat Receiver 5.5Meg or 6Meg £1.75

Radio Telescopic Aerial £1.00

PHILIPS AE100
Amplified Aerial £27.75

- UHF/VHF set-top aerial
- Conforms to BS safety standard
- High-gain amplifier operated from 240v AC or 12v DC
- Equipped with mains plug
- 0-36dB adjustable gain
- Bandwidth 45-890 MHz

PHILIPS SBC902 DIGITAL LOGIC PROBE £10.00

100 Coax Plugs EACH 14p

De-solder pump + 2 nozzles Philips £4.00

Flat Red LED and Green 5p

500gm 60/40 Solder reel £6.00

K30 Thermistor 232266298009 75p

De-solder Pump £2.50

Portasol Flameless Gas Soldering Iron £16.00

100 Mixed 20mm Fuses £2.50

Hill Meter Leads, S/Rubber and Probes £4.00

CV 8617	10p
Y 716	10p
Y 729	30p
Y 730	10p
Y 827:6A/1KV	20p
Y 860	30p
Y 933	5p
Y 969	50p
Y 997	30p
Min 12 volt Relays	75p
R 1038	40p
R 1039	40p
R 2009	80p
R 20106	£1.00
R 2029	50p
R 2210	60p
R 2257	60p
R 2265	50p
R 2305	50p
R 2306	30p
R 2322/2323	pair 80p
R 2323	15p
R 2396	50p
R 2461	80p
R 2030	50p
R 2433=BD124	30p
R 2540	£2.00
R 2737	40p
R 2738=TIP41	30p
R 2775=TIP41c	40p
R 3129=TIP47	40p
T 6068V	50p
R 4050	£1.00
S 2008b	80p
2SD898B	£1.00
2SC1942	£1.00

Hitachi sets etc.

STR454	£2.00
STR6020	£6.00
S 2000AF line o.p.	£1.00
2SC940	£1.00
BU 105/04	80p
BU 108	£1.00
BU 124	50p
BU 126	80p
BU 180a	65p
BU 204	60p
BU 205	75p
BU 206	£1.00
BU 207	£1.00
BU 208	80p
BU 208A	75p
BU 208D	90p
BU 222	£1.00
BU 326	£1.00
BU 407	60p
BU 500D	£1.00
BU 508A	90p
BU 508AF	£1.00
BU 508D	80p
BU 705	£1.00
BU 806A	£1.00
BU 807	£1.00
BUK 454/600	£1.00
BU 824	50p
BUT 11	50p
BUT 13 600V-28A	£1.00
BUW 11	50p
BUW 84	60p
BYW 20-08-9	£1.00
BYW 95	10p
BUX 39 25A-150V	£1.00
BUX 84	50p
BUY 49	20p
TIC 106a	30p
TIC 116m	30p
TIC 116n/Y 1003	30p
TIC 126N	30p
TIC 225S	30p
TIC 226E	30p
TIC 226m	30p
TIC 236m	30p
TAG 226/600	30p
TICV 106D	
(T092 case 2A/400V)	10p
TIP 29	25p
TIP 30	25p
TIP 30A	25p
TIP 30B	25p
TIP 30C	25p
TIP 31	25p
TIP 32	25p
TIP 33B	50p
TIP 33C	70p
TIP 34A	50p
TIP 34B	60p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41	15p
TIP 41B	40p
TIP 41D	70p
TIP 42	10p
TIP 42/BRC 6109	10p
TIP 48	40p
TIP 49	30p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 110	20p
TIP 115	50p
TIP 117	50p
TIP 125	35p
TIP 126	40p
TIP 127	40p
TIP 130	30p
TIP 131	6p
TIP 136	30p
TIP 140	50p
TIP 142	80p
TIP 640	50p
TIP 2955	35p
TIP L761A-1000V/4Amp	75p
T6032	30p
T6036	40p
T6040	40p
T6047	40p
T6049	40p
T6051	40p

