SEPTEMBER 1989

Australia $3·25, New Zealand $4·80 (inc. GST), Malaysia $6·30, Ireland £IR2·31 (inc. VAT)

£1·50

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS

Extra: SEME-Panasonic Video Spares Chart

Dealing with Video Tape Chewing

Repairing Remote Control Units

More on the Panasonic NV333

The Sakura Satellite TV System

Servicing the Salora G Chassis

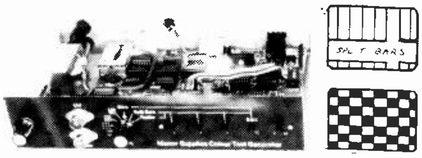
VCR Clinic • TV Fault Finding

09
9 770032 647009

MANOR SUPPLIES

MKV PAL COLOUR TEST GENERATOR FOR DOMESTIC TV & VCR.

TEST DEMONSTRATIONS AT 172 WEST END LANE

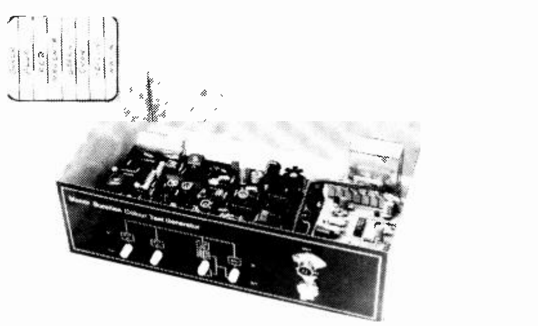


★ 40 different patterns and variations.
★ Fully interlaced sync pulses with correct picture blanking.
★ EBU colour bars, BBC colour bars, whole rasters & split bars (specially useful for VCR service), white, yellow, cyan, green, magenta, red, blue and black.
★ Chequerboard.
★ Mono outputs with border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

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

Post/Packing £3.00
Add VAT 15% TO ALL PRICES

PAL COLOUR BAR GENERATOR (Mk4)



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

PRICE OF MK 4 COLOUR BAR GENERATOR KIT £30.00. CASE £8.60. BATT HOLDERS £4.20. MAINS SUPPLY KIT £4.20 (Combined P&P £3.00).

MK 4 (BATTERY) BUILT & TESTED £58.00 + £3.00 P & P.
MK 4 (MAINS) BUILT & TESTED £68.00 + £3.00 P & P.
VHF MODULATOR (CH 1 to 4) FOR OVERSEAS £5.75.
EASILY ADAPTED FOR VIDEO OUTPUT & C.C.T.V.

ADD VAT 15%

KITS & PROJECTS

SAW IF AND TUNER UNIT complete and tested for video & audio outputs **£28.50** p.p. £1.80.
PAL DECODER KIT (Video to RGB) for Monitors **£27.00** p.p. £1.00.
PAL ENCODER KIT (RGB to Video) **£18.50** p.p. £1.30.
CROSS HATCH UNIT KIT, Aerial Input type, incl. T.V. sync. and UHF Modulator, Battery Operated, also gives Peak White & Black Levels, can be used for any set. **£13.50** p.p. 80p. (Alum. Case **£3.20** p.p. £1.40.)
ADDITIONAL GREY SCALE Kit **£2.90** p.p. 45p.
UHF SIGNAL STRENGTH METER KIT £30.00 Alum. Case **£3.20**. De Luxe Case **£8.60** (Built & Tested **£48.00**) p.p. £2.50.
CRT TESTER & REACTIVATOR KIT For Colour & Mono complete with Case, Panel Meter Indicator – can be adapted for latest CRTs **£35.00** p.p. £3.00.

TV SERVICE SPARES

PHILIPS SPARES

G8 VARICAP CONTROL £2.50 p.p. £1.00.
G8 PANELS (Tested) Power **£12.50**, Scan **£15.00**, Signals **£15.00** p.p. £2.50.
KT3, K30 PANELS, tested, exchange, sound, power, bridge rect, frame, RGB **£7.50** each. Decoder (Non-text) **£10.00** p.p. £1.50.
G11 TDA2600 IC HOLDER 70p p.p. 30p.
G11 PANELS (tested), frame, IF, decoder **£12.50** each. p.p. £2.00. Scan **£15.00** p.p. £2.80. Power tested exchange **£18.00** p.p. £2.80.
G11 PANELS EX-RENTAL (untested) Scan, Frame, Decoder **£2.50** p.p. £2.00.
G11 IF PANEL (new) less Tuner **£2.50** p.p. £1.30.
G11 8POS Touch Tune Channel Selector (replaces old type) incl. instructions **£25.00** p.p. £1.80
G9 POWER SUPPLY UNIT £5.00 p.p. £2.30.
HANDSETS EX-RENTAL, TEXT UNTESTED. KT. TEXT/VIDEO TYPE £3.50 p.p. £1.00.
MANUALS p.p. 80p. K35, 2A, 2B, CP90 **£3.50**, KT3 **£4.50**, CTX-E, CTX-S, CF1 **£1.50**. KT4, K40, 3A **£4.50** p.p. £2.50.

THORN/FERGUSON SPARES

8000, 8500, 8800, 9800 PANELS tested, exchange, **£8.80**, Frame. Decoder **£10.00** p.p. £2.30.
9000 Series IF/Decoder tested **£10.00**, Line/Power **£20.00**, Frame **£18.00** p.p. £2.80.
9500/9600 Line Scan **£25.00**, Power **£20.00** p.p. £2.80.
TX9 Panels complete & tested **£28.00** exchange (shop only)
TX9/TX10 Facia, control panel incl. infra-red receiver **£5.00** p.p. £2.00
TX10 Focus control **£8.50** p.p. £1.00.
TX9/TX10 Saw filter IF panel **£5.00** p.p. 80p.
TX9/TX10 Remote & tuning control panel 1515 (incl. SAA5012) **£7.50** p.p. £1.80.
TX9/10 Remote & tuning 1508A (incl. SAA5012) **£2.50** p.p. £1.80.
TX9/10 Remote & tuning 1536 (incl. SAA5012, SL471) **£3.50** p.p. £1.80.
TX Sweep Tune 1509G (incl. UAA1008 + BATT.) **£3.50** p.p. £1.80.
TX10 Stereo Audio Board **£3.50** p.p. £1.80.
TX90 20″ Chassis. Brand new **£25.00** p.p. £2.80.
TX10/TX90/TX100 Chassis complete & boxed (untested) **£20.00** p.p. £2.80.

IC SELECTION

LA7800	£1.80	SL1430	£1.80	TDA1170	£2.20	TDA2594	£3.80	TDA3571	£4.80
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ML238	£6.80	STK5471	£6.50	TDA1701	£3.80	TDA2653A	£3.20	TDA3653A	£5.90
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SAA5012	£5.80	STR6020	£5.80	TDA2522	£3.80	TDA3301	£6.80	TDA4600	£2.80
SAA5020	£5.80	TBA120	£1.20	TDA2548	£5.80	TDA3330	£3.50	TDA4601	£2.80
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SAB3037	£15.80	TCA270	£1.80	TDA2577A	£4.80	TDA3541	£3.50	TDA9403	£3.80
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SAF1039	£2.20	TDA10351	£2.40	TDA2579	£3.80	TDA3561A	£5.80	TDA9513	£4.80
SL470/471	£2.80	TDA1037	£1.90	TDA2581	£2.20	TDA3562A	£5.80	TEA1009	£2.20
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PHILIPS K30, K35	**£22.50**
PHILIPS CTX-E.S	**£22.50**
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TELEVISION

September 1989 **Vol. 39, No. 11**
Issue 467

On sale August 16th

this month

OUR NEXT ISSUE DATED OCTOBER WILL BE PUBLISHED ON SEPTEMBER 20

CORRESPONDENCE
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BF871	22p
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BF961	35p
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BT106	160p
BT109	90p
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BT146	99p
BT151	58p
BTY79	140p
BU100A	110p
BU104	100p
BU105	80p
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BU180	150p
BU184	100p
BU204	75p
BU205	70p
BU206	100p
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BU209	140p
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BU312	120p
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BU407	60p
BU407D	95p
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BU408D	95p
BU409	95p
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BU508A	85p
BU508D	90p
BY536	150p
BU526	80p
BU546	140p
BU608	150p
BU626	150p
BU636	150p
BU801	95p
BU806	80p
BU807	75p
BU902	130p
BU903	130p
BU920	130p
BU921	130p
BU922	130p
BU930	130p
BUT11A	90p
BUT56A	250p
BUX80	180p
BUX82	180p
BUX84	50p
BUX85	50p
BUY69A	200p
BUY71	300p
C106D	28p
J174	38p
J300	50p
MEO411	38p
MEO414	125p
ME3001	12p
ME4103	12p
ME6001	12p
ME6002	15p
ME8001	15p
ME9021	12p
MJ802	350p
MJ900	200p
MJ1000	200p
MJ1001	200p
MJ10012	300p
MJ15001	325p
MJ15002	300p
MJ15003	325p
MJ15004	370p
MJ15022	400p
MJ2501	110p
MJ2955	55p
MJ3000	115p
MJ3001	115p
MJE29A	30p
MJE30A	30p
MJE340	25p
MJE350	80p
MJE520	30p
MJE2955K	90p
MP8111	40p
MP8112	45p
MP8113	55p
MP8512	50p
MPS6571	20p
MPS9012	20p
MPS9013	20p
MPS9014	20p
MPS9015	20p
MPSA05	15p
MPSA06	15p
MPSA13	15p
MPSA20	15p
MPSA42	15p
MPSA43	15p
MPSA65	25p
MPSA66	25p
MPSA70	15p
MPSA92	20p
MPSA93	20p
MR510	35p
MR856	36p
OC28	250p
OC29	250p
OC35	250p
OC36	250p
OC45	50p
OC71	30p
OC72	50p
OC200	180p
OT121	120p
R2008B	100p
R2010B	100p

S2800D	52p
S2800M	72p
T2800D	52p
T2800M	72p
TIP29	15p
TIP29A	22p
TIP29C	25p
TIP30	25p
TIP30C	30p
TIP31A	24p
TIP31C	30p
TIP32	24p
TIP32A	24p
TIP32C	28p
TIP33	50p
TIP33C	60p
TIP34	50p
TIP34C	60p
TIP35C	65p
TIP36C	65p
TIP41A	22p
TIP41C	25p
TIP42A	22p
TIP42C	25p
TIP47	40p
TIP48	40p
TIP49	45p
TIP50	60p
TIP51	120p
TIP52	120p
TIP53	120p
TIP54	140p
TIP105	65p
TIP106	65p
TIP107	65p
TIP110	47p
TIP111	50p
TIP112	40p
TIP115	45p
TIP116	45p
TIP117	50p
TIP120	43p
TIP121	48p
TIP122	47p
TIP125	47p
TIP126	56p
TIP127	58p
TIP130	30p
TIP131	30p
TIP132	30p
TIP141	90p
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
VN.10KM	60p
VN 66AF	100p
VN.88AF	115p
ZTX107	11p
ZTX108	11p
ZTX109	12p
ZTX212	27p
ZTX300	13p
ZTX301	18p
ZTX302	16p
ZTX303	24p
ZTX304	17p
ZTX320	29p
ZTX500	13p
ZTX501	13p
ZTX502	18p
ZTX503	18p
ZTX504	25p
ZTX550	24p
2N.696	26p
2N.697	22p
2N.698	40p
2N.706	22p
2N.708	22p
2N.914	28p
2N.930	18p
2N 1131	28p
2N.1132	28p
2N.1613	24p
2N 1711	24p
2N.1893	30p
2N.2102	50p
2N.2218A	24p
2N.2219	24p
2N.2221	23p
2N.2222	23p
2N.2369	15p
2N.2484	20p
2N.2646	40p
2N.2904	20p
2N.2905	20p
2N.2906	18p
2N.2907	18p
2N.2926	8p
2N.3019	28p
2N.3053	18p
2N.3054	40p
2N.3055	38p
2N.3055H	50p
2N.3440	58p
2N.3442	85p
2N.3583	90p
2N.3585	120p
2N.3702	9p
2N.3703	9p
2N.3704	9p
2N.3705	9p
2N.3706	9p
2N.3707	9p
2N.3708	9p
2N.3710	12p
2N.3711	12p
2N.3771	85p
2N.3772	90p
2N.3773	110p
2N.3799	18p
2N.3819	29p
2N.3866	68p
2N.3903	11p
2N.3904	11p
2N.3905	11p
2N.3906	11p
2N.4031	25p
2N.4036	25p
2N.4037	25p
2N.4062	12p
2N.4064	100p
2N.4401	12p
2N.4403	12p
2N.4443	76p
2N.4444	76p
2N.5061	20p
2N.5088	20p
2N.5163	45p
2N.5192	50p
2N.5241	500p
2N.5245	45p
2N.5294	30p
2N.5296	30p
2N.5320	90p

2N.5321	60p
2N.5366	25p
2N.5401	12p
2N.5448	12p
2N.5496	80p
2N.6107	40p
2N.6109	40p
2N.6254	110p
2N.6292	40p
2N.6384	120p
2N.6385	120p
2N.6403	160p
3N.143	65p
DIODES	
Rectifier Diodes	
AA119	9p
BY100	40p
BY103	32p
BY126	6p
BY127	8p
BY133	8p
BY164	40p
BY179	35p
BY184	32p
BY196	20p
BY206	11p
BY207	11p
BY208	18p
BY210	22p
BY225	120p
BY226	18p
BY227	19p
BY228	32p
BY296	20p
BY298	28p
BY299	28p
BYX10	15p
BYX55/350	30p
BYX55/600	30p
BYX70/500	32p
BYX70/800	36p
OA47	6p
OA90	6p
OA91	8p
OA200	7p
OA202	7p
IN.914	2p
IN.4001	4p
IN.4002	4p
IN 4003	4p
IN.4004	4p
IN.4005	4p
IN.4006	4p
IN.4007	5p
IN.4148	2p
IN.5400	9p
IN.5401	10p
IN.5402	10p
IN.5403	11p
IN.5404	11p
IN.5405	12p
IN.5406	13p
IN.5407	13p
IN.5408	13p
SKE4F2/06	50p
SKE4F2/08	70p
SKE4F2/10	90p
I.C. SOCKETS	
8pin	6p
14pin	8p
16pin	9p
18pin	12p
20pin	14p
22pin	15p
24pin	18p
28pin	20p
40pin	25p
ZENER	
400MV BYZ88 RANGE 2V7 to 39V	6p
1.3W BZX61 RANGE 2V7 to 39V	12p
CRYSTALS	
Freq in MHZ	
1.00	260p
2.00	200p
2.45670	180p
2.5	200p
3.276	115p
3.5795	95p
4.0	110p
4.194	130p
4.43	95p
4.9152	150p
5.0	130p
6.0	115p
8.0	125p
8.867	125p
10.0	140p
11.0	250p
12.0	120p
14.0	125p
14 756	200p
15.0	160p
16.0	130p
18.0	130p
18.432	130p
24.0	250p
48.0	160p
VOLTAGE REGULATORS	
7805	35p
7806	35p
7808	35p
7812	35p
7815	35p
7818	35p
7824	35p
7905	35p
7906	40p
7908	40p
7912	40p
7915	40p
7918	40p
7924	40p
78L05	28p
78L08	28p
78L12	28p
78L15	28p
78L18	28p
78L24	28p
79L05	40p
79L08	40p
79L12	40p
79L15	40p
7818KC	100p
7824KC	100p
LM309K	100p
LM317K	220p
LM317T	180p
LM323K	420p
LM723	40p
78HGKC	570p
78HO5KC	800p
78H12KC	700p

78GU1C	190p
79GU1C	215p
79HGKC	800p
VALVES	
DAF96	60p
DF96	50p
DL92	60p
DY86	50p
DY87	60p
DY802	75p
EABC80	60p
EB91	44p
EBF80	45p
EBF89	50p
ECC82	80p
ECC83	80p
ECC84	70p
ECC85	80p
ECH81	100p
ECH84	70p
ECL80	65p
ECL82	80p
ECL84	70p
ECL85	70p
ECL86	90p
EF80	65p
EF85	65p
EF89	85p
EF183	75p
EF184	85p
EL34	250p
EL36	90p
EL84	75p
EL95	85p
EL500	100p
EL504	130p
EY86	45p
EY87	45p
EY88	65p
EZ35	65p
EZ80	70p
EZ81	55p
GZ34	200p
PC97	100p
PCC85	60p
PCF80	80p
PCF200	135p
PCF801	110p
PCF802	80p
PCF806	115p
PCH200	100p
PCL81	62p
PCL82	80p
PCL84	50p
PCL85	80p
PCL86	80p
PCL805	80p
PFL200	110p
PL36	120p
PL82	60p
PL83	60p
PL84	80p
PL95	180p
PL500	110p
PL504	120p
PL508	200p
PL519	450p
PY81	90p
PY88	70p
PY500A	190p
L.E.D.'S	
LED 3MM RED	5p
LED 3MM YEL	10p
LED 3MM GRN	10p
LED 5MM RED	5p
LED 5MM YEL	10p
LED 5MM GRN	10p
RECTANG. L.E.D.'s	
RED	10p
GREEN	15p
YELLOW	15p
LINEAR IC'S	
AN-203	210p
AN-210	165p
AN-214Q	170p
AN-228	280p
AN-236	235p
AN-240P	150p
AN-241	135p
AN-245	290p
AN-247	230p
AN-252	150p
AN-259	250p
AN-262	140p
AN-271	230p
AN-272	480p
AN-274	250p
AN-301	330p
AN-303	250p
AN-304	360p
AN-305	320p
AN-315	210p
AN-316	350p
AN-318	460p
AN-360	100p
AN-362	140p
AN-366	150p
AN-610	160p
AN-612	160p
AN-5151	600p
AN-5612	400p
AN-5620	330p
AN-5712	350p
AN-5722	140p
AN-5730	160p
AN-5732	160p
AN-5753	170p
AN-6135	150p
AN-6300	600p
AN-6320	300p
AN-6330	380p
AN-6341	350p
AN-6344	440p
AN-6350	610p
AN-6359	810p
AN-6360	400p
AN-6362	480p
AN-6371	510p
AN-6387	560p
AN-6677	550p
AN-6811	130p
AN-6876	270p
AN-6884	240p
AN-7105	210p
AN-7110	130p
AN-7114	150p
AN-7115	150p
AN-7116	130p
AN-7120	130p
AN-7130	110p
AN-7222	300p
AN-7310	90p
AN-7311	90p
AN-7410	250p
AN-7420	250p
AN-7140	450p
AN-7145	195p
AN-7146	210p
AN-7154	180p
AN-7156	240p
AN-7158	310p
AN-7168	260p

AN-7178	270p
AY3-1015	290p
AY3-1270	800p
AY3-1350	450p
AY3-8910	360p
AY3-8912	400p
BA-301	65p
BA-311	80p
BA-313	60p
BA-333	100p
BA-340	150p
BA-401	60p
BA-402	60p
BA-511	160p
BA-514	160p
BA-516	150p
BA-521	160p
BA-524	240p
BA-526	220p
BA-527	95p
BA-532	140p
BA-534	290p
BA-536	180p
BA-546	180p
BA-612	160p
BA-656	150p
BA-658	380p
BA-684	400p
BA-685	400p
BA-1310	160p
BA-1320	110p
BA-1330	160p
BA-1360	160p
BA-4403	220p
BA-5101	400p
BA-5102	250p
BA-5204	200p
BA-5402	250p
BA-5406	280p
BA-5408	220p
BA-6104	250p
BA-6135	250p
BA-6208	250p
BA-6209	320p
BA-6304	190p
BA-6305	200p
BA-6410	220p
BA-6411	250p
BA-6993	150p
BA-7001	150p
BA-7004	200p
BA-7007	200p
BA-7021	180p
BA-7022	350p
BA-7752	250p
BA-7755	150p
BA-8420	350p
CA-3011	110p
CA-3012	160p
CA-3028A	95p
CA-3046	60p
CA-3048	190p
CA-3052	190p
CA-3054	95p
CA-3059	300p
CA-3060	280p
CA-3065	210p
CA-3080E	60p
CA-3085	135p
CA-3086	55p
CA-3088E	200p
CA-3089E	150p
CA-3089Q	250p
CA-3130E	80p
CA-3130S	100p
CA-3134E	280p
CA-3140E	38p
CA-3160	85p
CA-3161E	140p
CA-3162E	450p
CA-3189E	230p
CA-3193E	230p
CA-3240E	90p
CA-3260E	170p
CA-3290E	150p
ER-1400	200p
HA-1125	150p
HA-1137W	135p
HA-1144	380p
HA-1156	110p
HA-1197	150p
HA-1199	145p
HA-1319	240p
HA-1338	300p
HA-1339A	350p
HA-1366WR	160p
HA-1367	300p
HA-1368	160p
HA-1372	300p
HA-1374	230p
HA-1377	200p
HA-1388	320p
HA-1389	210p
HA-1392	230p
HA-1394	280p
HA-1397	250p
HA-1398	240p
HA-1452	120p
HA-1457	120p
HA-11219	280p
HA-11221	210p
HA-11223	340p
HA-11225	170p
HA-11226	410p
HA-11235	170p
HA-11251	240p
HA-11423	210p
HA-11714	400p
HA-11724	800p
HA-12002	300p
HA-12003	250p
HA-12005	400p
HA-12017	130p
HA-13001	260p
HA-13002	250p
HA-13006	400p
HA-13007	400p
HA-13108	350p
HA-13412	600p
HA-13432	400p
HA-17301	250p
HA-17458	100p
HA-17524	250p
HA-17555	100p
HA-17558	100p
HA-17723	150p
HA-17747	150p
HA-17805	100p
HA-17806	100p
HA-17807	100p
HA-17808	100p
HA-17901	150p
HA-17902	150p
HA-17904	150p
ICL-7106	650p
ICL-7107	950p
ICL-7611	90p
ICL-7660	240p
ICM-7555	60p
ICM-7556	130p
KA-2206	150p
KA-2210	230p
KA-2212	80p
KA-2213	130p
KA-2261	100p