Philips Handset IC £3.00
SAA3010P £3.00
MAB8461/WO63 £3.00

MAB 8420P-C031 £3.00
MAB 8400B-6 £3.00
MAB 8440P-D070 £3.00
MAB 8440P-D033 £3.00
MAB 8440P-D056 £3.00
MAB 8441P-T001 £3.00
MAB 8441P-T132 £2.00

M58484P £2.00

FERGUSON ICs
Ferg-TX982 £3.00
TMP47C 634N 2685 £3.00
ST6391B1/B2 ICC7 £4.00

CMC 301 front panel £5.00
CMC 303 front panel £5.00

CMC 302 Panel with TC mains switch etc £5.00

Turntable Satelite Modulator
Sound 5.5MHz MPM 1000T
Sound 6.0MHz MPM 1040

Safe Block £5.00

FEROX
RF Filter Clamp for CoAx Cable Cost £2.50 (25p each)

Ferguson TX85 £2.00
TX86 £2.00
Switch Mod Transformer £2.00
TX98 £2.00

ICCS Ferguson Switch Mod Trans 3112-338-32642 £4.00

ICC5 L.O.P.T.
DST 88B243
DST 85B243 £10.00 each

ICC5 MAIN ICs
ICC5 Remote I.C.
CCUFRG07 £7.00
CCUFRG09 £8.00
IC FERG TX982 £3.00
IK7 ST6391 B1 £3.00

Ferguson Hand Set
ICCS Mod £8.00

KT3/K30 T/Text £12.50
KT3/K30 Full remote £15.00
KT3 Power supply £4.00
GEC infra-red 2236-2026 £4.00
GEC 8 button full remote £14.00
GEC push pad handset button blobs 10p each

Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5071-RC5177
Special Price £13.00
RC4001 KT3 and Teletex £14.00
IT CVC 32 handset repaired £15.00
CVC 32 Hand Set £15.00
CVC 45 3 and 2 Pin
TX10 Hand Set Text £12.50
TX9 with Text £12.50
TX9 & TX10 button print £2.00
TX10 Focus Pots £5.50

Mains Stand By Switch with Coil £1.00

PHILIPS
UNIVERSAL HAND SET £12.00 RC5
KT3 – K45

We have all parts for Philips Handsets

RC5353 £15.00
RC5300 £12.00
Philips RC5 £15.00

TEXT-TYPE
Replace Hand Set for Philips KT3-K30. K4 etc £12.50

THORN HAND SETS
9000 – 9600 – TX9 – TX10 – TX100
Text and Non-Text £10.00

PHILIPS
RC5171 £12.00

K35-K4 HAND SET
Repaired for £5.00

SENDZ COMPONENTS

63 Bishopsteignton.
Shoeburyness. ESSEX SS3 8AF.
SAME DAY SERVICE

All items subject to availability. Technical Information by telephone only. No accounts: No Credit Cards
Postal Order Cheque with order
Please add £1.70 post packing (unless otherwise specified) and then 17½% VAT to total. Export orders charged at cost.
Callers: To shop at 212 London Rd., Southend. Tel. 0702-332992. Fax 0702 338805
Open 9-12/2.30-6. GVMT school orders accepted on official headings.

TUNER UNITS

TX90-TX100 Tuners with AE socket	£5.00
Thorn TX Tuner V/Cap eqv. to ELC1043	£4.50
AMSTRAD Tuner	
Thorn TX10 Export V/Cap UHF, VHF	£3.00
ENV 57836G2F UHF/VHF Small	£4.00
NEW G8 Tuner V/Cap	£3.50
ELC2000 on Panel	£2.50
GEC 2110 V/Cap	£5.00
ELC1043 (Ex Panel)	£3.75
ELC2000 NEW	£4.00
ELC2003	£4.00
GEC Tuner V/Cap Hitachi After 1979 ET548, ET547, ET541B	£8.00
ET546	£6.00

Moultor Astec UM1233	50p
UE33-B01 Amstrad UHF Tuner	£5.00
VHF/UHF EG522F	£6.00
ASTEC UM1183	£10.00
V314 (VHF)	£5.00
V334	£4.00
U321	£6.00
U322	£8.00
U341 UHF	£6.00
U342 (UHF)	£5.00
U343 Phono	£5.00
U343C	£6.00
U344C	£10.00
U411 UHF	£4.00
UVF10	£8.00
U.V. 411 Tuner	£8.00
U.V. 417	£5.00
UHF/VHF Tuner 1500 DKO	£5.00
U743 Tuner	£7.00
Fidelity/Amstrad 2000 V/Cap Tuner	£5.00
Small V/Cap Mitsumi	
UHF	£4.00
VHF	£3.00
Portable & rotary Tuners Sanyo & Mitsumi	
UHF	£5.00
Mosfit UHF/VHF (new type)	£8.00
UE2-B31 Fidelity V/Cap T/Unit	£6.00
UHF-VHF V/Caps on panel	£3.00
HITACHI 20 Turn Pot	40p
U321 on panel	£6.00

Mullard Video Modulator. Application, video tape recorders. TV cameras, video games, closed circuit TV, C.C.I.R. system. Data supplied	£10.00
T85 250v AC mains filter 0.1+ (03x2) 11" leader & earth clip	25p
NEW U321 Mullard	£4.00

U944	£5.00
Astec 230V/.6A Switch Mode Power Supply	£5.00
Astec UM1623 VHF	£2.00
VHF/UHF Tuner S Band	£3.00
UHF/VHF Tuner EGG13F	£6.00
ENV-5765G2 VHF/UHF	£5.00
Change over switch co-ax type box with lead	50p
TX90MOD 37141B	
The Sweep Tuning System	
TX9 139/001	£12.00
UF745 BAV	
UHF Tuner and IF in one can	
Small	£5.00
KT3 Luminance	75p
UF7548	£5
Co-Ax Belling Lee Plug	14p
Co-Ax Splitter	£1.00
Infra Red Emitting Diode	20p
NE286H Small Neon Lamps	
GEC & Philips	5p
Mullard 5 Watt Amps. LP1162	
New	75p

S.W. Filters

HW2011	50p	SW185	£1.00
HW2013	50p	SW153A	50p
SW453	50p	SW154	50p
SW150	£1.00	SW173	50p
HW2013	50p	F1035B	50p
RW303	50p	F1045A	50p
SY2153	50p		

BD646	50p
BD676A	30p
BD807	20p
BD826	50p
BD933	30p
BD939	30p
BD948	30p
BDT31A	50p
BDX75	20p
BDV64B	50p
BDU65	50p
BF761	30p
BF769	30p
BF788	20p
BF819A	30p
BF858	30p
BF869	30p
BF871	30p
BFR52	7p
BFR81	15p
BFS60	10p
BFT42	20p
BFT57	20p
BFW11	20p
BFX85 100V, 1 amp	30p
BSD215	50p
MR1366	20p
AN6350	£2.00
BRC-M-200	40p
BRC-M-300	50p
BRC 1693	£1.00
BRC 3064	£1.00
BT7822	£1.00
BTT6016	£1.20
BTT6018/ML237B	£1.50
BTT6218	£1.50
BT18124	£1.00
BT18224	£1.00
BUP22A	£1.00
CA270AE	50p
CA270CW	50p
CA270CE	50p
CA920AE	£1.00
CA1310	50p
CA3046	50p
CA3065Q	50p
CA3094AE	50p
CA3123	40p
CA3146	£1.00
CA3189	40p
CBF16848	50p
CD4510	30p
CD4555BE	30p
DM7492	50p
HA1124A	40p
HA1196	40p
HA1377	£2.00
HA1377	£3.00
HA11223	40p
HA11423	£1.00
HA11440	50p
HA11484	£3.00
HA11485 Ant	£1.00
HA17458	50p
HEF4001	10p
HEF4518B	25p
HBF4011AF	10p
HEF4053B	30p
HEF4066BP	20p
HEF4528	20p
HD3890C	£3.00
K5731D 1001012	£1.00
LA3220	50p
LA4102	£1.00
LA4261	£1.00
LA7830	£2.00
LA7831	£2.00
LM1111N	£1.00
LM1017N	25p
LM8361	£3.00
PCF8571P	£5.00
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
M5840A-84RS	£3.00
MC476p	£1.00
MC1307	75p
MC1312	
MC1330 GN76530	£1.00
MC1352	£1.00
MC1358	£1.00
MC1496	50p
MC14002	15p
MC14013	25p
MC14016	25p
MC14066	30p
MC14514	50p
MC1748	80p
MEM4956	£1.00
ML231	£2.50
ETT6016	£2.00
ML232	£1.00
ML236E	£1.00
ML237B	£1.00
ML238B	£4.00
ML239	£2.00