LA-1130	240p
LA-1150	150p
LA-1185	150p
LA-1201	75p
LA-1210	140p
LA-1222	80p
LA-1230	130p
LA-1231	210p
LA-1364	200p
LA-1365	120p
LA-1368	220p
LA-1385	170p
LA-1460	220p
LA-2000	150p
LA-2101	270p
LA-2200	190p
LA-3101	160p
LA-3160	120p
LA-3201	80p
LA-3210	65p
LA-3220	100p
LA-3300	140p
LA-3301	110p
LA-3350	110p
LA-3361	100p
LA-3375	300p
LA-4030	180p
LA-4031	140p
LA-4032	140p
LA-4051	160p
LA-4100	85p
LA-4101	80p
LA-4102	120p
LA-4110	120p
LA-4112	120p
LA-4120	270p
LA-4125	200p
LA-4126	240p
LA-4135	250p
LA-4137	130p
LA-4140	70p
LA-4160	220p
LA-4180	300p
LA-4182	190p
LA-4190	300p
LA-4192	130p
LA-4200	130p
LA-4201	120p
LA-4220	120p
LA-4260	230p
LA-4261	300p
LA-4270	300p
LA-4420	140p
LA-4422	130p
LA-4430	130p
LA-4440	230p
LA-4445	230p
LA-4460	170p
LA-4461	170p
LA-4500	230p
LA-4505	260p
LA-4507	360p
LA-4508	260p
LA-4510	160p
LA-4520	230p
LA-4530	250p
LA-4540	300p
LA-4550	200p
LA-4555	220p
LA-4560	300p
LA-4570	300p
LA-5112	120p
LA-5523	150p
LA-5527	150p
LA-5700	300p
LA-6324	200p
LA-6358	100p
LA-7011	220p
LA-7031	250p
LA-7033	400p
LA-7040	280p
LA-7042	280p
LA-7046	300p
LA-7224	150p
LA-7230	500p
LA-7505	250p
LA-7506	250p
LA-7507	250p
LA-7508	250p
LA-7520	500p
LA-7620	500p
LA-7621	500p
LA-7751	450p
LA-7755	300p
LA-7770	300p
LA-7800	180p
LA-7801	280p
LA-7802	300p
LA-7806	260p
LA-7808	250p
LA-7810	300p
LA-7811	300p
LA-7820	250p
LA-7822	280p
LA-7823	280p
LA-7910	150p
LA-7920	150p
LC-7131	260p
LC-7132	400p
LC-7137	450p
LF-347	110p
LF-351	45p
LF-353	48p
LF-355	60p
LF-356	60p
LF-357	70p
LF-398	300p
LM-301	26p
LM-307	42p
LM-308CN	70p
LM-311	35p
LM-318	120p
LM-319	165p
LM-324	35p
LM-334Z	115p
LM-335Z	120p
LM-337	250p
LM-339	37p
LM-348	55p
LM-358	45p
LM-377	220p
LM-380	100p
LM-381	150p
LM-382	130p
LM-384	130p
LM-386	85p
LM-387	100p
LM-392	100p
LM-393	55p
LM-709DIL	30p
LM-710	45p
LM-711	85p
LM-723	40p
LM-733	60p
LM-741DIL	18p
LM-741MET	45p
LM-747	58p
LM-748	35p
LM-1458	33p
LM-1889	400p
LM-3900	40p
LM-3909	80p
LM-3911	160p
LM-3914	250p
LM-3915	255p
LM-3916	290p
M-51102	290p

M-51514	160p
M-51515BL	220p
M-51516	260p
M-51518	200p
MB-3515	240p
MB-3614	180p
MB-3712	140p
MB-3713	130p
MB-3714	270p
MB-3715	250p
MB-3722	310p
MB-3730	200p
MB-3731	300p
MB-3756	230p
MB-3759	200p
MB-8719	360p
MC-1310P	130p
MC-1455	45p
MC-1458	33p
MC-1469	290p
MC-1488	65p
MC-1489	65p
MC-1496	65p
MC-3302	70p
MC-3401	45p
MC-3403	60p
MC-3423	75p
NE-531	115p
NE-544	170p
NE-555	20p
NE-556	40p
NE-565	110p
NE-566	130p
NE-567	115p
NE-570	360p
NE-571	290p
NE-592	85p
NE-5532P	140p
NE-5534P	110p
SAS-560	110p
SAS-570	110p
SAA-1006	300p
SAA-1008	450p
SAA-1009B	350p
SAA-1010	400p
SAA-1020	450p
SAA-1024	250p
SAA-1025	250p
SAA-1016T	400p
SAA-1075	350p
SAA-1094	350p
SAA-1121	600p
SAA-1124	200p
SAA-1174	300p
SAA-1220	400p
SAA-1250	280p
SAA-1251	380p
SAA-1272C	280p
SAA-1274	280p
SAA-3004	400p
SAA-5000	200p
SAA-5010	220p
SAA-5012	400p
SAA-5020	350p
SAA-5030	440p
SAA-5040A	280p
SAA-5040B	400p
SAA-5050	420p
SAB-3013	200p
SAB-3022	600p
SAB-3023	500p
SAB-3035	600p
STA-301A	380p
STA-312	280p
STA-401A	380p
STA-403A	300p
STA-432A	250p
STA-434A	300p
STA-435A	300p
STA-441C	250p
STA-901M	300p
STK-0025	420p
STK-0029	430p
STK-0039	410p
STK-0040	560p
STK-0049	570p
STK-0050	570p
STK-0059	620p
STK-0060	900p
STK-0070	1100p
STK-0080	690p
STK-011	370p
STK-015	490p
STK-016	800p
STK-025	700p
STK-043	980p
STK-056	820p
STK-077	600p
STK-078	620p
STK-080	710p
STK-082	720p
STK-084	740p
STK-086	910p
STK-420	400p
STK-430	500p
STK-433	490p
STK-435	510p
STK-436	490p
STK-437	600p
STK-439	550p
STK-441	740p
STK-443	740p
STK-457	580p
STK-459	610p
STK-460	720p
STK-461	720p
STK-463	780p
STK-465	800p
STK-501	580p
STK-561	550p
STK-563	480p
STK-583	600p
STK-734B	510p
STK-745	600p
STK-760	600p
STK-772B	480p
STK-780	650p
STK-1039	550p
STK-1040	700p
STK-1049	800p
STK-1050	750p
STK-1060	760p
STK-1070	1200p
STK-1080	1000p
STK-2025	800p
STK-2028	650p
STK-2029	500p
STK-2038	900p
STK-2048	1000p
STK-2110	680p
STK-2120	820p
STK-2125	650p
STK-2129	610p
STK-2139	800p
STK-2155	1000p
STK-2230	580p
STK-2240	920p
STK-2250	920p
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STK-3062	600p
STK-3082	700p
STK-3083	550p
STK-3156	560p
STK-4017	450p

STK-4021	425p
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STK-4026	800p
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STK-4036	500p
STK-4038	680p
STK-4044	1000p
STK-4046	1100p
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STK-4101	650p
STK-4111	650p
STK-4112	950p
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STK-4142	800p
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STK-4152	950p
STK-4161	820p
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STK-4171	1000p
STK-4181	820p
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STK-4192	1000p
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STK-4311	800p
STK-4332	500p
STK-4352	700p
STK-4362	625p
STK-4372	600p
STK-4392	720p
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STK-4833	920p
STK-4843	865p
STK-4853	950p
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TA-7283	260p
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TBA-820	65p
TBA-820M	50p
TBA-920	120p
TBA-950	120p
TBA-990	120p
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TCA-830	90p
TCA-940	100p
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TDA-1420	200p
TDA-1470	140p
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TDA-1522	200p

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TDA-1670A	300p
TDA-1701	320p
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TDA-1870A	300p
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TDA-2640	220p
TDA-2653A	350p
TDA 2654	250p
TDA-2670	150p
TDA-2690	100p
TDA-2760	400p
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TDA-3501	400p
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TDA-8190	280p
TDA-8440	380p
TDA-9403	250p
TDA-9503	240p
TDA-9513	350p

LINEAR IC'S — Cont.

TEA-1002	650p
TLO-61	40p
TLO-64	80p
TLO-71	38p
TLO-72	55p
TLO-74	92p
TLO-81	40p
TLO-82	46p
TLO-83	67p
TLO-84	80p
ULN-2002	70p
ULN-2003	69p
ULN-2004	69p
ULN-2068	270p
ULN-2803	130p
ULN-2804	170p
UPC-16C	160p
UPC-20C	220p
UPC-554	130p
UPC-555	60p
UPC-556H	80p
UPC-566	60p
UPC-571	220p
UPC-574	60p
UPC-575C2	90p
UPC-576	200p
UPC-577	64p
UPC-580	300p
UPC-592	95p
UPC-595	190p
UPC-596	190p
UPC-1001	220p
UPC-1018	170p
UPC-1020	200p
UPC-1023	60p
UPC-1025	230p
UPC-1026	95p
UPC-1028	90p
UPC-1031H2	180p
UPC-1032	60p
UPC-1158H2	70p
UPC-1167CL	170p
UPC-1181	110p
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UPC-1183	200p
UPC-1185H2	230p
UPC-1186	80p
UPC-1187	150p
UPC-1188H	400p
UPC-1197	140p
UPC-1200	325p
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UPC-1230	210p
UPC-1238	120p
UPC-1263	230p
UPC-1277	240p
UPC-1278	240p
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UPC-1365	320p
UPC-1368H	425p
UPC-1373	85p
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UPC-1403CA	750p
UPC-1420CA	500p
UPC-1458	100p
UPC-1470	200p
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UPC-1505C	400p
UPC-1517CA	400p
UPC-1525C	400p
UPC-1536C	550p
UPC-1571C	300p
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ZN-435	340p
ZN-448	510p
ZN-459	190p
ZN-1034	170p
ZN-1040	640p
ZNA-134H2	150p
ZNA-234E	920p

JAPANESE TRANSISTORS

2SA-473	35p
2SA-490	60p
2SA-505	120p
2SA-509	120p
2SA-550	150p
2SA-562	50p
2SA-603	100p
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2SA-608	15p
2SA-634	60p
2SA-636	50p
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2SA-673	20p
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2SC-1775	20p
2SC-1781	65p
2SC-1789	100p
2SC-1809	40p
2SC-1815	15p
2SC-1819	140p
2SC-1826	60p
2SC-1827	120p
2SC-1845	20p
2SC-1846	100p
2SC-1847	120p
2SC-1855	85p
2SC-1870	700p
2SC-1875	260p
2SC-1881	210p
2SC-1890	45p
2SC-1904	125p
2SC-1906	30p
2SC-1907	75p
2SC-1909	250p
2SC-1913	190p
2SC-1921	60p
2SC-1923	25p
2SC-1929	180p
2SC-1940	110p
2SC-1941	40p
2SC-1942	190p
2SC-1944	350p
2SC-1945	350p
2SC-1946	1500p
2SC-1947	450p
2SC-1957	70p
2SC-1959	20p
2SC-1969	160p
2SC-1970	200p
2SC-1971	400p
2SC-1972	600p
2SC-1973	150p
2SC-1983	130p
2SC-1984	150p
2SC-1985	120p
2SC-1986	160p
2SC-2001	60p
2SC-2002	40p
2SC-2003	25p
2SC-2004	60p
2SC-2021	40p
2SC-2022	200p
2SC-2023	180p
2SC-2026	60p
2SC-2027	450p
2SC-2028	75p
2SC-2029	120p
2SC-2053	120p
2SC-2055	150p
2SC-2056	450p
2SC-2058	40p
2SC-2060	60p
2SC-2068	90p
2SC-2071	140p
2SC-2073	70p
2SC-2075	80p
2SC-2078	95p
2SC-2081	950p
2SC-2085	100p
2SC-2086	60p
2SC-2120	60p
2SC-2131	550p
2SC-2141	150p
2SC-2166	80p
2SC-2168	175p
2SC-2199	600p
2SC-2221	650p
2SC-2228A	60p
2SC-2229	25p
2SC-2230	80p
2SC-2233	100p
2SC-2235	60p
2SC-2236	30p
2SC-2237	600p
2SC-2238	70p
2SC-2240	25p
2SC-2258	120p
2SC-2259	80p
2SC-2271	60p
2SC-2274	40p
2SC-2275	50p
2SC-2278	120p
2SC-2290	1800p
2SC-2291	125p
2SC-2295	60p
2SC-2298	120p
2SC-2307	500p
2SC-2308	40p
2SC-2312	300p
2SC-2314	70p
2SC-2320	40p
2SC-2324	120p
2SC-2329	480p
2SC-2331	150p
2SC-2333	200p
2SC-2334	240p
2SC-2335	120p
2SC-2344	150p
2SC-2347	60p
2SC-2353	120p
2SC-2360	120p
2SC-2361	160p
2SC-2362	50p
2SC-2369	100p
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2SC-2373	210p
2SC-2389	45p
2SC-2407	110p
2SC-2408	120p
2SC-2412K	50p
2SC-2413	50p
2SC-2458	40p
2SC-2459	50p
2SC-2470	65p
2SC-2481	120p
2SC-2482	40p
2SC-2483	120p
2SC-2484	240p
2SC-2500	80p
2SC-2519	60p
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2SC-2568	120p
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2SC-2577	125p
2SC-2578	220p
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2SC-2580	240p
2SC-2581	290p
2SC-2591	140p
2SC-2592	200p
2SC-2603	40p
2SC-2610	85p
2SC-2611	40p
2SC-2621	90p
2SC-2625	380p
2SC-2626	600p
2SC-2631	65p
2SC-2634	45p
2SC-2635	450p
2SC-2636	50p
2SC-2654	180p
2SC-2655	75p
2SC-2656	550p
2SC-2660	150p
2SC-2671	120p
2SC-2681	270p
2SC-2682	120p
2SC-2688	70p
2SC-2690	120p
2SC-2705	70p
2SC-2719	80p
2SC-2721	120p
2SC-2738	200p
2SC-2740	450p
2SC-2749	350p
2SC-2751	400p
2SC-2752	140p
2SC-2769	400p
2SC-2774	600p
2SC-2785	60p
2SC-2791	650p
2SC-2792	550p
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2SC-2810	360p
2SC-2812	40p
2SC-2814	40p
2SC-2834	400p
2SC-2837	360p
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2SC-2853	70p
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2SC-2877	120p
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2SC-2912	120p
2SC-2922	610p
2SC-2928	550p
2SC-2929	280p
2SC-2944	620p
2SC-2979	320p
2SC-2988	280p
2SC-2995	60p
2SC-3012	300p
2SC-3019	320p
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2SC-3026	550p
2SC-3039	140p
2SC-3040	260p
2SC-3042	300p
2SC-3060	900p
2SC-3057	150p
2SC-3068	60p
2SC-3070	120p
2SC-3077	120p
2SC-3114	40p
2SC-3117	120p
2SC-3130	100p
2SC-3148	410p
2SC-3149	180p
2SC-3150	200p
2SC-3151	230p
2SC-3152	250p
2SC-3153	320p
2SC-3156	400p
2SC-3157	200p
2SC-3158	260p
2SC-3159	200p
2SC-3169	200p
2SC-3173	180p
2SC-3175	340p
2SC-3178	340p
2SC-3179	160p
2SC-3181	240p
2SC-3209	120p
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2SC-3246	70p
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2SC-4020	280p
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2SC-4262	50p
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2SD-201	260p
2SD-257	195p
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2SD-315	75p
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2SD-330	110p
2SD-348	460p
2SD-357	40p
2SD-358	40p
2SD-371	240p
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2SD-381	80p
2SD-388	170p
2SD-389	90p
2SD-400	20p
2SD-401	50p
2SD-402	120p
2SD-415	120p
2SD-424	400p
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2SD-438	45p
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2SD-526	70p
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2SD-555	500p
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2SD-571	80p
2SD-575	530p
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2SD-602	60p
2SD-612	100p
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2SD-636	30p
2SD-637	40p
2SD-638	60p
2SD-639	60p
2SD-640	350p
2SD-642	50p
2SD-655	60p
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2SD-666	70p
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2SD-668	120p
2SD-669	40p
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2SD-676	250p
2SD-716	115p
2SD-717	180p
2SD-718	100p
2SD-722	240p
2SD-725	400p
2SD-734	60p
2SD-741	120p
2SD-743	130p
2SD-756	100p
2SD-757	120p
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2SD-762	140p
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2SD-768	180p
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2SD-794	100p
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2SD-820	450p
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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	260p
2SD-856	80p
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2SD-863	60p
2SD-864	200p
2SD-866	120p
2SD-866A	140p
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2SD-871	450p
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2SD-882	80p
2SD-892A	100p
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2SD-1843	100p
2SD-1846	350p
2SD-1884	300p
2SD-1910	280p
2SD-1941	500p
2SD-1984	150p
2SJ-49	425p
2SJ-50	425p
2SJ-77	360p
2SK-19	45p
2SK-49	50p
2SK-55	100p
2SK-68	100p
2SK-134	415p
2SK-135	415p
2SK-147	160p
2SK-192	45p
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2SK-197	140p
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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
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BR352	35A/200V	200p
BR354	35A/400V	225p
BR356	35A/600V	230p
BR358	35A/800V	260p
BY164	1.5A/100V	40p
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TIC226D	—	8A/400V	68p
TIC236D	—	12A/400V	85p
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TIC253D	—	20A/400V	190p
TIC263D	—	25A/400V	205p
T2800D	—	8A/400V	52p

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C106D		4A/400V	28p
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TIC116D		8A/400V	70p
TIC116M		8A/600V	79p
TIC126D		12A/400V	75p
TIC126M		12A/600V	90p
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BR103			37p
BR303			85p
BT106			180p
BT116			80p
BT119			100p
OT121			120p
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TIC45			27p
TIC47			32p
17088			200p
17089			200p
17127			200p
15/80H			230p
15/85R			230p
SG613			850p

UHF TUNERS

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U341	500p
U342	500p

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6V	240p
9V	240p
12V CW	240p
12V CCW	240p
13.2V CW	290p
13.2V CCW	290p

CASSETTE TAPE HEADS

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STEREO HEAD	150p
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AUTO REVERSE HEAD	260p

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SONY ON/OFF SWITCHES	200p
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AKAI

VS-109/201/202/301/303	£24.00

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AMSTRAD

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VCR7000 360p

FERGUSON

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3V29-30, 3V31-32 280p
3V35-36, 3V38-39, 3V42-43, 3V44-45, 3V48, 280p
3V53, 3V54-55, 3V56-57, 3V58-59, 3V64-65, FV10-11, FV12-14

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VT61-62, VT63-64, VT65, VT86-88, 280p
VT110-122, VT120-128, VT130-135, VT138-150, VT168,-220
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HRD160, HRD225, HRD455, HRD565, HRD725