THYRISTORS

Philips Kits OT121	50p
IR106A	30p
BT151/500	20p
BT106 Plastic	30p
BY106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
G11 Tyristor	60p
Decca 80-100	60p
2N4444	£1.00
MCR72-6	25p
OT112	£1.00
TF320M	£1.00
HC8441	£2.00
17052	£2.00
17088H	£2.00
17089R	£2.00
17053R	£2.00
5P2M	50p
RCA Line Thyristor	
CC0240H	£2.00
CC0240R	£2.00

Thermistors

PTHBG180M	75p
G8 Degausing	35p
Philips type VA1104	70p
ITTP7266312	15p
PTH451 AOR	15p
PT37P Fits Pye & PT34	20p
Degausing Thermistor (fits most sets)	20p
POS 009 Philips	50p
POS 016 Philips	50p

ML926	£1.00
MAB8400B-C	£2.00
MAB844C P-D070	£2.00
MAB8441 PT001	£3.00
MAB8420PC035	£2.00
MAB8422P-Q005	£2.00
MAB8440P	£2.00
MAR840CXX	£3.00
M708LB1	£2.00
MM5387	£1.00
MM5611	£1.00
MM5840	£3.00
PCD8571P	£3.00
K35 Philips Receiver IC	
MA1250 BJC	£3.00
M491BB1	£3.00
M5840H-84RS	£5.00
MM5290N-4	75p
MM53108N	£4.00
MN650	£1.00
MN1250BJC	£2.00
MR1366	20p
N64100	£1.00
NE555P	60p
NE555	60p
NE556	50p
NE646	50p
HD38980C	£3.00
IL-J	20p
OPT600	20p
OPT601	20p
PH2369	10p
PCD8571P	50p
PCD8572P	£2.00
SAA611	£1.00
SAA661	£1.75
SAA1021	£4.00
SAA1024	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1124	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£2.00
SAA1250	£3.00
SAA1251	£4.00
SAA1272	£3.00
SAA1274	£3.00
SAA1276	£3.00
SAA1292	£10.00
SAA1293	£6.00
SAA3027P	£1.00
SAA5000A	£1.50
SAB3013	£2.00
SAB3205	£3.00
SAB3210	£2.00
SAB4209	£2.00
TBO0124	£1.00
SAA3008P	£3.00
SAA5000A	£2.00
SAA5010	£2.20
SAA5012A	£5.00
SAA5020	£3.50
SAA5025D	£3.00
SAA5030	£4.50
SAA5040A	£3.00
SAA5042A	£3.00
SAA5043	£4.00
SAA5050	£4.50
SAA5051	£2.00
SAA5052	£2.00
SAA5053	£2.00
SAA5240	£5.00
SAA5241 P/A TEX IC	£5.00
SAE1032p	£2.50
SAE1039	£2.00
SAS570T	75p
SAS660	£1.00
SAS670	£1.00
SAS580	75p
SAS590	75p
SAS3210	£2.00
SL437F	£4.00
SL471	50p
SL480	£1.00
SL901B	£4.50
SL971B	£3.00
SL918	£4.50
SL1430	£1.00
STK4793	£3.00
STK5471	£3.00
STR58041	£5.00
TA7122	£1.15
TAA320A	50p
TAA470	£1.50
TAA570	75p
TAA611B	£1.00
TAA621	£2.00
TA7108P	£1.00
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7137P	50p
TA7193AP	£3.00
TA7240AP	£3.00
TA7265	£3.00
TA7609P	50p
TA7227P	£1.00
TA7265AP	£3.00
TA7608AP	£3.75
TA7680AP	£3.00
TA7750P	30p
TBA120A	40p
TBA120AS	40p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120T	50p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1440	£1.00
TBA1441	£2.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00