MITSUBISHI

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HS320, HS700

NATIONAL

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NV777, NV788
NV230, NV370, NV430, NV460, NV730, NV810, NV830, 280p
NV850, NV870, NV890, NV2000, NV2010, NV3000, NV7000, NV7200, NV7800, NV8600, NV8610, NV8620, NVG14
NVG7, NVG10, NVG12, NVG18 360p
NVG21, NVG25, NVH65 360p

PHILIPS

VR6460 280p

SANYO

VHR1100, VHR1300, VHR1500, VHR2300 360p
VTC5000, VTC5150, VTC5500, VTC9300, VTCM10, VTCM20 280p

SHARP

VC381, VC386, VC2300, VC3300, VC7300, VC7700, VC8300 360p
VC9100, VC9300, VC9500, VC9700
VC387, VC481, VC482, VC483, VC486, VC496, VC581 360p
VC582, VC583, VC585
VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787 360p
VC793, VCT72

SONY

SLC5, SLC6, SLC7 360p
SLC9, SLC20, SLC24, SLC30, SLC33, SLC44, SLHF100 360p
SLF1, SLF11, SLF25, SLF30, SLF60, SLF100

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VS-1	150p
VS-2EG	100p
VS-4	120p
VS-5EG	100p
VS-9300	160p
VS-9500	155p
VS-9700	160p
VS-9800	155p

AMSTRAD

TVR-1-2-3	210p
VCR-4600 & Mk 2	210p
VCR-4700	210p
VCR-5200	210p
VCR-7000	80p

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FERGUSON

3292, 3V00, 3V01150
3V16, 3V22, 3V2365
3V29/30120
3V31/3285
3V35/3680
3V38-3980
3V42/4365
3V44/4565
3V45/5465
3V5565

FISHER

VBS-7000245
VBS-9000120

HITACHI

VT-11, VT-33100
VT-5000120
VT-5500130
VT-800060
VT-850060
VT-930050
VT-950050
VT-970060

JVC

HR-3300, HR-3330,150
HR-3360, HR-3660,
HR-4100180
HR-720070
HR-760080
HR-761095
HR-765075
HR-765590
HR-770077
HRD-110, HRD-111,100
HRD-120, HRD-225
HRD-250, HRD-455,100
HRD-565, HRD-566, HRD-725,
HRD-755

MITSHUBISHI

HS-200200

NATIONAL

NV-300160
NV-333135
NV-777100
NV-2000150
NV-3000160
NV-700095
NV-720090
NV-8600160

PHILIPS

VR-6460170

SANYO

VTC-500075
VTC-5300100
VTC-550095
VTC-9300220

SHARP

VC-381/383/386125
VC-6300150
VC-7300/7700/7750150
VC-8300150
VC-8381, VC-9100125
VC-9300, VC-9500135

SONY

SL-C5, SL-C6140
SC-C7140
SC-C9165
SL-8000-8080200

TOSHIBA

V-55,/5785
V-5250/5280230
V-5480210
V-5475160
V-7540160
V-8600150
V-960085

VIDEO MOTORS

AMSTRAD

VCR-7000 REEL MOTOR1700

FERGUSON & JVC

CAPSTAN MOTOR2100
PU-45979
CAPSTAN MOTOR1950
PU-55371V
DRUM MOTOR1950
PU-46414
REEL MOTOR2650
PU-51381V2650

NATIONAL

REEL MOTOR1350
MYN-135V5L
FOR NV333, NV366

SANYO

REEL MOTOR700
4-529V-10800

SHARP

REEL MOTOR1500
RMTOV 1008 GEZZ

SONY

CAPSTAN MOTOR700
A-6751131A FOR SLC6
CAPSTAN MOTOR2500
BHF 1100D FOR SLC7

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4002	13p
4006	34p
4007	13p
4008	38p
4009	20p
4010	21p
4011	13p
4012	13p
4013	19p
4014	32p
4016	18p
4017	29p
4018	30p
4019	28p
4020	33p
4021	36p
4022	36p
4023	13p
4024	25p
4025	13p
4026	60p
4027	18p
4028	29p
4029	34p
4030	17p
4031	90p
4032	52p
4033	60p
4034	76p
4035	42p
4036	180p
4037	75p
4038	46p
4039	180p
4040	30p
4041	36p
4042	30p
4043	36p
4044	36p
4045	72p
4046	42p
4047	45p
4048	27p
4049	18p
4050	20p
4051	38p
4052	35p
4053	35p
4054	53p
4055	52p
4056	52p
4060	40p
4063	52p
4066	20p
4067	120p
4068	13p
4069	13p
4070	13p
4071	13p
4072	13p
4073	13p
4075	13p
4076	42p
4077	13p
4078	13p
4081	13p
4082	13p
4085	36p
4086	30p
4089	75p
4093	18p
4094	44p
4095	58p
4098	50p
4099	42p
4501	27p
4502	36p
4503	30p
4504	55p
4505	180p
4506	58p
4507	30p
4508	67p
4510	32p
4511	30p
4512	38p
4513	80p
4514	65p
4515	65p
4516	36p
4517	100p
4518	36p
4519	28p
4520	36p
4521	86p
4522	43p
4526	38p
4527	41p
4528	38p
4529	65p
4532	48p
4551	75p
4553	140p
4555	29p
4556	36p
4557	140p
4583	60p
4584	30p
4585	40p
40100	120p
40101	78p
40102	150p
40103	120p
40104	80p
40105	140p
40106	35p
40107	50p
40108	260p
40109	74p
40110	170p
40114	180p
40117	180p
40147	240p
40160	55p
40161	55p
40162	55p
40163	55p
40174	48p
40175	60p
40181	170p
40182	70p
40192	48p
40193	48p
40194	58p
40208	240p
40257	120p

74 SERIES

7400	20p
7401	16p
7402	18p
7403	20p
7404	35p
7405	10p
7406	36p
7407	36p
7408	25p
7409	20p
7413	30p
7414	45p
7416	40p
7417	32p
7420	22p
7421	25p
7425	15p
7430	25p
7437	28p
7438	32p
7442	38p
7447	60p
7450	22p
7451	10p
7454	25p
7470	30p
7473	25p
7474	35p
7475	25p
7481	90p
7482	60p
7485	28p
7486	28p
7489	75p
7490	35p
7492	45p
7493	35p
7495	48p
7497	80p
74107	30p
74111	52p
74116	85p
74119	85p
74122	40p
74123	20p
74125	40p
74126	45p
74132	42p
74141	55p
74145	70p
74153	45p
74155	45p
74157	45p
74160	50p
74164	50p
74167	35p
74173	50p
74174	30p
74175	35p
74176	45p
74180	50p
74182	45p
74192	40p
74196	40p
74197	45p
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74HC20	19p
74HC21	20p
74HC27	20p
74HC30	20p
74HC32	20p
74HC42	30p
74HC51	20p
74HC73	24p
74HC74	24p
74HC75	28p
74HC76	28p
74HC77	35p
74HC85	33p
74HC86	29p
74HC93	50p
74HC107	28p
74HC109	28p
74HC112	28p
74HC113	28p
74HC123	35p
74HC125	32p
74HC126	33p
74HC131	36p
74HC132	33p
74HC133	33p
74HC137	52p
74HC138	33p
74HC139	22p
74HC147	42p
74HC148	38p
74HC151	32p
74HC153	32p
74HC154	90p
74HC155	48p
74HC157	34p
74HC158	34p
74HC160	44p
74HC161	44p
74HC162	44p
74HC163	44p
74HC164	44p
74HC165	56p
74HC166	60p
74HC173	52p
74HC174	38p
74HC175	38p
74HC181	180p
74HC182	60p
74HC190	48p
74HC191	55p
74HC192	53p
74HC193	41p
74HC194	46p
74HC195	46p
74HC221	80p
74HC237	50p
74HC238	55p
74HC240	48p
74HC241	47p
74HC242	55p
74HC243	60p
74HC244	44p
74HC245	48p

74HC251	25p
74HC253	36p
74HC257	40p
74HC258	50p
74HC259	52p
74HC273	42p
74HC279	35p
74HC280	61p
74HC283	61p
74HC298	50p
74HC299	105p
74HC354	38p
74HC356	48p
74HC365	34p
74HC366	36p
74HC367	36p
74HC368	36p
74HC373	46p
74HC374	48p
74HC375	52p
74HC377	52p
74HC386	20p
74HC390	50p
74HC393	47p
74HC423	65p
74HC533	65p
74HC534	61p
74HC540	70p
74HC541	70p
74HC563	60p
74HC564	60p
74HC573	68p
74HC574	65p
74HC583	90p
74HC595	85p
74HC597	80p
74HC620	110p
74HC623	110p
74HC640	90p
74HC643	90p
74HC646	120p
74HC648	120p
74HC651	100p
74HC652	100p
74HC670	75p
74HC688	80p
74HC690	110p
74HC691	110p
74HC4002	25p
74HC4015	85p
74HC4016	75p
74HC4017	48p
74HC4020	50p
74HC4022	40p
74HC4024	34p
74HC4028	40p
74HC4040	34p
74HC4049	38p
74HC4050	38p
74HC4051	85p
74HC4052	85p
74HC4053	85p
74HC4059	85p
74HC4060	33p
74HC4066	33p
74HC4072	31p
74HC4075	26p
74HC4078	32p
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74LS01	12p
74LS02	12p
74LS03	12p
74LS04	12p
74LS05	12p
74LS08	12p
74LS09	14p
74LS10	12p
74LS11	12p
74LS12	12p
74LS13	20p
74LS14	24p
74LS15	14p
74LS20	14p
74LS21	14p
74LS22	14p
74LS24	35p
74LS26	14p
74LS27	14p
74LS28	14p
74LS30	14p
74LS32	15p
74LS33	15p
74LS31	15p
74LS38	15p
74LS40	15p
74LS42	25p
74LS47	52p
74LS48	48p
74LS51	13p
74LS54	13p
74LS55	15p
74LS73	24p
74LS74	18p
74LS75	24p
74LS76	24p
74LS78	24p
74LS83	37p
74LS85	37p
74LS86	25p
74LS90	26p
74LS91	55p
74LS92	32p
74LS93	26p
74LS95	41p
74LS96	52p
74LS107	28p
74LS109	28p
74LS112	28p
74LS113	28p

74LS114	28p
74LS122	35p
74LS123	35p
74LS124	85p
74LS125	30p
74LS126	30p
74LS132	30p
74LS133	30p
74LS136	30p
74LS138	28p
74LS139	28p
74LS145	65p
74LS147	90p
74LS148	75p
74LS151	27p
74LS153	31p
74LS154	78p
74LS155	36p
74LS156	36p
74LS157	22p
74LS158	27p
74LS160	38p
74LS161	38p
74LS162	38p
74LS163	36p
74LS164	36p
74LS165	50p
74LS166	55p
74LS168	60p
74LS169	55p
74LS170	68p
74LS174	30p
74LS175	32p
74LS190	47p
74LS191	43p
74LS192	41p
74LS193	41p
74LS194	41p
74LS195	44p
74LS196	45p
74LS197	42p
74LS221	45p
74LS240	45p
74LS241	42p
74LS242	43p
74LS243	50p
74LS244	40p
74LS245	40p
74LS247	40p
74LS248	40p
74LS249	70p
74LS251	24p
74LS253	36p
74LS256	52p
74LS257	32p
74LS258	35p
74LS259	50p
74LS260	30p
74LS266	22p
74LS273	44p
74LS279	33p
74LS280	88p
74LS283	51p
74LS290	26p
74LS293	26p
74LS365	26p
74LS366	31p
74LS367	28p
74LS368	30p
74LS373	45p
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4116	75p
4164	150p
6116	180p
6264	400p
6502	300p
6502A	400p
65C02	930p
6503	570p
6520	170p
6522	330p
6530	1050p
6532	460p
6545	880p
6551	530p
6800	210p
6802	220p
6803	800p
6808	500p
6809	600p
6810	150p
6818	380p
6820	140p
6821	140p
6840	310p
6845	620p
6850	110p
8080A	400p
8085A	300p
8086	500p
8088	500p
8155	360p
8156	360p
81LS95	120p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8228	270p
8243	250p
8250	850p
8087	11000p
8251	270p
8253	230p

8255	200p	75188	55p
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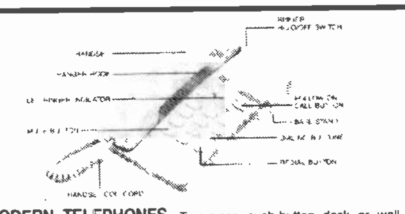

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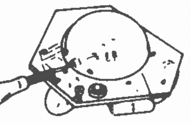

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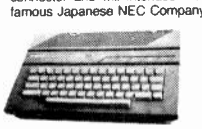

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MAINS OPERATED WATER VALVE with hose connection for inlet and outlet suitable for low pressure. Auto plant watering, etc. Only £1 each. Our ref BD370.

20 VOLT 4AMP MAINS TRANSFORMER. Upright mounting with fixing feet. Price £3 Our ref 3P59

12 VOLT SOLENOID. Has good ½in pull or could be made to push if fitted with a rod Approx 1½in long by 1in square Price £1 Our ref BD232A.

16 OHM PM SPEAKERS. Approx 7in × 4in. 5 watts. Offered at a very low price so you can use two in parallel to give you 10 watts at 8 ohms. £1 for the two. Our ref BD684.

EHT TRANSFORMER. 4kv 2mA Ex-unused equipment. £5. Our ref 5P139.

4 CORE TINSEL COPPER LEAD. As fitted to telephones, terminating with flat BT plug 2 for £1 Our ref BD639

EHT TRANSFORMER. 8kv 3mA £10. Our ref 10P56

DOUBLE MICRODRIVES. We are pleased to advise you that the Double Microdrive, which we were offering at about this time last year as being suitable for the 'QL', 'OPD' and several other computers are again available, same price as before namely **£5.** Our ref 5P113.

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ACORN COMPUTER DATA RECORDER. Ref ALF03. Made for the Electron or BBC computers but suitable for most others Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44. Add £2 special packing.

SOLAR CELLS. Will give a good current (depending on size) from sunlight or bright daylight. Module A gives 100mA. Price £1. Our ref BD631. Model C gives 400mA Price £2. Our ref 2P199. Module D gives 700mA. Price £3. Our ref 3P42.

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6-CORE FLEX CABLE. Description same as the 4-core above Price 15 metres for £2 Our ref. 2P197 or 100 metres £9. Order ref. 9P1

13A PLUGS. Sleeved and complete with fuse, parcel of 5 for £2 Order Ref. 2P186.

13A ADAPTERS – Takes 2 13A plugs, packet of 3 for £2. Order Ref 2P187.

20v – 0 – 20v – Mains transformers 2½ amp (100 watt) loading, tapped primary. 200-245 upright mountings £4 Order Ref. 4P24

BURGLAR ALARM BELL. 8" gong OK for outside use if protected from rain. 12V battery operated Price £8. Ref. 8P2.

CAPACITOR BARGAIN – axial ended – 4700uf @ 25v Jap made. Normally 50p each, but you will get 4 for £1. Ref. 613.

SINGLE SCREENED FLEX 7.02 copper conductors, pvc insulated then with copper screen, finally outer insulation. In fact quite normal screened flex 10m for £1. Our ref BD668.

M.E.S. BULB HOLDERS. Circular base batten type fitting. 4 for £1 Our ref DB127s.

SPRING LOADED TEST PRODS – heavy duty, made by the famous Bulgin company. Very good quality. Price four for £1. Ref. BD597.

3 CORE FLEX BARGAIN No. 1 – Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. Order Ref 2P189.

3 CORE FLEX BARGAIN No. 2 – Core size 1.25mm so suitable for long extension leads carrying up to 13 amps – or short leads up to 25A, 10m for £2 Order Ref 2P190

ALPHA-NUMERIC KEYBOARD – this keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area field is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" × 4" – brand new but offered at only a fraction of its cost namely £3, plus £1 post. Ret. 3P27.

⅛TH HORSEPOWER 12 VOLT MOTOR. Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 3/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts A very powerful little motor which revs at 3,000 rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6P1, discount for quantities of 10 or more.

3 VOLT MOTOR. Very low current so should be very suitable for working with solar cells £1 each. Our ref BD681

MINI SPEAKERS to use instead of headphones with your personal stereo – simply plug in to earphone socket. Excellent sound quality, only £4 per pair. Our ref 4P34.

INNER EAR STEREO HEADPHONES. Ideal for lady listeners as they will not mess up your hair do! Come complete in a neat carrying case. Price £3. Our ref 3P56.

STEREO HEADPHONE AMPLIFIER. Very sensitive A magnetic cartridge or tape head will drive it Has volume control and socket for stereo headphones. 3v battery operated. £1 each Our ref BD680

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SUB-MIN PUSH SWITCH DPDT. Single hole fixing by hexagonal nut 3 for £1 Our ref BD650

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John A. Reddihough

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CORRECTIONS

The address of Celtel Ltd. – see Computer Programmed RC System last month – is now PO Box 135, Basingstoke, Hants RG25 2HZ (telephone no. 0256 474 900).

The final item in VCR Clinic last month (page 755) relates to the Ferguson 3V29, not 3V39.

The 25KX1201 portable mentioned in TV Fault Finding last month (page 768) is a Pye model, not Philips. The Philips equivalent is the 10CX1120, also mentioned above under the heading CX1120.

COVER PHOTO

A lady video engineer for a change, shown making probe/pulser checks on the syscon logic circuitry in the Panasonic NV333 VCR. See article on page 848.

Product Development

Did you know that in 1950 the UK was the world's largest exporter of motor vehicles? That probably doesn't mean a lot, since at that time the world was still recovering from the devastation of World War Two. It does however mean that the UK's motor industry was in a strong position to develop and establish itself firmly as a world leader. It didn't. Compare the situation today. In 1988 the UK's trade deficit was a record £6·1bn, and the situation has since worsened. Yet from the early Thirties to 1955 the UK had Europe's largest motor industry. Today the indigenous industry – what's left of it – appears to be doing next to no development work on new products (the last launch, the Montego, was in 1984). From the production point of view the situation is expected to improve dramatically by the late Nineties, because of the plants being set up by Japanese manufacturers. Interesting that in 1952 Nissan was producing Austin cars under licence. It's a searing story of industry failure.

The UK's domestic electronics industry and its automobile industry have long followed similar paths. Back in 1950 there was much TV development work being done and the industry was getting into its stride. It was certainly at that time ahead of anything in Europe or Japan, and the US industry was only just restarting after war-time restrictions on production. The situation today is almost exactly as in the automobile industry, apart from the fact that the Japanese got into the act to help out a decade or so earlier, with the result that the trade balance is not nearly so bad – in fact it has been positive in recent times. But there's still almost no development work being done.

There's a saying that today's development is tomorrow's profit, or something like that. The time-scale with the sophisticated products of today is of course rather longer. However that might be, the corollary is that no development work today equals no profits tomorrow for whatever is left of the UK-owned consumer electronics products and automobile industries.

One wonders whether UK industrialists/boardrooms have ever been really serious. Things have started and stopped in half-hearted ways, sometimes in almost bizarre circumstances. There's a story that one of our once leading consumer electronics firms was started up simply as a means of getting rid of a spare line of mains transformers. That sort of thing was perhaps not uncommon in the Fifties, when many small firms started up and eventually merged or fell by the wayside. In those days you could design radio sets and suchlike from a simple data sheet. Change the values of a few resistors here and there to get the tolerances right, then get a lot of young ladies busy with soldering irons. A world quite different from today's sophisticated production engineering. A sort of spontaneous getting in when a market seemed to exist. Yet the UK's domestic electronics industry keep up with things well into the solid-state era. Some of the first transistor radios were produced in the UK, and research was being done on solid-state electronics.

The Japanese phenomenon is not something new. Most of the well-known Japanese firms have histories that go back much farther than the UK ones now bought out or merged into overseas concerns. Sony is the best-known exception, being started in the immediate post-war era. Sharp was started in the early Twenties, Matsushita dates from the first world war period, while Hitachi, Mitsubishi and Toshiba have yet longer histories, some being started up in the nineteenth century. These firms established firm roots, survived the depression years and the trauma of World War Two, then mushroomed in recent decades to assume their present dominant positions.

It takes professionalism and dedication to do this. Contrast the amateur ways of UK firms. One thinks for instance of the famed EMI body scanner, an electronic development that put the UK in the forefront of medical electronics. But having developed the thing EMI took it no farther. The later versions came from elsewhere. Why does this sort of thing happen so often? Could it perhaps be connected to the lack of engineers or those with some engineering knowledge in boardrooms? It's difficult to persuade accountants that money has to continue to be spent on development work. Like the Japanese, the Germans and others do not lack engineering knowledge in the higher echelons of industry. Our education system has a lot to answer for in this respect.

Today's mass markets are not built solely on the basis of engineering expertise however, vital though this is. The ability to produce goods inexpensively and well is no good if the market is not there. Here again the Japanese have long done the right thing in following the path of market-led development. A lot of effort is put into establishing what the public would find useful and what it would be prepared to pay. This has meant that many items are produced and tried out and are then quickly dropped. The cost of a few failures is readily covered by the major successes

Trying to find out what the public might want is of course a time-consuming business. But it's not only a matter of new products. Have you noticed how often the Japanese come up with just the right combination of features in a particular product? It's all a matter of careful market research.

It seems that from every angle UK industry has failed. Innovation, production engineering and market research: all have been tackled in a half-hearted way, with little sense of commitment. It's not so surprising then that things have ended up in their present sorry state.

Repairing Remote Control Units

Nick Beer

Much domestic electronic equipment nowadays relies on a remote control unit – very often the equipment cannot be operated without the handset, or operation is very limited without it.

The circuits of modern remote control units can be awesome. Some have built-in screens, will talk back, and have send and receive operation. The service policy of different manufacturers varies. Spare parts for the cheaper units are very often not supplied, it being simpler to supply the complete unit. Many dealers adopt a similar policy – they advise customers to buy a new unit rather than have an old one repaired. Personally, I'm not in favour of replacing anything unless it's absolutely necessary – in my view panel and handset replacement must rate amongst the most inefficient practices in this trade. Handset repair can be profitable and straightforward, and if you can save your customer some money and make a greater profit yourself it can't be bad, can it?!

In this article we'll go through the various types and generations of handset, describe basic faults and outline the repair procedures required. Spares can very often be a problem, but we'll give some advice on this too.

Cord Types

The cord remote control units you're most likely to encounter now are those used with early VCRs. Most have a single screened lead that's terminated with a standard audio jack plug, typically 2·5 or 3·5mm in size. Push-switches bring different resistances into circuit. These represent an extension of the on-board control circuits. The other approach is to have a multicored cable with DIN plug termination and just switches (no resistors) in the handset. This arrangement is bulkier.

Likely faults, as you would expect, are breaks in the cables and plugs. With a single screened cable the break can occur anywhere along its length. It usually occurs in the screen rather than the core, presumably due to stretching. With multicored cables the breaks tend to occur at either end, particularly within the DIN plug. In either case the plug is usually moulded on, so repair involves cutting off the old one and fitting another. Repairs of this sort can be carried out using normal workshop stocks of cable and plugs. Note that with this type of fault you will often get the customer on the phone shortly after collecting his unit to say that it still doesn't work. This is invariably due to the socket in the VCR being faulty – damaged when the customer tripped over the cable! Making a simple continuity or resistance test in the workshop will confirm that the unit works without the need to connect it to a VCR.

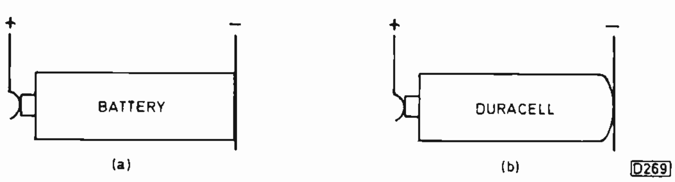

Fig. 1: Battery contact problems. (a) One hundred per cent negative plate surface area contact. (b) Reduced contact with domed negative plate.

The only other problems you are likely to encounter are print breaks. These are usually easy to detect and repair. The switches used are generally just that, not mat and pad contacts (see later), so they are pretty reliable. Should they fail replacement is the only real answer. In most cases this is not a problem. If the manufacturer cannot supply a replacement a search through the advertisements in *Television* will usually reveal something that's suitable.

Ultrasonic Units

Though ultrasonic remote control handsets are rather old now many sets that use them are still going strong, for example some of those fitted with the Decca 100 and Philips G11 chassis and the B and O 35XX series.

There are two major types of fault, no or intermittent no results with all or some functions, and buttons doing the wrong thing. The former type of fault is caused by poor joints etc., see below. Another thing to check is the ultrasonic transducer. These tend to go open-circuit, especially after being dropped. The second type of fault is due to incorrect frequency tuning. Check any coils for damage, cracked or missing cores etc. If no reason for drift can be found realignment is the best course. If possible do it with its own set. This can be a fiddly business. Check for drift over a few days.

Infra-red Units

The infra-red remote control unit is the most common type. It succeeded the ultrasonic type with its rather limited number of functions. Although there were ultrasonic teletext units they were not common, and the advent of text led to a change over to infra-red devices. Once again there are a limited number of basic faults.

The most common symptom has to be no go. Even without a circuit diagram much can be done to establish the cause. The first thing to do is to check the battery/batteries. Always check on and off load. Many tests can be made, such as current consumption, and these can be helpful. But as such units generally have few components general tests can be more time consuming than tests on individual components. Check visually for dry-joints on the infra-red diode(s) and for broken leads on transistors and in particular the crystal. Often a solder round will cure the fault, but make sure that you keep the unit and test it for several days afterwards as a faulty i.c. can be temporarily cured by the application of heat – you may think that you've cured the trouble only to find that it comes back.

Intermittent no go can be caused by any of the faults just mentioned, but is very often due to poor battery contacts. The cause of this can be tarnishing, spillage or battery design. The latter applies particularly with Duracell batteries that have rounded/domed contact plates, see Fig. 1. When this type of battery is fitted in a handset with contacts that have a small surface area, e.g. in some Panasonic units, the result can be intermittent operation. Borderline battery output voltage is another

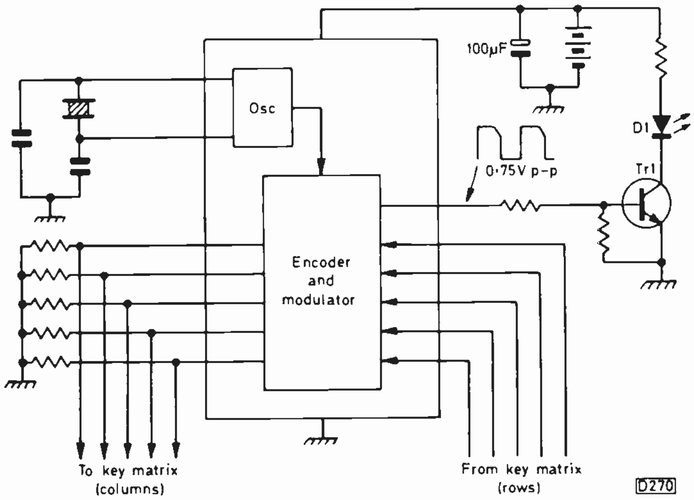

Fig. 2: Typical simple infra-red handset circuit.

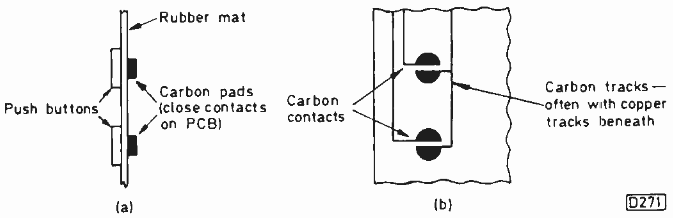

Fig. 3: Mat contact assemblies. (a) Contact mat. (b) Section of PCB.

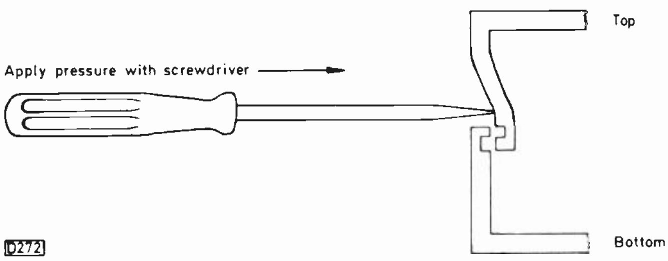

Fig. 4: Opening a click-fit case.

common cause of intermittent operation.

Fig. 2 shows a typical infra-red remote control transmitter circuit. For excessive battery drain check the electrolytic capacitor across the battery and the i.c. For no output check the IR diode, the transistor and the output from the i.c.

The keypads used in infra-red remote control units vary from the rubber pad and carbon contact type to actual copper sprung contacts and membrane/foil arrangements. With the latter, replacement is usually the only viable method of repair. These usually plug into an edge connector on the PCB and breaks in the tracks here are common. It's worth checking this before ordering a replacement as repair can be carried out with RS conductive silver paint.

PCB Faults and Repair

Breaks in PCB copper tracks are in general easy to repair, but with a handset there may be minor complications due to the limited space or infringement of contact area. The best way to deal with a break is to run a lead between the nearest soldered joints on either side, but for the two reasons just mentioned you might have to settle for scraping off the lacquer and bridging the break with tinned copper wire. If this is necessary, ensure that when the case is closed nothing is fouled and that there is sufficient mechanical strength. Such breaks often occur where a PCB clips into the case: if the repair doesn't strengthen the board it's likely to flex, causing further failure of some functions. You can use Araldite or thin sheets of Paxolin glued on to strengthen the board. Again, you may be restricted by space. If all else fails you'll have to replace the PCB. The boards are usually available as spares minus the components. Swapping over the components doesn't take long, but if you are making an estimate don't forget to allow for this.

Another common type of PCB failure is where the carbon type contact and mat arrangement is used – see Fig. 3. The contacts on the mat or PCB wear, causing loss of one or more functions. Depending on the severity of wear and the constitution of the PCB underneath, this can usually be repaired with soft pencil lead. Either redraw the track several times or grind the lead finely and glue the powder in place. This is more likely to be required with the mat. If more than the odd contact is affected it's better to replace the whole mat. The average manufacturer unfortunately doesn't keep these in stock for long and after that it's worth trying to carry out a repair. If you do, bridge with TCW lacquer or varnish over but be very careful not to insulate any contacts used by the keypad.

Another fault that occurs, particularly with this type of PCB that has layers of carbon print over copper print, is electrical leakage. The symptom is usually transmitting all the time. You can spend ages changing components only to find that the fault persists – it can be difficult to diagnose the cause of this trouble in any other way however, unless you are familiar with the unit. The handset used with the Salora J chassis (and Hitachi equivalents) for example is prone to this trouble. When you've replaced the PCB, snap the old one in half so that if it should lie around for a while you don't use it by mistake.

If copper contacts are used and these are worn they can often be repaired by soldering over. Take care not to do any more than tin them or you could end up with a permanent contact.

Case Faults

Handset construction varies tremendously, but there are some basic patterns. The majority are PCB based with the PCB fitted in the top half of the case. The buttons, whether individual or a rubber mat, fit through the top half as well. The bottom half contains the battery compartment, the two halves clipping together. We'll look next at case dismantling and some of the faults that can arise.

The battery cover is usually clipped into the rest of the unit, being held only by its own elasticity. Not surprisingly these tend to wear out. The modern trend is to clip the case together without the use of screws. This means that to open up the unit you have to push the side of the case where the clips are situated, at the same time levering the two halves apart. This must be done very carefully – see Fig. 4. It's best to use a plastic screwdriver or to cover the metal blade. Sometimes space prohibits this and it's impossible to avoid marking the case. For this reason we keep in stock spare cases for certain Panasonic units and replace them after carrying out a repair. Minor indentations can very often be smoothed down using fine wet and dry paper.

With regard to presentation and finish, if you have to order parts to complete the repair check the case and any printed plates for signs of wear, discolouration or fading.

In view of the cost it's well worth replacing these to restore the appearance of the unit. I have in mind particularly the handsets for Ferguson VCRs such as the 3V53/5 etc. where the button functions are printed on an aluminium fascia that's stuck to the upper case. These wear, marring the appearance and losing the button information. Replacements cost around £1·50. We always replace this when doing up a VCR for re-renting or sale.

Displays

Handsets with displays are becoming more common. So far we've had very few faults in this area. Most units have LCD screens but LEDs are also used, for example with the B and O MCP5500. The main problem with LCD types is dust getting between the layers of the sandwich. This is easily remedied in a clean area. Remember to clean gently with anti-static fluid otherwise you will attract even more dust. Corrupt displays are often caused by a low battery or the driver i.c. Remember that these put a heavy demand on the battery/batteries – most incorporate an auto shut-off circuit.

Bar Scanners

Digital bar scanners are certainly very popular with our customers. Panasonic developed this system, which is also now produced under licence for Amstrad/Fidelity. By far the most common trouble is a blocked sensor. Customers let the units get filthy, the relatively small hole becoming blocked so that it can't read the codes. Such units should always be kept in their wallet, and the little brush supplied for cleaning them should be used regularly. There are now combined scanners/handsets, but these are felt to be clumsy and difficult to use – it's difficult to keep them at the right angle. The charts on which the codes are printed are plasticised but do wear. Replacements are cheap enough.

Dealing with Spillage

Spillage is a common problem. Often it's not mentioned. No go or transmitting continuously are the usual symptoms. Very often the liquid ingress is slight – around the buttons and over the contact area of the PCB. Depending on the time that has elapsed since the spillage occurred the unit may be a write off or may just require cleaning.

If the contacts are damaged and the legs of components are corroded it's best to supply a replacement unit. If cleaning will suffice this should be done with isopropyl alcohol. Don't be tempted to use something stronger, such as solvent cleaner, as this will tend to dissolve carbon print and lacquer. Wash cases and buttons in soapy water. To avoid buttons that stick, completely dismantle the case into its component parts and clean thoroughly.

Testing Cordless Handsets

The ideal way of testing a cordless remote control handset is with the unit it controls. This is seldom possible however. A number of testers which give either an audible or visual confirmation that an infra-red or ultrasonic unit is transmitting are available. I've used several over the years and have found that the Konig type from Willow Vale is the most reliable. We had two of the Planet type and they both failed continually. On one such occasion an apprentice came up with a very useful suggestion. He fitted an IR receiving diode into the plastic black cover of a quarter-inch jack plug, added a BNC plug and connected this to a scope to check for emission. This is an alternative if you like.

Spares

Whether some/all spares are available tends to depend on the manufacturer. This is not too much of a problem when it comes to transistors and diodes – if necessary equivalents can be sought. Resistors and capacitors are even less of a problem. The only point to watch here is the physical size of capacitors. Very often low-voltage capacitors with relatively high values are used and the equivalent value with a more usual voltage rating will be too large. You will often find 100μF or 220μF capacitors rated at 6·3V for example. These are available from RS, Willow Vale and other sources however. The i.c.s tend to be common between units of different manufacture and a look through distributors' catalogues or the advertisements in *Television* should reveal a source of supply. Standard IR diodes and ultrasonic transducers are available and should be kept in stock.

If you want a non-standard part and the manufacturer cannot supply this it's worth checking whether the unit is a clone or is badge engineered. Often the other manufacturer can supply spares. For example, Salora cannot supply certain spares for handsets made by Sanyo, but Sanyo can. It's worth a look around.

Charges

If a new handset costs say £25 you can't apply the usual £15-£18 an hour labour charge. It's quite possible however to make a fixed charge of say £7 and see a decent return. Very often few if any parts are required. Few handsets should take more than half an hour to sort out. In the case of a handset costing £70 to replace (B and O for example) the customer will be pleased indeed if you repair his unit for say £12.

Many customers don't even bother when a handset fails. Others assume that they have to be replaced. Customer education in the form of a notice in the shop or in your advertising should generate a bit of business and a lot of goodwill. If you give the unit a good clean up, replace slack battery covers etc. you will restore the handset to almost new condition.

Developments

Things have developed by leaps and bounds over the years, to the stage where some handsets have looked like the flight deck of Concorde. This was the fashion for a while. We've had multi-function remote control units that control the TV set and the VCR, now we have programmable units that replace three or more units. Flaps that cover up most of the buttons are appearing, for example with the new A1 series of Panasonic colour TV sets. Extensive use is now being made of menus and on-screen displays – this means that we could soon be back with handsets that have only about six buttons but will still control everything. The home automation idea hasn't really taken off yet but it will probably come. Many customers are feeling the benefit of integrated systems such as the Bang and Olufsen Link, where the latest addition is a light controller that can be operated from the Beolink 1000 handset.

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You Won't Believe This . . .

Les Lawry-Johns

We've had a wall built around the rear garden of the bungalow. Not to keep intruders out but to keep the dogs in. The rear garden has also been concreted, again for the dog's use. As repair business at the shop dried up we moved to the bungalow, with the dogs, cat and bird, hoping that the shop will sell before long.

The bungalow is in a secreted part of a housing estate built well after the war on a site previously occupied by Gravesend Airport, which was used by Fighter Command during the war. When an invasion was expected in 1940 all the runways were mined. The public was not informed of course. All these years later the Royal Engineers have been instructed to locate the long tubes of explosives and make them safe. So two days after we arrived we were told that the whole area is to be examined, using metal detectors, and eventually made safe. What a welcome!

Anyway, we've not been blown up yet and the shop telephone number has been transferred to the bungalow.

The other day a man phoned to say that the Decca TV set (80 series chassis) he bought from us some years ago suffered from field collapse after it had been on for about fifteen minutes. He said that hitting the top of the set restored the picture, so I thought it would be a dry-joint. I told him I would be at the shop in ten minutes. When I got there I waited for him to appear. He didn't. So after half an hour I drove to his house. He opened the front door and said "I thought you said ten minutes?"

"I said I'd be at the shop in ten minutes. That way you'd have avoided the call-out charge."

After removing the right-hand side timebase panel I resoldered all the field timebase connections. I then turned the set round and fitted an aerial. There was a good picture when I switched on. It was still there half an hour later.

I replaced the back and suggested a charge of £20. He flinched. "That includes the call-out charge," I explained.

He paid me and I drove off. Before I got very far I was held up by traffic. While waiting I saw the chap I'd just left chasing up the road, so I backed down to meet him.

"It's gone again."

Back to the house again. When we got there the set looked perfectly all right.

"Blast. It's come back again."

"I bet your wife was upset," I said.

"Oh no, this is my set. She's watching hers in the front room."

I took the back off again and watched for another half an hour. It was obvious that the fault was not a dry-joint as I'd assumed. It occurred only when the back was on and the temperature rose. I'd no hairdryer with me to make heat checks on the components and it struck me that this would be best done in the shop. I told him I'd call later to pick the set up.

When I got it to the shop I managed to create the fault by pulling away at the upper left plug and socket on the right side timebase panel. So I took the panel out and resoldered all the connections. There was a clear picture when I switched on again. After refitting the back I let the set run for an hour or so. Then, confident that all was well, I put it into the estate car carefully and returned it to Mr. Evans.

I was similarly gentle with the set when I got to his house. I plugged it in and connected the aerial. There was a white line until I clouted the top of the set and a picture appeared. This was too much. I returned the £20 and apologised. In fact I practically ran out of the house. But I've an idea that the set will be all right after this.

The Midday Clinic

When I got back to the bungalow the phone was ringing. A G11 I'd repaired several weeks ago had gone wrong. I asked the owner to bring it to the shop at about twelve the following day. Shortly afterwards a lady rang to say that her ITT portable had a funny fault – the sound would go off until the aerial plug was waggled about. I asked her to bring the set to the shop midday tomorrow.

So just before midday I packed my stuff into the car and sped off down to the shop. The G11 was the first one to arrive. The holder at the back didn't hold a remote control unit. I switched on and a red light appeared. Nothing happened when I pressed the button, and switching off and on again made no difference. There was life on the power supply panel, but only 50V at the fuse. I checked here, there and everywhere but couldn't get the h.t. to rise. The reservoir capacitor was of the blue welded type. I'd fitted it some time ago and it checked o.k. After spending some time checking through the power supply circuit I'd got no further and gave up. Another failure.

Shortly after the ITT portable arrived. I removed the cover and found that the sound came on and went off as the coaxial aerial lead was juggled about over the tuner and i.f. unit. No dry-joints could be seen when the chassis was taken out, but I did find that when the tuner etc. was held in one position the sound didn't go off. So I fitted a wedge. I showed the lady what I'd done and explained that in my opinion the fault was in the tuner-i.f. unit, but that I didn't have a replacement. She seemed happy enough and left me a pound for my trouble. I know that I should have removed the unit and stripped it down, but I didn't have the patience. Sorry.

Another G11

Another call had come in while I'd been away. A G11 with field collapse. When I arrived at the house I found that the owner was the best friend of an old friend of mine, so I resolved not to give up this time.