TV CRYSTALS

4MHz	
4,433-619	
6MHz	
8.867238	
11.059.000	
Large or small	50p each
Antistatic Isolators	
Disc Type Black	10p
Filters	
CSA 3.97M	15p
6MEGtCDA	25p
6MHztSFE	25p
SFE 5.5MHz	20p
CDA5.5	25p
SFD460B	15p
CSB455A	15p

TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA560CQ	£1.00
TBA570	£1.50
TBA625	50p
TBA651	£2.00
TBA673	£1.00
TBA750Q	£2.50
TBA780	£1.50
TBA800	50p
TBA810AP	60p
TBA810S	60p
TBA820	60p
TBA820M	25p
TBA920	£1.50
TBA920Q	£1.50
TBA990Q	£1.00
TMS1000NL	£2.00
TMS1943 N2L (clockchip)	£1.00
TMS9980	£4.00
TMS9901	£1.00
TMS2708JG45	45p
TMS2716JL	£1.00
TMS3529	£1.00
TMS3720ANS	£3.00
TMS4014	70p
TX-012	£1.00
TMS9902	£1.20
ULN2004P	£1.50
ULN2216	75p
UPC566H	£1.00
UPC585C	£1.00
UPC1009C	£2.00
UPC1031H	£2.00
UPC1353C	£1.00
UPC1363C	£2.75
UPC1364C	£2.00
UPX1365C	£2.00
UPC1366C	£1.00
UPC1378H	£2.00
UPC1514C	£3.00
UPC2002	35p
UPD1943G	£2.00
UPD8049HC	£2.00
SN29848	50p
SN29770BN	£2.00
SN29771BN	£2.00
SN29772BN	£2.00
SN76001	£1.00
SN76013ND	£2.00
SN76018	£1.00
SN76110N	£1.00
SN76115AN	50p
SN76131	50p
SN76141N	£1.00
SN76226	£1.00
SN76227N	£1.00
SN76228N	£1.00
SN76270	£1.00
SN76532N	£1.00
SN76545N	£3.00
SN76546	£3.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76660N	40p
SN76620AN	50p
SN76666	£1.00
SN76705N	£1.00
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
SN76709N	£2.00
UA783P3C	40p
BT100A/02	40p
BT138/10A	70p
BT146	30p
TBA540Q	£1.50
TCA270	£1.00
TCA270Q	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA800	£1.50
TCE120CQ	£1.00
TCE520	30p
TD6306P	£3.00
TDEA440Q	50p
TDA1003A	£1.00
TDA1010	£1.00
TDA1013	£1.00
TDA1012	£1.00
TDA1013A	£1.00
TDA1060A	£1.50
TDA1035SB	£1.00
TDA1072	£1.00
TDA1150	50p
TDA1151	30p
TDA1154	50p
TDA1170S	£1.00
TDA1180	£2.00
TDA1190	£1.00
TDA1200	75p
TDA1270	£1.50
TDA1327A	69p
TDA1365	£3.00
TDA1512	£2.00
TDA1540P	£3.00
TDA1670A	£2.00
TDA1908A	£1.00
TDA2002	£1.00
TDA2003	25p
TDA2004	£2.00
TDA2006	£1
TDA2008	£2.00
TDA2010	£1.00
TDA2020	£1.00
TDA2030	£2.00
TDA2140	£3.50
TDA2160	£1.00
TDA2320	50p
TDA2545A	£1.00
TDA2600	£3.00
TDA2640	£2.00
TDA2522	£5.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2542	£1.00
TDA2545	£2.00
TDA2546	£2.00
TDA2556	£1.00
TDA2560	75p