After removing the rear cover I checked that voltage was present at the TDA2600 field output chip. I then fitted a new TDA2600, with the clip under it, and refitted the heatsink. The line was still there. I told the owner I wouldn't be long and sped off to the shop, hoping to find another panel. As luck would have it I'd kept an old G11 with a duff tube. After extracting the upper left panel I hurried back to the house and fitted it. I crossed my fingers and switched on. The picture appeared and I was greatly relieved.

I felt guilty about charging them £25, but they seemed to be quite happy and I went off with the faulty panel. I'll find the fault on it when I have time. Meanwhile all the best to you all.

Teletopics

BUSINESS PROSPECTS

While sales of consumer electronics goods in the UK remain flat, the latest report from specialist market researchers BIS Mackintosh paints a hopeful picture of what trade will be like in the European Community come 1992. Its predictions, compared to 1988, are as follows:

Market	*1988*	*1992*
TV sets	£8bn	£9·15bn
VCRs	£4·12bn	£4·9bn
Camcorders	£1·2bn	£2bn
Audio	£9bn	£10bn
Overall consumer electronics	£22·3bn	£26·7bn

BIS Mackintosh suggest that thereafter the growth rate might accelerate due to the effect of the single European market. Amongst newer products, the report suggests that the market for satellite TV receiving equipment will be around £300m in 1992. Camcorders are picked out as a section of the market where considerably increased demand is expected.

Meanwhile, back to reality. Following Ferguson's retrenchment (see Teletopics last month), Tatung has announced that just over ten per cent of its workforce at Telford is to be made redundant. Most of the redundancies will be in back-up rather than production-line staff. Tatung blames the poor demand for TV sets and the failure of the satellite TV market to develop for the need to make this move. Earlier, the company had expected to take on additional production-line staff during the summer to build up satellite TV equipment output in anticipation of increased sales later in the year. In another move, Thorn EMI has announced the closure of its CTV tube plant in Sunderland. The plant was mainly involved with regunning tubes, some 85 per cent of the output going to Thorn EMI's rental chains. It was originally established in 1950 for the manufacture of monochrome TV tubes. The switch to sets with FS tubes is cited as one reason for the reduced call for regunned tubes.

SKY AND BSB

Sky Movies' transmission hours have been increased to up to sixteen a day, starting at 2 p.m. and running to approximately 5.30 a.m. The final film in each broadcasting day starts at about 4 a.m. and will usually be the main film of the previous day. Meanwhile Sky Television is planning a major move to increase its number of viewers, one aim being to take advantage of BSB's postponed service start. Sky is to offer a rental package consisting of receiving equipment and a Sky Movies subscription at a price expected to be around £4·50-£5 a week. This would mean Sky Television going into the rental market and would represent a considerable investment on top of the present cost of running the Sky TV services, around £2m a week. It's understood that the receivers would be supplied by Amstrad and that an order has been placed for "hundreds of thousands" of them. A network of installers is being established.

BSB is still suffering from the consequences of its decision to adopt the high-tech approach to satellite TV broadcasting. The difficulty over the ITT 2285 chip has led BSB to reassess the possibility of using the Philips/Plessey MAC decoder chip set. This is understood to cost around £27, which would increase the cost of receivers. There is also continuing doubt about whether the Squarial will be made available, particularly in view of the proposal to use reduced transmitter power in order to start the service with five channels from one satellite.

SERT's one-day seminar on DBS reception, postponed from June because of the railway strikes, has been rescheduled for Friday September 15th, with an enhanced programme. It's hoped that there will be direct demonstrations from the BSB satellite, which is due to be launched at the end of August. The programme will include presentations on Ferguson, Grundig and Salora equipment. The seminar is to be held at the IBA Conference Hall, Brompton Road, London SW3. Additional tickets are available at £75 (£60 for members of SERT) inclusive of lunch and VAT. For further details apply to Consert, 57-61 Newington Causeway, London SE1 6BL (telephone 01-403 2351).

SEME TO HANDLE PANASONIC SPARES

SEME Ltd. has been appointed authorised supplier of Panasonic spares to handle, from August 1st, all orders outside the manufacturer's own franchised dealer network. This development will ensure that non-account dealers and service engineers will now have a speedy access to original Panasonic parts. A new sales office has been established at Buckingham to deal specifically with Panasonic orders. Three new sales staff and a technical liaison engineer have been trained jointly by SEME and Panasonic's head office at Bracknell. The Buckingham office is directly linked to SEME's computer at Melton Mowbray, site of the company's warehouse.

SEME's Buckingham address is Chandos House, School Lane, Buckingham MK18 1HD. The new SEME telephone number exclusively for Panasonic spares is Buckingham (0280) 823 523 or fax 0280 814 916.

SERVICE AIDS

Ferguson has issued an extremely useful pocket book to assist with fault finding in the TX90 and TX100 chassis. There are separate sections on the various parts of the chassis, with symptoms and likely causes listed. It's available under part number 10P1-552-001 from Ferguson Ltd., Service Division, PO Box 1594, Crown Road, Enfield, Middx EN1 1DY.

Robin Electronics, Hirst Hall, GEC Centre, East Lane, Wembley HA9 7YA has introduced a range of high-quality safety test probes designed to fit many instruments including multimeters and insulation testers. All models feature Robin's unique angled prod, have cable engineered in silicone for maximum flexibility and long life, gold-plated tips and terminations for minimum contact resistance, and colour coding in black and red for safe use. Price of the general-purpose SP25RA lead set for use with test equipment that has 4mm shrouded sockets is £12·95.

CD AND DAT

The price of CD players in Europe is set to rise following the decision by the EC to impose anti-dumping duties ranging from 6·4 to 33·9 per cent on imports from Japan and South Korea. This move is the outcome of a two year investigation by the European Commission following a complaint lodged by Philips, Grundig and Bang and Olufsen. In the two years to 1987 the European producers' share of the market fell from just over 50 per cent to

18 per cent. Selling prices will have to rise since under EC trade law the duties cannot be deducted from profit margins. The duties are expected to remain in force for five years.

Digital audio tape recorders are expected to be on sale in Europe and North America by Christmas, following an agreement reached between the world's recording and consumer electronics industries. Consumer electronics manufacturers have agreed to incorporate in each machine a device that will prevent it making more than one copy of each original recording.

UP-MARKET TVs

Sony has released a new top-of-the-range TV receiver, Model KV-FX29TU, with a host of features and a suggested retail price of around £2,000. It has a 29in. (68cm) tube and is compatible with S-VHS and hi-band 8mm video equipment. There are Nicam and Fastext decoders and an on-screen display for control operation. The digital circuitry incorporated includes sufficient memory to be able to produce a flicker-free display and noise reduction. Of particular interest is the fact that it will work with VCRs capable of handling NTSC and SECAM tapes.

Shortly to follow, at around £2,500, is a set with an even larger tube. The KV-DX3412U will have a 34in. (80cm) screen.

Grundig plans to launch a set using the flicker-free (100Hz) technique at this year's Berlin Audio and Video Fair.

A US company, Northwest StarScan, claims to have developed a signal compression system that enables an HD-TV transmission to be fitted into a standard bandwidth channel. Signal compression of ten times is understood to be possible. This could significantly cut the cost of satellite TV transmissions.

TRANSMITTER PRIVATISATION

The government has decided to privatise the UK's broadcasting transmitter networks (BBC and IBA) in their present form rather than adopting the approach suggested by Price Waterhouse (see last month). The BBC will retain its transmitter network until 1996, when the corporation's royal charter expires. The issue will then be reviewed. An announcement from the IBA has welcomed the decision, and also the suggestion that a uniform transmission tariff should be retained for the Channel 3 companies.

CONFERENCES/EXHIBITIONS

The High-definition Television International 89 conference and exhibition is to be held on September 18-19th 1989 at the London Tara hotel. It's designed for those with little or no knowledge of HD-TV as well as for those working on the development of this technology. Further details can be obtained from Meckler Ltd., Grosvenor Gardens House, Grosvenor Gardens, London SW1W 0BS (telephone 01-931 9985).

The fourth International Cable and Satellite exhibition and conference will take place at the National Hall, Olympia, London from April 9-11th 1990. For further details contact Cable and Satellite 90, 11 Manchester Square, London W1M 5AB.

The fourth International Broadcasting and Telecommunications Show is to take place in Milan from October 12-18th 1989.

VCR Clinic

Reports from Philip Blundell, Eng. Tech., John C. Priest, Eugene Trundle, Chris Plaice, Harvey Benson, Ian Bowden, Alfred Damp and Nick Beer

Philips VR6468

This machine would accept a cassette normally, but if wind or play was selected the cassette would eject. A check revealed that the microcomputer chip thought the capstan wasn't turning even though it was! The tacho pulses were missing – a new P687 amplifier module put that right. **P.B.**

Philips VR6561

If play or wind was selected this machine would eject the cassette. The error memory showed that the capstan tacho signal was missing. R3509 (15Ω) had gone high-resistance – it read about 60Ω. **P.B.**

Philips VR6462

This machine played o.k. but wouldn't tune in a signal. We found that the tuning information pin 16 of the SAB3013 chip was at a higher voltage than it should have been as T7420 (BC547) was open-circuit base-to-emitter. **P.B.**

Philips VR6468

There was no vision in E-E or play, though the test pattern worked. The +11·9b supply was missing as C2329 on the signals board was short-circuit. The short had also damaged transistors 7607 and 7304 (both type BC328). **P.B.**

Philips VR6180

This machine intermittently failed to accept a cassette. If it was put into standby before the cassette was tried the display would go bright, showing that the cassette in switch was being sensed, but the tray wouldn't move. No supply voltage reached the control motor as there was a dry-joint on plug B2. **P.B.**

Panasonic NV-G40/NV-G45

Two similar machines came in with different versions of the same fault. The first one, an NV-G40, had a reluctance to capture and lock on to channels when search tuning. It would tune all the way through the u.h.f. bands, pulling in all the local, fringe and distant channels but refusing to stop at any of them.

The manual contains no description of the search tune circuitry but did provide a clue as to the area involved. In addition to running the clock and the displays, and decoding the push-button inputs, IC7501 on the timer and operation panel provides tuning memory and digital-to-analogue conversion for the tuner and TV demodulator, via the channel select chip IC7551. During tuning search, as a signal is resolved the video from the tuner-demodulator is fed to the luminance/chrominance section and passes via the input/output CBA and emitter-follower Q3013 to pin 1 of IC3002. The sync pulses are separated and fed, together with a 15·625kHz signal, to a comparator. Presence of a signal is detected by identifying line sync pulses – this results in a low at pin 9 of IC3002. This low is fed back to pin 20 of IC7501. The tuning scan then stops and the tuning point is locked, after which the memory button is pressed.

We found that by artificially introducing a low by momentarily shorting pin 9 of IC3002 to chassis at the point during the tuning scan when a picture was resolved it was possible to lock on to a channel. Pressing the memory button then stored the channel in the normal way. Using this technique, we were able to program all the local channels. The machine would have been usable in this state provided the user didn't move to a different area or unplug his machine long enough for the tuning memory to be lost. Resisting this temptation, also the temptation to provide an extra push-button switch to short out pin 9 during the tuning process, we pressed on.

Scoping the video waveform at the tuner-demodulator output and then tracing it along the path to pin 1 of IC3002 showed that there was no loss of signal here. Pin 9 of IC3002 should have been at 0·1V but was actually at 4·75V and didn't vary whilst tuning. Replacing IC3002 (AN5421N) cleared the fault.

The second machine, an NV-G45, had exactly the same symptoms. So after confirming channel lock by pulling down pin 9 of IC3002 we replaced this chip. This time the fault remained. Resorting to the scope we found that the video input at pin 1 of IC3002 was of very low amplitude, less than 25 per cent of that at the base of emitter-follower Q3013. Further investigation showed that one leg of C3055 (33μF, 16V) came loose from its can when moved. Replacing this capacitor finally cleared the fault. **J.C.P.**

Sanyo VHR4350

This one led us a merry dance. The head drum wouldn't turn, though voltage was present at the drum motor and it was free to turn. The cause of the problem turned out to be dry-joints at CN823 on the deck-mounted junction PCB. As a result the motor was off earth. You have to remove the deck to gain access for resoldering – do all the joints while you are at it. **E.T.**

Panasonic NV-G7

The mode switches used in various Panasonic decks can be troublesome. If you replace one in the D1 deck (NV-G7, NV-G10 etc.) don't use the VSS0110 type which you may have in stock for earlier models. It looks similar and fits perfectly, but electrically it's quite different, giving rise to some peculiar deck behaviour. The correct part number is VSS0135. **E.T.**

Mitsubishi HSB20

There was a nasty buzz on the E-E sound with this new machine. We fed the output from a colour-bar generator into the machine and found that the buzz disappeared when the generator's chroma signal was switched off. Attention was therefore turned to the 6MHz filter circuit CF151. By making comparisons with a good machine we found that although the output waveforms at pin 18 of IC101 were similar they were different at the input to

CF151. After replacing various components in this area to no avail I was getting somewhat puzzled. L153, which is connected between CF151 and chassis, had been measured but as a last resort I decided to swap it over with the coil from the good machine. This cleared the fault. Both coils were identically marked and gave exactly the same resistance reading, so I can only assume that the faulty one had a couple of shorted turns or perhaps a crack in its core. **C.P.**

Panasonic NV333

The job card said that the problem was intermittent failure to eject, also other intermittent mode failures. When I checked the machine it behaved like a video possessed. On application of power, sometimes the record LED or the pause LED would light, play was intermittent, and at other times the machine would return to stop after a few seconds. Occasionally the cassette housing would eject five seconds after the button was pressed!

My first thoughts were that perhaps the microcomputer control chip IC6001 was faulty or that maybe the mode switch was defective. With this machine however I've found that the microcomputer chip is usually innocent when there's a syscon fault. Changing it made no difference, neither did removing, cleaning, adjusting and replacing the mode switch. Detailed checks were then made in the syscon circuit. As a result I discovered that transistor Q6008 had an intermittent base-emitter open-circuit. Q6008 is driven by Q6009: they are employed by IC6001 to pulse scan its mode sensor input. **H.B.**

Salora SV6600/Sanyo VHR1300

The problem with this machine was intermittent tuning drift. As all channels appeared to be affected we checked the 33V supply, which was slightly high. We also noticed that the panel (the timer/tuning panel) in the vicinity of the 33V regulator IC6206 was brown and showed signs of overheating. The supply to this 33V regulator chip is provided by a constant-current regulator arrangement on the power supply/system control panel. Note that there are two different circuit diagrams in the manual – this was the more complex one.

The voltages around the regulator transistor Q5004 (2SA984) didn't agree with those in the manual, but the transistor, along with diode D5003 and zener diode D5004, were all o.k. Resistor checks were then carried out. The emitter resistor R5010, which is used to sense the current, was found to be only 270Ω instead of 560Ω – the wrong value had been fitted. In addition R5015 was 560Ω instead of 1·8kΩ. Both resistors were original parts and had been in the machine for around three-four years. Maybe this was a one-off occurrence, or maybe more machines with these errors will start to show up soon. **I.B.**

Panasonic NV430

The problem with this machine was that the optical tape-end detection wasn't working. As detection didn't occur at either end of the tape the infra-red emitter circuit was the most likely suspect. On these machines the infra-red LED is pulsed on and off by the system control chip IC6001 via the 2SD636 emitter-follower Q6006. Meter checks showed that the LED, transistor and two assorted resistors all read correctly. But no light reached the end sensors. Scope checks then revealed that while 5V peak-to-peak pulses were arriving at the base of Q6006 the pulses at its emitter were of only 1V amplitude. Replacing this transistor restored normal operation, but it read o.k. on the meter's diode check when tested out of circuit. **I.B.**

Philips VR6760

There was no E-E picture and no playback picture, due to the absence of any 10V supplies on the signal board (P306). Tracing back led us to an open-circuit transistor (7607) on the main board (P606). Removing the panel to replace this transistor is no easy task. It was even more frustrating when the replacement gave an impression of Vesuvius ten seconds after switching on. Further checks revealed that there was a short to chassis on the signals panel. The +10c supply stabiliser transistor on this panel was found to be burnt up and short-circuit, but the short was still present after it was removed. It was found to be in C2329, and when this and the two transistors were replaced normal operation was restored. **A.D.**

Ferguson 3V44

This machine had no clock display though the function display worked correctly. Scope checks on the timer/display board showed that there was no output from IC401. The supply to this chip was correct, but there was no clock signal either at this chip or where it enters the board at pin 6 of CN1. The missing signal was traced back to broken print on the power supply module. Repairing this print restored the display. **A.D.**

Marantz MV762/Philips VR6860

The complaint with this machine was "lines on the picture and a whistling noise when not in use". A trial with the test tape showed that the "lines on picture" were due to the capstan motor running at full speed. Checks around the MAB8420 servo chip IC7091 revealed that it was not supplying pulses to the D-A converter chip. A new MAB8420 put matters right. **A.D.**

Hitachi VT-M622

This brand new stock machine came from the shop with the complaint of poor stills in the SP mode. This is not actually a fault with these machines, but it does catch the unwary. On this model preference is given to the LP mode. Thus functions such as picture search and still are of poorer quality in the SP than in the LP mode. **A.D.**

Panasonic NV-MC10/NV-MC6

This fault occurred on an NV-MC10 but could equally well be experienced with the NV-MC6. The customer's complaint was that the speed seemed a bit fast. The capstan was rotating at maximum speed, which meant that the reels were also running at maximum speed. The output chip is mounted on the back side of the mechanism, and the servo is on the main PCB, sandwiched across the back. All in all it's impossible to fault find in this area without a set of extension leads. We found that there was no feedback from the capstan motor. A new motor (VEM0284) put matters right. **N.B.**

Letters

POLARISERS FOR TVRO SYSTEMS

Most test reports now seem to mention the use of a magnetic polariser as an effective component in any satellite TVRO system – in one trade publication an NEC spokesman was recently quoted as saying that "if you find a so-called polariser with moving parts, have nothing to do with it", and went on to condemn the cross-polar discrimination with Marconi LNBs, pointing out that the most effective solution is to use a magnetic polariser. Such advice is not always helpful to those in the front line, who find few such clear-cut answers to technical difficulties.

Yes, magnetic polarisers are a useful addition to the TVRO system buyers' shopping list, with their advantages of low insertion loss, no moving parts, fast polarity change etc. But we must also be aware of their weaknesses. The first problem is fundamental to the operation of such a device: for a given magnetisation of the ferrite core in the polariser, it will twist the polarisation of a plane incoming wave by an amount that varies with frequency. This leads to the need to be able to adjust the skew and store this for *each channel*. Some installers will claim that the results obtained without this facility are adequate when receiving Astra's channels – so far. Thanks to Astra's reluctance to fire up all transponders, an installer needs to adjust the skew for best cross-polar rejection only at the mid to high end of the frequency band in use (Screensport on ch. 1 has to date no adjacent signal with vertical polarity to cause cross-polar interference). Unfortunately the problem becomes worse as the required frequency range increases, creating difficulty with reception of future Astra satellites.

The second problem is more obvious – the installer cannot easily see the polariser's "viewpoint". When a mechanical polariser is fitted he needs to look only at the probe position to know the skew setting. When a Marconi LNB is fitted the case position indicates the skew setting, although this must be done manually. The magnetic polariser has no indication of the skew setting other than from the signal level obtained. This makes a signal level measuring facility an absolute necessity. Simple peak-level units aren't suitable as they simply average the total power level of the channels received, when it's necessary to examine individual channel levels. This makes "by the book" installation a tedious job, requiring adjustment for optimum skew on each channel.

A Marconi LNB (or any LNB with two selectable receive probes 90° apart) will not require such elaborate alignment. It will require adjustment for the opposite polarity. Both these types of polariser are able to provide polarity selection with very low insertion loss and with cross-polar isolation better than that of a magnetic device. The mechanical polariser has the extra facility of skew adjustment from the receiver. Neither device will alter skew with frequency across the Ku band.

So next time you're asked to weigh up a TVRO system with a magnetic polariser, check that the receiver stores skew on each channel and be prepared for a return visit to the system when Astra fires up the remaining transponders.

Gordon McCrea,
Kesh Electrics (Satellite Systems) Ltd.,
Kesh, Co. Fermanagh, N. Ireland.

PHILIPS REPLY

In response to Martin Blake's letter (July) I would make the following observations which may help to enlighten Martin and your readers.

Philips, being at the forefront of electronic communications and leaders in the field of interactive communications, have translated this expertise into the area of spares distribution to provide material support for the UK's consumer electronics service industry. With the development of our Multi-option Interactive Enquiry System (MOVIES) we offer the trade the ability to gain access to our mainframe computer at Croydon in order to obtain up-to-date information on spares, technical advice and product availability. By using MOVIES the dealer can take advantage of the following facilities:

(1) Ordering parts. (a) Identify and code parts required. (b) Check on price and availability. (c) Place orders. (d) Check the progress of an order.

(2) Technical Information. (a) There is access to some 1,200 pages of current technical advice and service tips. (b) Technical assistance can be obtained from our Technical Support Engineer at Croydon via the messaging facility or contact made with Technical Liaison Officers throughout the UK. (c) The user can communicate with other MOVIES users in the UK via the messaging/mailbox facility.

All this is available for what is in most cases the cost of a local telephone call.

We at present have over 1,000 registered UK users (including our five major distributors) who regularly use MOVIES. In May, 67 per cent of all orders transacted at our Waddon warehouse were placed via MOVIES. Our current stock availability is 98·8 per cent of all codes required, and 93 per cent of all order items are cleared from stock. Orders placed before 18·45 hours by the trade via our MOVIES system are picked, packed and ready for despatch via mail or express carrier by 10 o'clock on the following working day (subject of course to stock availability).

Need I say more Martin? Join the MOVIES club or get closer to your Philips Appointed Distributor who will be delighted to help you.

Max Hofmann, Major A/C Manager,
Philips Consumer Electronics,
Consumer Electronics Service,
Waddon, Croydon CR9 4DR.

PHILIPS SPARES FROM WILLOW VALE

I read with interest Martin Blake's letter (July) regarding the distribution of Philips spares through wholesalers. According to Philips, in May Willow Vale supplied 48 per cent of all the non-account spares used in the UK. This comprised nearly 8,000 different parts with a supply ratio from our stock of 94·59 per cent. This means that half the trade ordered Philips parts from Willow Vale and received 95 per cent of their total order the next day.

I doubt whether any other manufacturer other than Sharp and Grundig (for whom we are the sole parts distributor) can boast such an impressive record.

Martin says he cannot understand our invoices. But as long as he gets his parts, why worry? Our rep will explain the paperwork and our technical people will help him order. Martin, my message is: Open an account – your problems should then be solved.

P.J. Bartlett, Managing Director,
Willow Vale Electronics Ltd.,
Reading, Berks RG2 0LU.

THE PVC LEAD PROBLEM

M. Bennett (Letters, August) asks why a PVC lead should attack plastic. PVC (poly vinyl chloride), whether used in mains leads or plastic macs, is somewhat different from other common plastics. Essentially it's a stiff or rigid polymer which is made softer by the addition of a colourless synthetic oil or "plasticiser". In some cases this plasticiser has an unfortunate tendency to migrate or leave its parent PVC compound under the action of heat and/or pressure. This gives rise to the observed effect, i.e. that by contact the plasticiser can migrate and soften silver paint etc. Some PVC/plasticiser combinations are worse than others in this respect. Cheap, poor quality compounds will no doubt be the worst offenders. In hopefully rare cases the plasticiser may contain other materials such as dissolved colour matter which could produce a clearly visible stain.

Although this problem doesn't always arise, it would be prudent to regard all leads as suspect and avoid conditions that would assist the process. In other words, let the leads dangle!

J.W. Turner, Grad. P.I.,
Morecambe, Lancs.

Editorial comment: We have received several letters on this subject and wish to thank all those who took the trouble to write. A further letter from Andy Emmerson will be published next month – he warns of the danger of using polystyrene roof insulation with PVC-covered cables.

AMSTRAD'S SATELLITE TV RECEIVER

Ian Martin's article on the Amstrad satellite TV receiver system (July) was very interesting. I too live in South Wales and experienced all the same problems as Ian, even down to the LNB packing up after the first week. Unlike Ian however I was quickly given a replacement by the local Currys branch despite my SRX200 kit being self-installed. I agree that the Amstrad system is excellent: the text, stereo sound etc. cannot be faulted. There's only one small thing that I wonder about. As Ian says, it's probable that the decoder will fit snugly in the top of the receiver. The only problem is that the receiver already runs pretty hot, so I don't know how hot the decoder will get!

Chris Plaice,
Swansea, Glamorgan.

THANKS!

I am writing to thank you for the excellent advice provided by your Advisory Service. This has helped me on several occasions. Here are a couple of examples.

The problem with a Philips set fitted with the G11 chassis was inconsistent line sync. Following your advice to check out decoupling capacitors I scoped the sync signal and found a ring which was causing the mis-sync under certain signal conditions. The cause of this problem was the LT1 supply reservoir capacitor C3150 (150μF) on the line output panel.

The problem with a Ferguson 3V35 VCR was intermittent noise on playback of its own recordings. You suggested worn heads, so I replaced them with an economy grade drum at £18. The results were superb! No realignment was necessary and the new heads overcame poor tracking with prerecorded tapes, a fault that had been present almost from new. No guide tweaking was required.

T.G. Borg,
Weaverham, Cheshire.

EQUIPMENT IN SCHOOLS

I work for a local authority in the repair and maintenance of audio-visual and reprographic equipment. In 1990 this work will go out to tender at many of the schools within this county and others. Thus in future schools will be able to call in local engineers to carry out repairs and servicing. I would like to point out however that there are some safety practices to take into account, as follows:

(1) TV sets should be in a cabinet or securely fastened.

(2) The security of all fastenings should be checked at regular intervals. These sets are prone to working loose from their mounting screws and if not checked the set can slide off its trolley. For this reason a sticker should be attached to one end of the TV set marked "push from this end only".

(3) It's recommended that the insulation of the TV sets, VCRs and audio equipment is flash tested at least once a year. It's the school's responsibility to ensure that all equipment is tested.

(4) Fuses, plugs etc. should also be checked every year.

(5) Extension cables should not be used.

J. Fenton,
Hull, North Humberside.

HELP WANTED

Can anyone help me obtain a TBA500 chip which I understand is no longer being made? Alternatively can anyone let me know of any chassis that used it so that I can perhaps salvage one?

Harvey Benson, 5/11 Rehov Hatzanhanim,
Entrance B, Magdiel, Hod Hasharon, Israel.

Can anyone supply or suggest an alternative for the hard-to-get LM373N chip?

M. Stevenson, 124 Green Lane,
Eastwood, Essex SS9 5QJ.

Can anyone assist with the repair of a Rank T510B ultrasonic remote control unit, used with the Bush Model AC6333? All that's wrong is that there's a missing top to a coil.

David Jackson, Graphic Studio Ltd.,
74 Lower Camden Street, Dublin 2, Ireland.

Servicing Salora Colour Receivers

Part 2: The G and H Chassis

Nick Beer and Ian Bowden

This month we'll start on the G and H chassis – the production of these very similar chassis overlapped. Both chassis use the Salora Ipsalo (integrated power supply and line output) circuit, which was devised as a means of reducing the power consumption. It uses a common transformer, referred to as the combi transformer, for the chopper and line output stages.

The situation is complicated by the fact that two different Ipsalo circuits were used in the G and H chassis. G sets up to serial number 300,000 and H sets up to serial number 200,000 use the Ipsalo-1 circuit while later sets use the Ipsalo-2 circuit. The two circuits are quite different. While Ipsalo-1 uses a thyristor as the chopper device, a second thyristor for protection and soft-start, and a 28-pin type LF0015 hybrid i.c. for chopper control, Ipsalo-2 uses a couple of transistors in the chopper circuit (both as switching devices) and an LF0034A 20-pin hybrid i.c. as the control device. Ipsalo-1 has two driver transformers for the two thyristors while Ipsalo-2 has a single driver transformer with two secondary windings for the two chopper transistors – the primary winding on the combi transformer is connected in series between these two devices. Both Ipsalo circuits provide mains isolation.

Ipsalo-1

Fig. 1 shows the Ipsalo-1 circuit used in the H chassis. In the following description we'll use the H chassis circuit reference numbers with the G equivalents in brackets.

The incoming mains supply is filtered and then fed to the bridge rectifier DB708-711 (DB1-4) whose output is fed via the surge limiter RB711 to the anode of the first thyristor THB700 (THB2). The mains input is also fed to transformer MB700 (MM1) which produces an output of approximately 24V a.c. This is rectified by DB700-3 (DB40-3) and fed via DB704 (DB44)/RB702 (RB127) to the start supply regulator circuit TB700/TB701/DB706 (TB15/TB16/DB14) which produces an output of about 12V. With the H chassis there's also a feed via DB704 to the MC78M18 18V regulator ICB700. On the G chassis a 32V feed from the cathode of DB44 is taken to the battery kit socket and remote control PCB if fitted.

During start-up the regulated start supply is used to power the Ipsalo chip HB1, the TBA2593 sync/line generator chip ICB501 (ICB2) and the line driver stage.

Overload Protection and Soft Start

The first thyristor THB700 (THB2), type TIC106M, is used as an electronic fuse in case of an overload and also to provide a slow start-up. Both these functions are controlled by the hybrid chip. For slow-start control a zero cross-point switch in the chip is fed via pin 27 with an integrated a.c. waveform from the secondary winding on MB700 (MM1). This circuit produces a sawtooth waveform which is used as one input to a control amplifier circuit, the other input being a clipped line flyback pulse from the combi transformer. This control amplifier's output is fed to an integrated driver transistor whose output leaves the chip at pin 4, going to the driver transformer MB701 (MB4) which controls the gate of THB700 (THB2). The soft-start action is to switch THB700 (THB2) on during only one half of the mains input, so that the main reservoir capacitor CB721 (half CB5) receives only a half-wave rectified input. Once the set has started up THB700 (THB2) is driven on both half cycles of the mains input.

The 12V supply at pin 22 of the hybrid chip, the 20V supply at pin 6, the 28V supply at pin 5 and information on the operation of the chopper, fed in at pin 20, are sensed by the overload protection circuit. Should an overload occur the drive to THB700 (THB2) is removed, leaving this thyristor cut off. Thus the set closes down, after which it will try to start up again – with the later Ipsalo-2 circuit the set remains shut down.

Chopper Action

The second thyristor THB701 (THB1), type 18022, is used as the chopper device, controlling the amount of energy transferred from the mains supply to the combi transformer and thus all the secondary output voltages. Note that this device incorporates a reverse current (efficiency) diode. Line flyback pulses are fed back to pin 16 of the hybrid chip and are used to generate a sawtooth waveform which is applied to one input of a control amplifier. The other input is fed in at pin 18 and provides a reference voltage, developed across CB718 (CB15) at pin 10. This reference is preset by RTB700 (RTB1) which thus controls the levels of the output voltages provided by the Ipsalo circuit. This control amplifier acts as a pulse width modulator: each time the sawtooth input falls below the reference level its output changes state. This cuts off the integrated driver transistor whose output, at pin 9, drops. A drive pulse is then coupled via MB702 (MB5) and CB724 (CB20) to the gate of THB701 (THB1), switching it on. When the line flyback occurs a back-e.m.f. is generated by the combi transformer's primary winding, the reverse voltage across it switching THB701 (THB1) off. Current flows through the integral efficiency diode, putting energy back into the smoothing capacitor CB722 (part CB5). As the thyristor's switch-off point is fixed, it's the switch on point – or rather the length of time the thyristor conducts – that governs the amount of energy supplied to the set.

This switch-on point varies to provide regulation of the secondary supplies. If the amplitude of the flyback pulse or the rectified mains input increases, the reference voltage at pin 10 of the hybrid chip will fall (there's an inverting amplifier between pins 18 and 10). The driver transistor will thus switch off later and the thyristor will not remain in conduction for so long, resulting in less energy being supplied. The reverse happens when there's a drop in the mains input or the amplitude of the line flyback pulse.

Standby System

The transformer fed start-up supply is used when the set is in the standby mode. In the H chassis the 18V

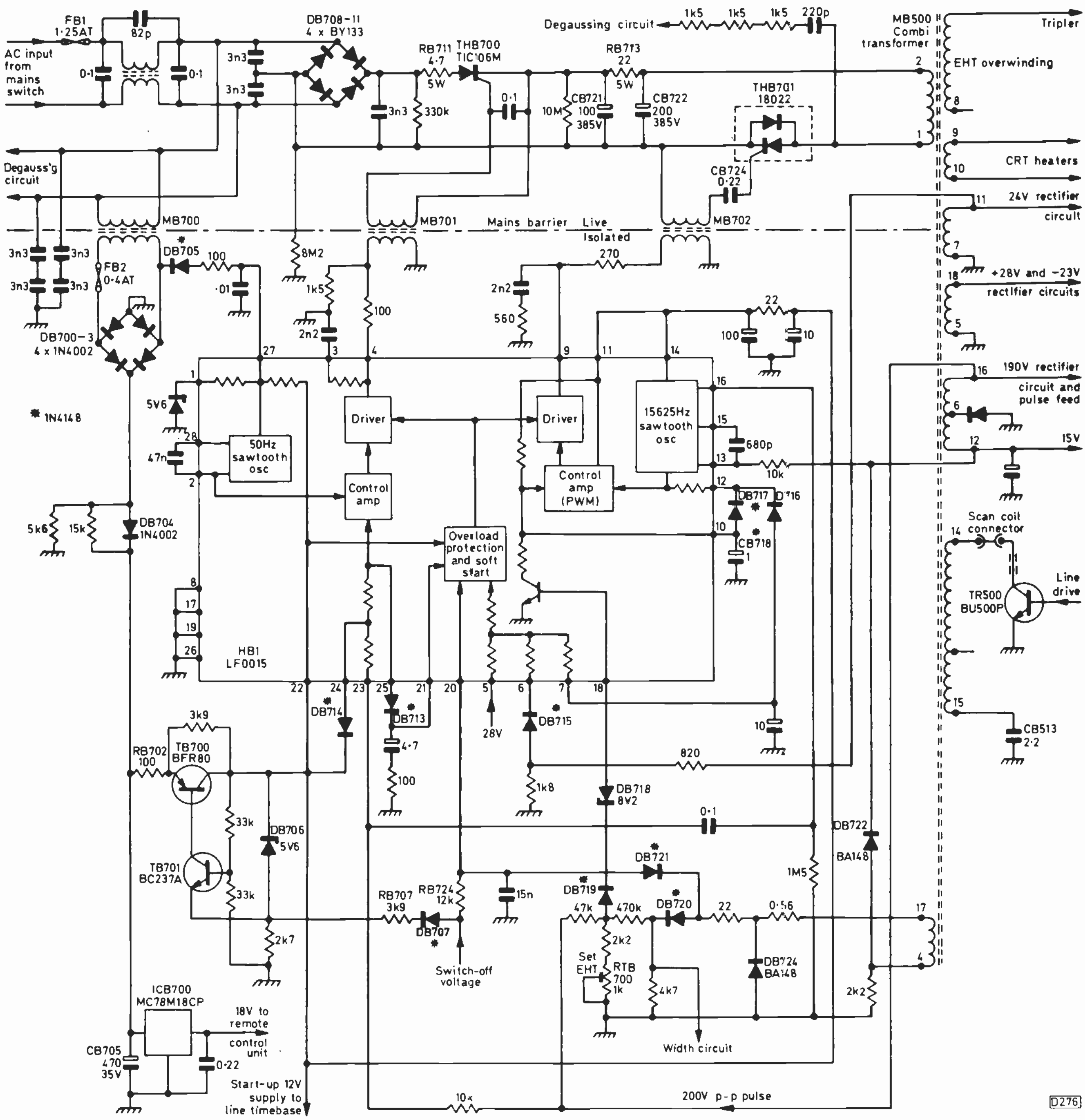


Fig. 1: The Ipsalo-1 circuit as used in the H chassis. Note that the line output transistor's supply is generated across capacitor CB513 by efficiency diode action.

output from ICB700 powers the remote control circuitry in standby, while in the G chassis the 32V output from DB40-3 is fed to the remote control panel where a similar i.c. provides regulation.

When a standby command is received, pin 19 of the SAA1251 remote control decoder chip ICC101 goes low, switching on transistor TC102. This links the 18V line back to the power supply where it passes via RB724 (RB125) to pin 20 of the hybrid chip. This shuts off both driver transistors in the chip, so that neither thyristor in the chopper circuit receives drive pulses. The 18V supply is also fed via DB707 (DB37) and RB707 (RB124) to the start-up supply regulator circuit where TB701 (TB16) switches off. As a result TB700 (TB15) is no longer conductive, removing the start-up supply to the Ipsalo chip, the line oscillator and the line driver stage. When the set is asked to come on from standby it's simply a matter of switching off TC102 so that the 18V feed to the power supply is removed, after which the set starts up in the usual manner.

Tuning Arrangements

Earlier versions of the G and H chassis used basically the same sweep tune and control circuit. The difference is that in the H chassis the SAA1251 remote control decoder chip is on the microcomputer panel whereas the G chassis has to be fitted with a small extra PCB to perform this function. The reference numbers in the following description apply to both the H and G chassis.

The later eight-channel version of the G chassis did not have this search tuning. Instead it uses preset potentiometers switched by two i.c.s (ICCP1 and ICCP2) on the lower front panel. These chips are fed with channel number data from the 74C922 channel number keypad encoder chip ICS1 on the upper front panel. This arrangement has proved to be far more reliable and we feel requires no further explanation.

In later H chassis sets with the Ipsalo-2 circuit the search tuning circuit is simplified by the use of an M193C combined microcomputer, memory and varicap supply driver chip. There are two exceptions, the 1H7 which has the same system as later G chassis sets and the 1H3 and 1H5 which have mechanical switch banks to select the channel and the appropriate tuning potentiometer. These circuits are more reliable (apart from switch contacts on the 1H3 and 1H5) than the search tuning system and do not call for any further explanation.

Search Tuning Operation

When it comes to faults in the G chassis the search tuning circuit is, after the Ipsalo circuit, the main trouble-spot. As you will see from the fault list next month, the number of faults is comparable to the power supply. When fault finding in this area it's helpful to know how the system operates, so that faults can be tracked down by making test measurements rather than

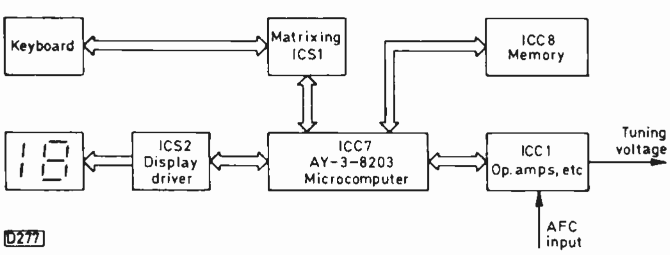


Fig. 2: Block diagram of the search tuning system.

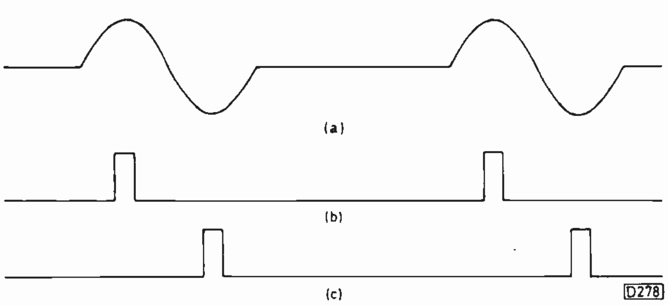


Fig. 3: Tuning up/down waveforms. (a) A.F.C. demodulator output, (b) up pulse, (c) down pulse.

by just changing the i.c.s one by one and keeping your fingers crossed that you will have cleared the fault.

The design is based around the AY-3-8203 microcomputer ICC7 whose function, in conjunction with the front control and display panel, is to provide tuning search and control of memory and channel switching. Fig. 2 shows a block diagram of the system.

Tuning is initiated by the start button, operation of which sets ICC7 in the search mode. A pulse train at approximately 3·9kHz then emerges from pin 35 – this will form the varicap supply voltage. At the same time the fine-tune voltage at pin 33 is centred to give an equal "throw" up and down. Also pin 31 goes low to mute the sound, lower the contrast level and, with the G chassis, switch on the tuning band LEDs.

The pulses from pin 35 vary in width to set the final d.c. level fed to the varicap tuner. They are adjusted to an amplitude of 5·2V by RC58/DC15/TC8/RC54 and then pass to a filter circuit consisting of RC9/10/11/13/14/15 and CC5-8 which, in conjunction with an operational amplifier in ICC1 (input pins 8 and 9), produces at pin 7 the d.c. required for the tuner. As the search continues, the a.f.c. demodulator ICCC1 (TBA120A), which is mounted in a screening can on the tuner/i.f. motherboard, gives a pulse output signal – see Fig. 3(a) – which is fed to the control PCB, entering ICC1 at pin 11. When the swing of this signal is greater than ±50mV in comparison with an internal reference voltage of 5·2V, a comparator circuit within the chip produces two output pulses that leave at pins 15 and 16 (the down and up signals respectively).