MA721PC	£1.00
M50430-8505P	£1.00
TD6359P	£1.00
M58657P	£1.00
PCD8572	£1.00
HD74HC86P	£1.00

TDA3565	£3.00
TDA2575A	£1.00
TDA2577A	£2.00
TDA2578A	£2.00
TDA2579A	£2.00
TDA2581	£2.00
TDA2591	£1.00
TDA2593	£3.00
TDA2560	50p
TDA2556	£1.50
TDA2600	£3.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA3651A	£1.00
TDA2653	£4.00
TDA2640	£2.00
TDA2593	£1.00
TDA3047	£1.00
TDA3048	£3.00
TDA3083	£2.00
TDA3190	£1.00
TDA3300B	£5.00
TDA3301	£3.00
TDA3505	£3.00
TDA3506	£3.00
TDA3561	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3590	£3.00
TDA3591	£1.00
TDA3592A	£3.00
TDA3650	£7.00
TDA3651	£3.00
TDA3651AQ	£3.50
TDA3652	£3.50
TDA3653AQ	£2.00
TDA3654	£2.00
TDA3654Q	£2.00
TDA3710	£3.50
TDA3800	£4.00
TDA3180	£2.00
TDA4260	50p
TDA4501	£3.00
TDA4505N4	£3.00
TDA4420	£2.00
TDA4439	£2
TDA4600	£3.00
TDA4601	£2.00
TDA8190	£3.00
TDA8703	£3
TDA9403	£1.50
TDA9503	£3.00
TDB2033	£1.00
TDD1610S	50p
TD6306P	£2.00
TDA1060	£3.00
TEA1009	50p
TEA1039	£2.00
TEA1060	£2.00
TEA2017	£2.00
TEA2029C	£3
TEA5114	£1.00
TDA3300B	£6.00
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7300	40p
MPS43A	25p
MJ13005	30p
MJE51T	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00
MJE2801	30p
MJE2955	50p
MJE13005	50p

Transistors

A1222	25p	BF181	20p
A1223	25p	BF182	20p
A1233	25p	BF184	20p
AC106	25p	BF194	10p
AC121	25p	BF195	10p
AC124	25p	BF196	10p
AC128	25p	BF197	12p
AC137	25p	BF198	10p
AC151	25p	BF199	10p
AC131	25p	BF200	20p
AC138	25p	BF222	10p
AC152	25p	BF224	15p
AC153K	25p	BF238	20p
AC142K	25p	BF240	16p
AC169	25p	BF244	40p
AC176	25p	BF245b	20p
AC178K	25p	BF255	20p
AC179	25p	BF256	20p
AC186	25p	BF257	20p
AC188	25p	BF258	25p
ACY21	25p	BF262	15p
AD143	50p	BF263p	25p
AD149	50p	BF264	15p
AF17A	25p	BF271	10p
AF139	25p	BF273	10p
AF181	£1.00	BF274	10p
AF239	25p	BF324	25p
AF367	25p	BF337	50p
AL102	£1.75	BF355	30p
BLY49	50p	BF362	20p
BF115	20p	BF363	15p
BF121	20p	BF367	15p
BF127	20p	BF391	15p
BF137	20p	BF394	10p
BF157	20p	BF419	30p
BF160	20p	BF422	15p
BF161	20p	BF423	15p
BF164	60p	BF448	30p
BF179	30p	BF470	30p
BF180	20p	BF471	30p
		BF5971	10p
		BF694	10p