The down signal is fed directly to the 4011 chip ICC9, providing one input to a nand gate. The up pulses from pin 16 are delayed by CC35/RC66/DC18 before being fed into ICC9 as the second input to the gate. When the up and down signals are both high, the gate's output goes low. This change is coupled via RC71 and CC37 to the level-shift transistor TC12 which turns off momentarily, providing a high pulse at pin 29 of ICC7. This is the stop input. The search then pauses. After a delay of approximately 256msec, set by an internal monostable, the validate input at pin 28 is checked. If it's low, the search will continue: if it's high this indicates that a channel has been found. It can go high only when the video sync fed to pin 12 of ICC1 and the flyback pulses fed to pin 13 coincide, making the output at pin 20 go high. This output is fed via ICC9 and the level-shift transistor TC11 to pin 28 of ICC7. The search will stop and pin 31 will go high, removing the mute and restoring the contrast level. The station can now be stored in the ER1400 tuning memory chip ICC8 by pressing the store button.

ICC7's clock is set at 2MHz by RTC3 and CC26. This is divided by 128 to provide the 15·625kHz memory clock. The search speed is set by the tuning oscillator whose frequency is set at approximately 1·2kHz by RC59 and CC27. ICS2 (U143M) on the front panel drives the LED channel number display, under the control of the four-bit parallel data lines from pins 22, 23, 24 and 25 of ICC7. Channel selection is performed by the MM74C922 chip ICS1 which feeds data directly on to the same data bus. The remote control system uses an SAA1250 encoder in the handset and an SAA1251 decoder in the remote control receiver (ICC101 in the H chassis). This chip provides the same data lines with outputs at pins 8, 9, 10 and 11, via ICC103.

Next month we'll take a look at the Ipsalo-2 circuit then provide a fault guide for the G and H chassis.

An Inexpensive Orthomode Transducer

Paul Matthews

An orthomode transducer is used at the feedpoint of a dish to split the signal two ways. These devices are usually sold at about £99 plus VAT. One type known as IRTE is made in Italy and comes with two adaptor rings. They can be used in various ways. For example you could use one to feed two LNBs from a single feedhorn, one for vertical and the other for horizontal polarisation. This could be done with a fixed dish for reception from a single satellite – you can't do it with a polar-mount dish as there's no skew control. Alternatively you could use the orthomode transducer to feed an 11GHz and a 12·7GHz LNB with a polariser at the input – the 12·7GHz LNB for use with Telecom-1. There's also the possibility of covering three bands by using a dual-band LNB at one port, giving low- and mid-band reception via one port and the high band via the other.

The present article came about to meet the viewing requirements of a home with several young people. I've three sons and their friends are often here, giving rise to frequent squabbles over programme selection. The solution – multiple receivers. But we didn't want more dishes outside. We needed another LNB anyway for the Astra signals. A fairly noisy one, 2dB, is quite adequate for use with our 90cm dish. I bought a used one for £33, which didn't eat too hard into the family budget.

The price of an orthomode transducer was the hardest thing. How much?!! Surely not for a piece of pipe with three flanges?! So I went out into the garage, in thought mode, dived into the central heating bits box and had a fiddle with some 22mm pipe. A visit to the local plumbing supplier produced a Yorkshire tee and a swept elbow. The total cost of these, with VAT, came to 99p.

Construction

The next step was to cut two 50mm lengths of 22mm pipe, slit them lengthways and open them out flat. These form the LNB connecting flanges – see Fig. 1. Another two pieces were cut to 35mm and deburred. The flanges were cleaned with a piece of emery paper then soldered on to the pieces of pipe using ordinary 60:40 solder, with 1mm of pipe sticking through. If you haven't got a blow torch, a gas cooker will provide sufficient heat.

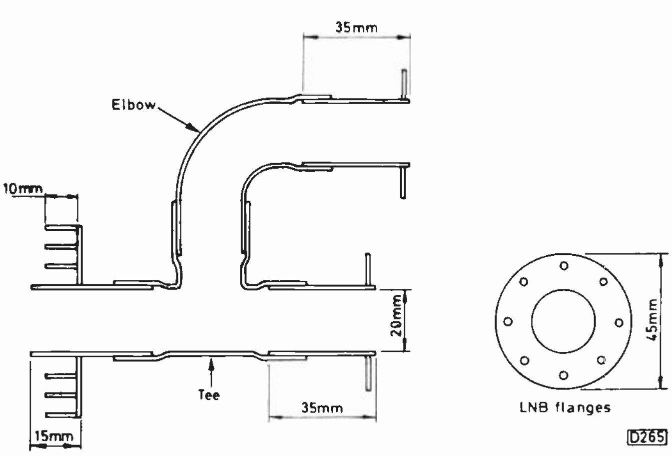


Fig. 1: Constructional details of the orthomode transducer, also a scalar feedhorn.

The inside edge of the swept elbow, which fits into the tee, was chamfered to provide a smooth entry into the socket. These two pieces were soldered together first, making sure that the output via the elbow was in line with the tee's through port output.

Similar treatment was applied to the inside edges of the flange pipes, i.e. they were chamfered to ease entry into the sockets. Mole grips were clamped to the flanges to act as heatsinks while the pipes were being soldered to the main body.

Scalar Feedhorn

After chamfering the edges to fit, a spare scalar feedhorn was fitted to the front of the tee, using two-part epoxy. If you are stuck for a feedhorn one can be made using a 35 × 22mm piece of pipe with a 55mm disc soldered 14mm from the front. Solder on to the disc three 10mm wide strips of copper made from slit pipe, fitted at 5·5mm centres, the longest strip around 175mm, the next 145mm and the smallest 105mm.

Dish Size

Because of the shadowing effect of the orthomode transducer and the extra LNB the dish should be of 85cm diameter minimum. The arrangement is mounted with the extra LNB upwards so that any water that gets past the O rings fitted on the 1mm projection between the flange and the LNB runs down and out through the holes of the spider trap cap.

Spiders

An anti-spider cap is worthwhile. Spiders seem to find this environment all too well suited to catching their lunch but play havoc with the microwaves! The Saturday morning chore is to brush spider's webs and things out of the feedhorn. I once had complete signal fade-out overnight and thought the LNB had died. Eventually I discovered that a spider had made a nest around the LNB's pick-up probe.

Transition Rings

The LNB flanges have eight holes on 45° centres. Thus if you have some spare quarter-wave circular-to-rectangular transition rings or need to fit these to minimise loss they can be fitted to retain the vertical and horizontal positioning. Their function is to match the signal to the polarity of the LNB. They consist of a 45mm diameter block of aluminium 12mm thick, with an oval hole 20 × 12mm and chamfering to a circle at the input side. I fitted some spare ones to the assembly and noticed only a very slight improvement.

Mounting

The whole assembly was mounted at the dish feedpoint using a three-inch PVC pipe clip that gripped around the bottom LNB, with the tripod arms in the form of a Y. The top LNB is used for vertical and the bottom one for horizontal polarisation.

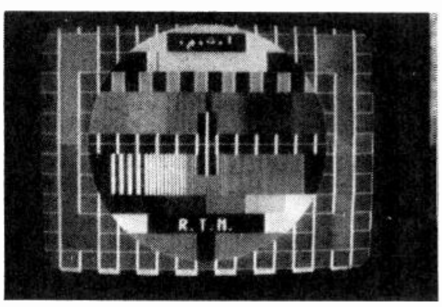
Long-distance Television

Roger Bunney

One correspondent wrote "there's something about most days – if you've the time to look for it". That sums up the conditions during June. Sporadic E signals were present on most days, though at times of short duration. On other days the openings were intense, with hours of reception and the m.u.f. reaching into Band III. The prolonged hot weather also produced good tropospheric reception. First the UK SpE log:

3/6/89 RAI (Italy) chs. IA, B; TVE (Spain) E2, 3, 4; TDFC+ (France Canal Plus) L2; TSS (USSR) R1, 2; TVP (Poland) R1.
4/6/89 TSS R1, 2, 3; C+ L2; TVE E2, 3, 4; EPT (Greece) E3; RAI IA, B; Ercalano (Telemarket) E2 and TVA IB – Italian private stations.
5/6/89 RAI IA, B; Teleroland E2 (Italian private); ARD (W. Germany) E2; CST (Czechoslovakia) R1, 2; TSS R2; EPT E3;TVE E2, 3, 4; TVE-2 E2; RTP E3.
6/6/89 TVE E2, 3, 4; RTP E3; RAI IA, B.
7/6/89 RAI IA; TVA IA; Telemarket E2; TVE E2, 3; TSS R1, 2; PTT (Switzerland) E3; smeary E2 video from the south at 1820, suspect ZTV (Zimbabwe).
8/6/89 NRK (Norway) E2; TVP R1, 2; CST R1, 2; ORF (Austria) E3, 4; JRT (Yugoslavia) E3, 4; C+ L2; RAI IA, B; TVE E3; RTP E3.
9/6/89 TVE E2; JRT E2; ARD E2; RTP E2.
10/6/89 An intensive day: JRT E3, 4; RAI IA, B; Canal-3 (Italian private) IA; Telemarket E2; C+ L2, 3, 4; TVE E2, 3, 4; RTP E3; TSS R1; MTV (Hungary) R1, 2; TVP R1, 2; CST R1, 2; RTSH (Albania) IC; JTV (Jordan) E3. An unidentified Arab station was logged on ch. E5. Low-level aurora activity from 1700.
11/6/89 TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; SVT (Sweden) E2, 3, 4; TSS R1, 2; NRK E2; YLE (Finland) E4; PTT E2, 3; C+ L3; RAI IA; Tele Uno IA; JTV E3 (at 1940); ARD E4. At 1400 Simon Hamer logged an excellent Band III SpE opening with RTT (Tunisia) E5, 6; Libya E6; RTA (Algeria) E5, 6, 7; RTM (Morocco) M4, 5, 7. All these signals were positively identified from test patterns, captions and logos.
12/6/89 RAI IA, B; Telemarket E2;TVE E2, 3, 4; RTP E2; ARD E2; PTT E2; TVP R1, 2, 3; CST R1, 2; TVR R2; TSS R1, 2, 3, 4, 5; SVT E2, 4; DR (Denmark) E3; NRK E2, 3, 4; YLE E4; RUV (Iceland) E3, 4; JRT E3, 4, 7; JTV E3 (at 1925). An unidentified system M signal on ch. A2 was logged during the evening.
13/6/89 TVE E2, 3, 4; RTP E2, 3; TVE-2 E2; RAI IA, B; ARD E2, 3, 4; SVT E2, 3, 4; NRK E2, 3, 4;YLE E3; JRT E3, 4. A coloured news announcer was received on ch. E3 from due south, possibly Sokoto, Nigeria.
14/6/89 RTP E3;TVE E2, 3, 4; TVE-2 E2; C+ L2; RAI IA, B; Videolina IA; TVA IA; CST R1; TVP R1, 2; NRK E2; SVT E2, 3, 4; TSS R1, 2.
15/6/89 RAI IA; Telemarket E2; RTSH IC; MTV R1, 2; TVR R2; RTP E2, 3; TVE E2, 3; ARD E2; TVP R1; CST R2; TSS R1, 2, 3; NRK E2, 3; SVT E2, 3, 4.
16/6/89 TVE E2, 3, 4; TVE-2 E2; RTP E2, 3; RAI IA, B; ORF E2a, 4; CST R2; MTV R1, 2; TVR R2, 3; RTSH IC; EPT E3; DR E3, 4; JRT E3, 4; TVP R1, 2; TSS R1, 2, 3, 4, 5; YLE E3; NRK E2, 3, 4; SVT E2, 3, 4; RTM (Morocco) M4.
17/6/89 TSS R1, 2, 3, 4; TVP R1, 2; NRK E2, 3, 4; SVT E2, 3, 4; YLE E3, 4; ARD E2, 3, 4; ORF E2a, E4; RAI IA, B; Telemarket E2; Tele Uno E3; RTSH IC; + PTT E3, 4; C+ L2, 3, 4; DR E3; TVE E2, 3, 4; RTP E3; JRT E3, 4.
18/6/89 TVE E2, 3, 4; RAI IA, B; TSS R1; AFN ch.E3 reported by Bill Cotterill – likely to have been ch. A2 AFRTS Crete (American Forces Radio and TV Service).
19/6/89 RAI IA, B; TVA IA; Telemarket E2; TVE E2, 3, 4, 5, 6, 7; RTP E2, 3; DR E3; MTV R1; RTM Morocco M6, 7 (Roger Fussell).
20/6/89 TVE E2, 3, 4; RTP E2; RAI IA; TVE-2 E2.
21/6/89 SVT E2, 3, 4; NRK E2, 3; YLE E3, 4; TSS R1, 2; CST R2; TVE E2, 3; RAI IA, B.
22/6/89 TVE E2, 3, 4; RTP E2, 3; C+ L2; NRK E2; TSS R1.
23/6/89 RAI IA.
24/6/89 TVE E2, 3, 4; C+ L3; ARD E3.
25/6/89 SVT E2; RUV E3, 4; NRK E4; ARD E2; TVE E2, 3, 4; TVE-E2; RTP E3; Arabic ch. E3 signal from 1845-1915 possibly Jordan or Iran.
26/6/89 YLE E2; TSS R1, 2; CST R1, 2; JRT E3, 4; RAI IA; Telemarket E2; ORF E2a; TVE E2, 3.
27/6/89 RAI IA; Telemarket E2; JRT E3; TVE E2, 3, 4; RTP E3; RUV E3, 4; NRK E2, 3, 4; SVT E2; TSS R1, 2.
28/6/89 PTT E3; EPT E3; NRK E2, 3; TSS R1, 2.
29/6/89 +PTT E3.
30/6/89 TVP R2; TSS R2.

The 11th and 17th produced the most intense SpE openings. On the 11th radio amateurs achieved two-way contact between the UK and Guyana at 50MHz. The 17th produced a prolonged opening, with the 2m (144MHz) amateur band open for some six hours. Several TV-DXers are now monitoring Band III during intense openings – their patience has certainly been rewarded. The latest solar cycle forecast indicates that the peak will be in early 1990, with a smoothed count of



Left: Test pattern B, from a Cathodeon publication – see Vintage test cards. Centre: The PM5544 test pattern as used by RTM (Morocco), received by Ian Waller in Lincoln. Right: The standard North American 525-line test pattern displayed on a 625-line receiver, showing the reduced height when the field hold control is adjusted to lock the picture. Signal received by Ian Waller via the Gorizont 14°W satellite (global beam, C band).

189 ± 32. We have heard that Greece is to offer experimental amateur radio transmitting licences for the 50MHz band.

There were two spells of tropospheric activity during the month. The first, around the 10-11th, produced Band III/u.h.f. signals from Denmark, Norway, Sweden, W/E Germany, the Benelux countries and France, with the ch. A80 AFRTS outlet in Holland as a bonus. The second spell lasted from the 15th through to the 22nd, with a similar selection of signals but perhaps with a bias towards the south. Intense signals were received from all networks in France, and TVE was noted in the south west. Interference with local services became so severe that on the 19th, a Monday, the *Daily Telegraph* ran a page one story on the subject, including DX-TV as a hobby.

Brian Renforth reports that Tyne Tees TV has been heard on 96·6MHz, using this frequency for outside broadcast to studio links and upsetting the Bilsdale TEM radio service.

My thanks to the following for sending in reception reports: Cyril Willis (King's Lynn), Ian Beckett (Buckingham), Simon Hamer (Powys), Peter Schubert (Rainham), Ryn Muntjewerff (Holland), Brian Renforth (Newcastle), Roger Fussell (Torpoint), Tim Anderson (St. Leonards) and Bill Cotterill (Tipton).

News Items

France: Antenne-2 and FR3 viewing figures have slumped to a combined total of 35 per cent. The government feels that these services are poorly equipped to face the rising competition and is to appoint a combined head to improve matters. This may lead to a radical change in FR3's regional operation, with more alternative programming.

Italy: J.M. Communications of Luxembourg has bought Tele Monte Carlo's Italian operation. Canal Plus has an interest through programme exchange. Tele Monte Carlo can transmit programming throughout Italy and is likely to introduce a new pay-TV service. The other foreign broadcaster who has a right to transmit within Italy is the Yugoslav Tele Capodistria, which is also to become a general entertainment pay-TV service.

Kenya: A modernisation plan for the Kenya Broadcasting Service has been announced and there's to be a study on the feasibility of a second service. In addition the government is expected to approve the establishment of private radio and TV stations.

USSR: Ted Turner's CNN news channel is soon to go Russian. To start with there will be scrambled u.h.f. transmissions from Moscow and Leningrad. The Moscow service will be on ch. R24, using SECAM-K.

In brief: The commercial Tele Madrid service is now in operation . . . BBC-1 and BBC-2 are to start Nicam-728 stereo transmissions in the autumn of 1991 . . . A mystery 45·7MHz transmission logged by DX-ers in New Jersey, USA and the Netherlands turns out to be a sound link for RCN Antena Dos, Bogota . . . The Belgian RTBF service is to include advertisements.

Vintage Test Cards

In the June column we published an appeal for information on test card B. Much detailed information with a copy of "test pattern B" (see photo) has been provided by Peter Delaney of the British Amateur Television Club. At one time Cathodeon Ltd., a subsidiary of Pye, produced monoscope tubes that gave various patterns including B, C, D, F and G. C was the familiar BBC test card C, D was a variation on the RETMA card (not the UK 405-line test card D). The F card was not the familiar colour card but a quite unusual display. G was the usual 625-line card used by several Continental broadcasters. B is not actually a test pattern but a view, apparently of a Cambridge college building, most likely King's College. Hopefully this at last resolves the mystery.

New EBU Listings

France: Nantes ch. E65, 50kW horizontal. M6 service.
West Germany: Hennsted/Itzehhoe ch. E49, 100kW horizontal. Private station.

Satellite News

During the last week in June sat-zappers may have noted the various programme inserts plus complete meetings for the Billy Graham movement, via ECS at 7°E. For those with a clear take-off towards the south east and thus able to receive Intelsat 60°E, Hong Kong TV can be seen for several hours in the early afternoon on Sundays and Wednesdays carrying sport.

BBC Enterprises has signed a five-year agreement with the European Space Agency to transmit BBC European programming via a 12·0919GHz transponder (this transponder is officially allocated to Austria). The satellite is at 19°W and the signal power is 62dBW. The agreement is to last until late 1994/early 1995.

The Spanish Hispasat craft will carry eight wideband 72MHz transponders. Two 36MHz channels will be used for transatlantic traffic to the States and three DBS channels will be available for Western Europe. An X band military frequency will also be available. TVE hopes to use the craft for ENG and EFP links.

AsiaSat hopes to reach over two billion viewers in the Far East, with coverage of Pakistan, India, Thailand, Korea and China – in fact some 35-40 per cent of the Earth's surface. Interesting that broadcasting organisations will be able to link up via this craft, bypassing Intelsat.

Radio Tele Veronique hopes to start transmissions via ECS-4 on January 1st 1990 with a new Dutch TV service. An Astra downlink is also a possibility. The main backers are CLT and three Dutch banks.

There are plans for a pair of satellites called Europsat to be launched in the mid-1990s, each with twelve high-power transponders. Britain, France and West Germany are studying the plans which have been presented by Eutelsat.

There is to be a two-year HD-TV test of the 1125/60 standard in Canada, via Telsat, starting this autumn. The new HD-BMAC scrambled system will also be used.

Astra is to bring forward the launch date of its second satellite to October 1990. The 16 channels will use 65W instead of the present 45W transponders, but as the beamwidths will be greater the signal levels should be much the same as with Astra 1A.

The BBC is using a mobile satellite link unit for radio OBs, via ECS at 7°E, with high-quality digitally encoded stereo (system DS-1).

IBA Technical Information

The 1989 IBA pocket guide is now available free from the Engineering Information Department, Crawley Court, Winchester, Hants SO21 2QA – a self-addressed, stamped foolscap envelope would be appreciated. As usual it contains full information on the IBA networks.