Thorn Transformers

DT2076/78	£10.00
90D3-035-003	£10.00
90D4-106-003	£1.00
90D3-038-001	£5.00
OT204130	£3.00

I.C.s

UPD114LC-2	£1.00
MN1250BJC	£1.00
M50441-5505P	£1.00
M491BB1	£2.00
HA513385	£1.00

BF694	10p
BF758	30p
BF760	30p
BFT34	15p
BFT43	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
BFY50	15p
BFY52	20p
BFY90	25p
BLY49	25p
BPW41	25p
BRC116	25p
BRX43	15p
BRX48X	10p
BRY56	30p
BSS68	10p
BSY79	10p
BSY95a	10p
BTY80	20p
BSX19	17p
BSX20	17p
FT3055	30p
TCE82	30p
TCE520	30p
2N930	5p
2N2221	8p
2N2222	8p
2N2906	10p
2N3055	40p
2N3566	10p
2N3702	10p
2N3711	10p
2N3583	50p
2N3904	15p
2N4355	10p
2N4442	£1.00
2N4444	£1.00
2N5278	20p
2N5296	40p
2N5983	30p
2N6099	40p
2N6109	40p
2N6130	50p
2N6133	20p
2N6348	20p
2N6399	10p
2SA437	20p
2SA673P	10p
2SA844P	10p
2SC643A	£1.00
2SA992	10p
2SB474	30p
2SB566	10p
2SB686	75p
2SC515A	£1.00
2SC772	20p
2SC381	10p
2SC458	50p
2SC491	50p
2SC732	10p
2SC733	10p
2SC940	£1.00
2SC1030	£1.00
2SC1061	30p
2SC1162 C/18	30p
2SC1514	30p
2SC1520	25p
2SC1546	20p
2SC1617	£1.00
2SC1725	20p
2SC1740	20p
2SC1756	50p
2SC1942	£1.00
2SC2068	20p
2SC2073	8p
2SC2229	15p
2SC2688	20p

2SC3795	30p
2SC3973B	30p
2SC7350	15p
2SD180 TO3 80v/6A	15p
2SD200	£2.00
2SD401	£1.00
2SD716	£1.00
2SD787	30p
2SD789	30p
2SD820	£1.00
2SD868	75p
2SD880	30p
2SD1264	£1.00
2SD1266	£1.00
2SD1415	£1.00
2SD1427	£1.00
2SD1432	£1.00
2SD1576	£1.00
2SD1577	£2.00
2SD1878	£1.00
2SK30A	10p
BC107	10p
BC108	10p
BC109	5p
BC113	10p
BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	25p
BC171	5p
BC172	5p
BC173	5p
BC174	5p
BC183	5p
BC184	5p
BC204	5p
BC207	5p
BC212	5p
BC213	5p
BC214	5p
BC237	5p
BC238	5p
BC239	5p
BC250	5p
BC251	5p
BC252	5p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p

BC368	10p
BC369	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BC636	10p
BCX31	25p
BCX32	25p
BD116	25p
BD124	30p
BD124 (metal)	30p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD140	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	30p
BD204	30p
BD207	60p
BD221	20p
BD222	20p
BD228	30p
BD226	20p
BD233	30p
BD234	25p
BD235	30p
BD238	30p
BD239	15p
BD240	50p
BD243c	30p
BD244	50p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD373b	20p
BD416	25p
BD433	25p
BD437	25p
BD438	30p
BD139	30p
BD439	50p
BD544D	40p
BD650	50p
BD678	30p
BD681	30p
BD682	30p
BD507	50p
BD508	30p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p