The May and June issues of the IBA's *Engineering Bulletin* contain very useful articles on TV signal levels, signal-to-noise ratios and using head amplifiers. The June issue article provides detailed head amplifier data, showing how the receiving system noise levels can be calculated and the improvements that can be obtained by using head amplifiers with different noise figures, taking into account cross-modulation (overload) problems. I feel that these two bulletins are very relevant to DX work and are worth reading.

The Yoko TVC-8M Multi-standard TV

The Yoko Model TVC-8M is currently on offer at £99 from Aerial Techniques who lent us one for evaluation as a general-purpose/DX-TV receiver. It has a 4·5in. screen with alongside this a vertical tuning scale for v.h.f. high/low, u.h.f. and radio coverage of MW, LW and 88-108MHz. The tuning scale covers 6cm and is marked with chs. E2/3/4, all the Band III CCIR channels and a general u.h.f. scale for every ten channels up to 60/65/69. A bank of six buttons below the screen together with an adjacent slide switch control the clock and alarm system – the 24-hour digital clock has a bright red LED display immediately below the vertical tuning scale. The lowest panel, which is angled slightly outwards, has four pushbuttons for power on/off, v.h.f./u.h.f., Bands I/III and radio/TV. At the upper right-hand side of the cabinet there's an edge volume control and below this a radio/TV tuning control. There's also a radio band slide switch and a 3·5mm headphones socket.

At the back there's a battery compartment (the PP3 battery acts as a clock back-up supply), a permanently attached mains lead, a systems B/G and L slide switch and an aerial input socket – this consists of a 3·5mm mono audio jack! An adaptor is supplied for a Belling Lee type plug. There are contrast, brightness and field hold controls but the line hold control is an internal preset. A 12V input socket is provided and at the top of the cabinet there's an integral seven-section chromium telescopic whip aerial that can be swivelled to any angle.

The low v.h.f. band was measured as 43·1-83·5MHz, the high v.h.f. band as 136-233MHz while the u.h.f. coverage is 452-860MHz. Scale indication is accurate.

The receiver was found to be stable, locking almost instantly on weak through to strong signals with either positive- or negative-going vision. It resolved system I signals in addition to system B/G and can thus be used in the UK, Western Europe, North Africa and the Middle East. Selectivity is good: for example there was no interference between the local strong Rowridge ch. 24 signal here and weak Crystal Palace transmissions on ch. 23. Sensitivity is similarly good, typical for this type of receiver. The 24-hour clock is I feel an excellent feature to help with logging DX signals. Radio performance is satisfactory.

The alarm facility brings an in-built buzzer or radio/TV reception into operation. There's a sleep function which cuts off radio/TV reception after a set time.

I wasn't impressed by the aerial socket adaptor arrangement, particularly at u.h.f., and feel that the lack of a user line hold control is a disadvantage, though SpE, tropospheric and various French signals locked. With mains operation there was an obvious lamination buzz from the transformer, louder when "off" and falling when on load, i.e. with TV switched on. The power section runs rather warm, the rear of the cabinet being too warm for my liking – repeated warming and cooling of the nearby battery could lead to its early demise.

The v.h.f. radio section enables Band II to be checked as the m.u.f. rises, and the extended low v.h.f. band coverage including chs. R3 and IC is a decided bonus. The design of the 3·5mm mono plug/jack aerial input is such that I would recommend adding strain relief to remove stress. The mono picture is sharp and the contrast range good.

Following comments supplied to Aerial Techniques on the overheating problem we have been informed that the latest models now incorporate improved ventilation.

Programming Guide

Alexander Wiese, once noted for his DX-TV activities, has in recent times become involved in the publication of several magazines aimed at the satellite TV market. On of these, *TVI* (Television International), lists the monthly programmes for most of the satellite TV services available throughout Europe, also a number of terrestrial services. In addition feature spreads (in German) are given on programmes and technical details are provided on each satellite downlink – frequency, coding etc. This worthwhile publication is available on subscription within Europe at 77DM from TELE-audiovision Medien GmbH, Abt. Vertrieb, Postfach 801965, D-8000 Munchen 80, West Germany. For copyright reasons Sky Movies programmes are not listed – they are officially not supposed to be viewed outside the UK.

Tackling Unknown Small-screen Sets

Malcolm Burrell

Field engineers years ago were accustomed to walking into a living room to be confronted by an unknown monster – not always the customer . . . Usually, if a dead monochrome set was involved, it was a case of replacing a valve or counting the bottles in order to use Ohm's Law to work out the value of the new dropper section required. Other main sections of the set could be identified by the valve type numbers, familiar large components or by tracing along connecting cables. Much has altered since then, and particularly with the smaller sets it's often tricky to find the line output transistor. Nevertheless with monochrome portables much can be ascertained by a cursory look. Most of them use a conventional circuit arrangement.

Video Problems

You may find the video output transistor on the c.r.t. base panel, but it usually resides on the main panel and is fairly easy to locate by following the c.r.t.'s cathode lead, which is usually separated from the other connecting leads. Expect around 40V at its collector – the supply will be derived from the line output stage. If the symptoms are sound and a raster but no picture, much can be deduced by adjusting the contrast and brightness controls, and by noting any variation in the video output transistor's collector voltage when the aerial plug is withdrawn with a signal tuned in. The brightness control sets the c.r.t. bias while the contrast control adjusts its drive. The video output transistor will normally be driven by an emitter-follower video driver transistor which should not be too far away. Coupling between the two is generally by means of a resistor/capacitor network.

AGC Faults

A.G.C. faults can give similar symptoms to a video problem, but an over-contrasted picture may be resolved. Attenuating the input signal may give you an otherwise normal though noisy picture. A search should then reveal the a.g.c. circuit, probably in the vicinity of the video driver transistor. The intercarrier sound take-off is usually also in the vicinity of the video driver transistor. So the presence of sound with no vision may help to eliminate certain stages.

With line-gated a.g.c. common in solid-state sets, missing pulses from the line output stage are a possibility. Common causes of this are a dry-joint on the line output transformer or open-circuit print, which may be the result of mechanical shock – a portable TV set is likely to be bumped quite heavily at some point of its life!

Fault descriptions can be helpful. A set that was apparently operating normally and developed the fault at switch on may have one or two semiconductor devices that have failed as a result of a flashover. The video and a.g.c. circuits are particularly vulnerable to this sort of thing. A slight high-voltage click at switch on should lead to a check on whether there's a dislodged c.r.t. Aquadag earthing spring which, since the chassis of most portables are isolated from the mains supply, may be anchored to the c.r.t.'s Rimband.

Signal Faults

With signal faults much can be discovered by using a signal injector or signal generator to trace through the i.f. stages. Older sets, particularly those that use germanium transistors, are prone to noisy semiconductors – on occasions these ultimately become corroded. More recent receivers tend to have lots of safety resistors that go open-circuit for no apparent reason.

Most of the varicap tuners used in such sets have separate power inputs for the r.f. amplifier and mixer stages, plus an a.g.c. input and the variable tuning voltage which is derived from a stabilised 30V line. If there appears to be a tuner problem, find the tuning line or the connection to the tuning buttons or potentiometer. If operating the control produces a voltage variation at the tuner check that both power inputs to the tuner are intact. On occasions the cause of no output from the tuner is simply an open-circuit resistor.

Don't Blame the Chip!

Don't blame a chip for faults unless you're certain. First check its supply voltage(s) – if known, but probably close to the l.t. rail voltage. Even with an unknown set the chips may be familiar types, and setmakers generally follow the chip manufacturer's suggested circuit. If necessary check in an i.c. data book or look at the circuit of a set of similar vintage that employs the same chip(s).

Check for faults in the associated components. Common faults are defective zener diodes or transistors, leaky or open-circuit electrolytic capacitors and missing pulse inputs. By the way, you do understand the chip's function, don't you?

O.K., so you still suspect the chip. Order a replacement and fit it, but beware of damaging the print or of careless probing that could introduce further problems.

The Power Supply

It's not difficult (usually) to locate the mains transformer. The mains rectifier diodes are particularly vulnerable items and the semiconductor devices in the series regulator circuit are also prone to failure. The regulator transistor is often bolted to the same heatsink as the line output transistor – trace the circuit to avoid being like the dentist who pulled the wrong tooth! Also suspect mains/battery switches or sockets that disconnect the mains when a battery plug is inserted.

Timebase Faults

Line output stage faults generally impose a heavy load on the power supply, with low l.t. as a symptom. E.H.T. rectifier sticks are the most common source of trouble in this area. The diodes and electrolytic capacitors in the rectifier circuits fed by the line output transformer can become short-circuited or leaky. A faulty line output transistor or transformer or an open-circuit safety resistor are other possibilities, particularly with the sound but no e.h.t. symptom. Check suspect capacitors by replacement. Remove the line output transistor to measure between the junctions – it will usually read short-circuit in situ. A beefy audio transistor can make a useful substitute for testing purposes.

If the output stage is o.k., check its drive. A scope should reveal quite large line pulses at the base of the output transistor. Tracing the circuit back will take you, often via a little driver transformer, to the driver transistor. Look for pulses at its base then at its collector. If they are of low amplitude the transistor may be faulty. If they are absent you may have to trace back to the oscillator. Remember that most faults will be proved only when the suspect component is removed for measurement. Make sure that the l.t. feeds to these stages are intact.

The feedback required to linearise the field scanning can make fault finding in the field timebase difficult. To find the field output stage, trace back from the scan coil connections. Safety resistors often go open-circuit, and good substitute transistors such as the BD131, TIP31 and TIP32 can often work wonders. Where the fault lies earlier in the circuit a signal injector or careful probing can introduce sufficient hum to trigger action on the screen. If a chip is used in the field timebase the previous remarks apply.

Audio Problems

Distorted sound, particularly at low volume, is usually caused by a displaced loudspeaker cone. Whilst a wad of cotton wool can be effective, the correct course of action is to replace the unit. A spare 80Ω loudspeaker should not damage any audio output circuit and can be used as a substitute for checking. A faulty chip or leaky transistors cannot be discounted, especially where the distortion is accompanied by low volume.

No audio could also be due to the speaker, this time going open-circuit, but check the supply voltages. Though many people never use it, a faulty earphone jack could be the cause – kids have to satisfy their insatiable curiousity by inserting objects into any unoccupied sockets!

In Conclusion

In conclusion, remember that even with a completely unknown set much can be ascertained by using your background knowledge, observation, measurement – and a little instinct!

The Sakura SR800ER Satellite System

D.J. Stephenson, B.A., I.Eng.

The British-made Sakura SR800ER is a budget-priced satellite TV system with remote control, designed for reception of the Astra channels. I obtained one last March from a High Street dealer. It's been used extensively for several months and is installed in the Merseyside area. A similar dish/LNB combination is supplied with certain Alba systems.

The Dish

The neat-looking dish is made of white-painted, heavy-gauge steel and is of the offset-focus type. All the mounting brackets and hardware are plated and no sign of corrosion has appeared to date. This is a point worth noting since the wall mounting brackets supplied by some manufacturers, notably those that are painted, are already beginning to show signs of corrosion. The LNB support arms are made of white-painted steel and are bolted to the dish and LNB bracket by means of stainless steel nuts and bolts. The whole assembly is quite fiddly and can be time-consuming to assemble. Two of the arms, which are marked L and R, are longer than the third one which is fixed to the bottom of the dish. After an initial finger-tight assembly it's advantageous to tighten the bolts a little at a time to avoid pulling the LNB off centre. Although this is not specifically mentioned in the instructions, for optimum results the LNB should be bolted as far back in its mounting collar as possible.

Wall Bracket

Unfortunately the wall bracket is a nightmare to assemble correctly and it's very easy to orientate it the wrong way so that the azimuth adjuster becomes the elevation adjuster and vice versa. In the vast majority of cases this will not be a problem, but if the dish is to be mounted at nearly right angles to the wall the azimuth adjustment will be restricted due to the limited size of the elevation adjuster slots. To avoid the installation team taking on a Laurel and Hardy look it pays to get this right before any mounting holes are drilled. The instructions that come with the dish are virtually incomprehensible and do not warn adequately of this possible mistake. The two-piece wall bracket ends must be mounted horizontally and not vertically. If you find that the stay bar can be fitted only horizontally the wall brackets are mounted the wrong way.

The wall bracket provides poor stability for such a heavy dish. It's best to use half-inch Rawlbolts – any lesser fixings could be a bit risky due to the closeness of the fixing points, which are spread over only one or two brick courses. The stay bar improves the overall strength of the assembly however. To avoid cracked bricks it's important not to overtighten Rawlbolts.

Marconi LNB

The LNB is the well tried and tested Marconi unit which gives good results. Its 10·96-11·7GHz coverage is converted to a first i.f. of 960-1,700MHz, which corresponds to a local oscillator frequency of 10GHz. The gain is typically 53dB with a noise figure of 1·8dB. An industry-standard 75Ω F-type output connector is used. The solid-state polariser needs approximately 13V for vertical and 17V for horizontal polarisation. Thus a single coaxial cable is used, the polarisation threshold switching voltage sharing the same cable as the LNB's output signal. This simplifies installation significantly.

Now that these Marconi units have been up for some time a couple of problems have become apparent. Both lead to water getting into the unit. The first problem applies to early units only – they can be identified by the silver "Do not remove this cap" label on the blue cap that covers the mouth of the feedhorn. The cap tends to distort due to the sun's rays being brought to a focus at certain times of the day. This can lead to either a gap at the edge, where water or insects can get in, or in severe cases the cap can melt, producing a large hole. Fortunately repair/prevention is easy. Replace the cap, ensuring that no insects or moisture are trapped inside. Apparently the cause of this problem was a manufacturing error – the ultra-violet stabiliser was omitted from the plastic. Later versions of the cap have "Do not remove this cap" embossed on the face side and can be regarded as being beyond suspicion. Secondly, in a small number of cases the rivets can pop or distort after a period of time. As a result water can penetrate the seam around the periphery of the unit. To prevent this, smear a small amount of sealer around the seam. This of course applies to all installations that use this LNB.

The Receiver

The receiver, optimised for the Marconi LNB, is housed in a small, neat looking black plastic case. It boasts a 20-channel non-volatile programmable memory and MAC compatibility. While it comes pretuned to Astra some of the newer channels that have come into operation recently need to be tuned. The synthesis tuning system scans rather slowly and tuning can be tediously slow. A dual seven-segment display on the front panel shows the selected channel, a pair of LEDs indicating the polarisation. Manual push-button controls provide ± tune, store, H/V polarisation for setting up, ± channel, parental lock and finally standby. The brief specification provided by the manufacturer is as follows:

R.F.: Input frequency range 950-1,750MHz; input noise 12dB; i.f. 479·5MHz; input impedance 75Ω.

Video: Static threshold better than 7dB; dynamic threshold better than 8dB; frequency deviation 13·5MHz/V; output 1V at 75Ω; de-emphasis CCIR 405-1 (PAL); MAC output baseband, unclamped and unde-emphasised.

Audio: Carrier 6·5MHz; bandwidth 20Hz-15kHz; de-emphasis 50μsec; output 0·5V r.m.s. at less than 1kΩ; harmonic distortion less than 1·5 per cent.

The unit and its remote control system are easy to use. The built-in parental lock consists of an audio jack plug with a 5·6V zener diode across the terminals. This can be removed to disable any channel that's programmed to be locked out via the front panel controls. It's a welcome feature that's present in few receivers, and will defeat the vast majority of children.

Another facility that's perhaps useful for DIY minded people is the audible satellite finder. On operating a switch on the rear panel an audible signal can be heard through the TV set's speaker. The pitch increases with the signal strength – but the volume must be turned up very high to hear it from the top of the ladder! Another switch produces a test pattern for tuning a TV set or a VCR to the modulator's adjustable output. The LNB connection is via an F-type socket.

The top can be lifted off after removing five screws. This reveals two boards. One is the sparsely populated main PCB, the other one containing all the control circuitry including an M494B1 microcomputer chip. A meaty transformer on the left-hand side produces outputs that were measured at 20V and 16V. Next to this are three regulator chips mounted on a heatsink. A 7805 and a 7812 produce 5V and 12V rails for the receiver's circuitry. The LM317T is a programmable regulator which is used to provide the switched 13/17V LNB/polarisation supply. The receiver runs fairly cool provided the ventilation slots are not obstructed.

Four metal cans house the majority of the circuitry. These include the satellite tuner module and the u.h.f. splitter/modulator module. The other two cans contain most of the rest of the signal circuits. A TBA120U is used for sound processing; the only other visible chips are an LM358M dual operational amplifier and a TC4066 logic chip. The receiver appears to be easy to service – especially if the canned modules are thought of as replacement items.

Decoders

A scart/peritel socket is provided at the back for attaching decoders etc. Fair results were obtained when I tried this with a Filmnet decoder. To do so it was necessary to pull pin 8 low to give unde-emphasised and unclamped baseband video at pin 19. Audio is present at pins 1 and 3.

Summary

Installation, apart from the assembly problems mentioned earlier with the dish, is straightforward and alignment is easy. The picture produced is, subjectively, as good if not better than much of the higher-priced competition. Neither heavy rain nor high winds noticeably degrade reception.

My only criticisms of this package are of the lack of stereo audio and the poor mounting bracket assembly. In view of the price, around £250 retail, these points are of little importance. The system is ideal for bridging the gap until the industry sorts itself out and decides on a standard transmission system. It's unwise at the present time to spend a large amount on a "flash" system that may restrict programme choice or require the addition of large numbers of decoders for various channels in the not too distant future. Beware of claims that current receivers are compatible with the forthcoming BSB DBS transmissions since with these there will be conditional access control signals that must be decoded within the receiver to make reception possible. In other words my advice is to buy/sell a cheap basic system, such as this Sakura one, which is designed to work with the Astra signals, then wait to see how the true DBS market develops next year. Otherwise if you are a dealer you could be left holding stocks of unsaleable equipment or having to explain the situation to dissatisfied customers.

Dual-band, multi-satellite systems will be essential once the BSB transmissions and those from the medium-power Eutelsat II series craft become available – the idea of ten or more receivers and decoders stacked on top of each other is clearly absurd. BSB's reluctance to supply chip sets to other than a handful of TV set manufacturers will only add to its marketing problems. From listening to the comments of many potential customers it's clearly not a matter of whether they would like to receive Sky of BSB programmes. They want both.

More on the Panasonic NV333

David Botto

The popular Panasonic NV333 VCR has been around for a few years now. It has proved to be so reliable that many of our customers are reluctant to part with their machines. An article by Nick Beer in the November and December 1988 issues of *Television* provided a comprehensive servicing and fault guide. In this article we'll deal with the operation of the power supply and fault tracing in the logic circuitry used in the system control section of the machine.

The Power Supply

Knowing exactly how the power supply operates is important for speedy servicing of a dead machine. The power supply circuit is straightforward – see Fig. 1 – and servicing presents few problems. Use of a modern digital multimeter (one with a 3¾ readout is best) and a component tester will cut service time to a minimum.

The a.c. mains input is fed to the mains transformer via fuse F1001. On rare occasions this gets tired and suddenly fails. If you find that it's the original fuse replace it to avoid a callback later.

Bridge rectifier D1001-4 produces some 15V across C1002. Note that in some machines D1001-4 comprise a single unit, type EM1Z. This 15V supply is fed to pin 1 of the STR1096 regulator chip IC1001. Pin 4 of this chip produces a regulated 9V supply which is fed to the video circuitry on the same panel and via P1003 to other parts of the machine. You should get a reading of 9·3V ± 0·1V at TP1002. It's been known for this voltage to increase to 10V or more, causing various problems such as failure to record the sound. If the voltage on this rail exceeds the correct level don't waste time making extensive checks – replace IC1001.

Pin 5 of IC1001 provides a regulated 6V supply which is dropped to about 5V by D1008.

With the VCR on you should measure 10·65V at pin 2 of IC1001 with your DMM. This pin is connected via D1011 to pin 2 of IC6002 (M53216P) on the system control board. If pin 1 of this chip, which contains six logic inverters, receives a logic high from pin 8 of the MN1405VKF microcomputer chip IC6001 pin 2 will go low, grounding the cathode of D1011 with the result that the voltage at pin 2 of IC1001 falls to about 0·74V, cutting off the regulated 9V supply. On rare occasions D1011 goes open-circuit.

IC1001 is quite reliable but can nevertheless fail. Before you replace it make the following quick checks. Make sure that 15V is present at pin 1. Next disconnect D1011 to remove the input from the control circuitry. Finally disconnect the loads from pins 4 and 5. If none of these checks restores power, replace IC1001.

D1005-6 produce 15V across C1003. This is used to provide the motor 15V supply and also a supply for the

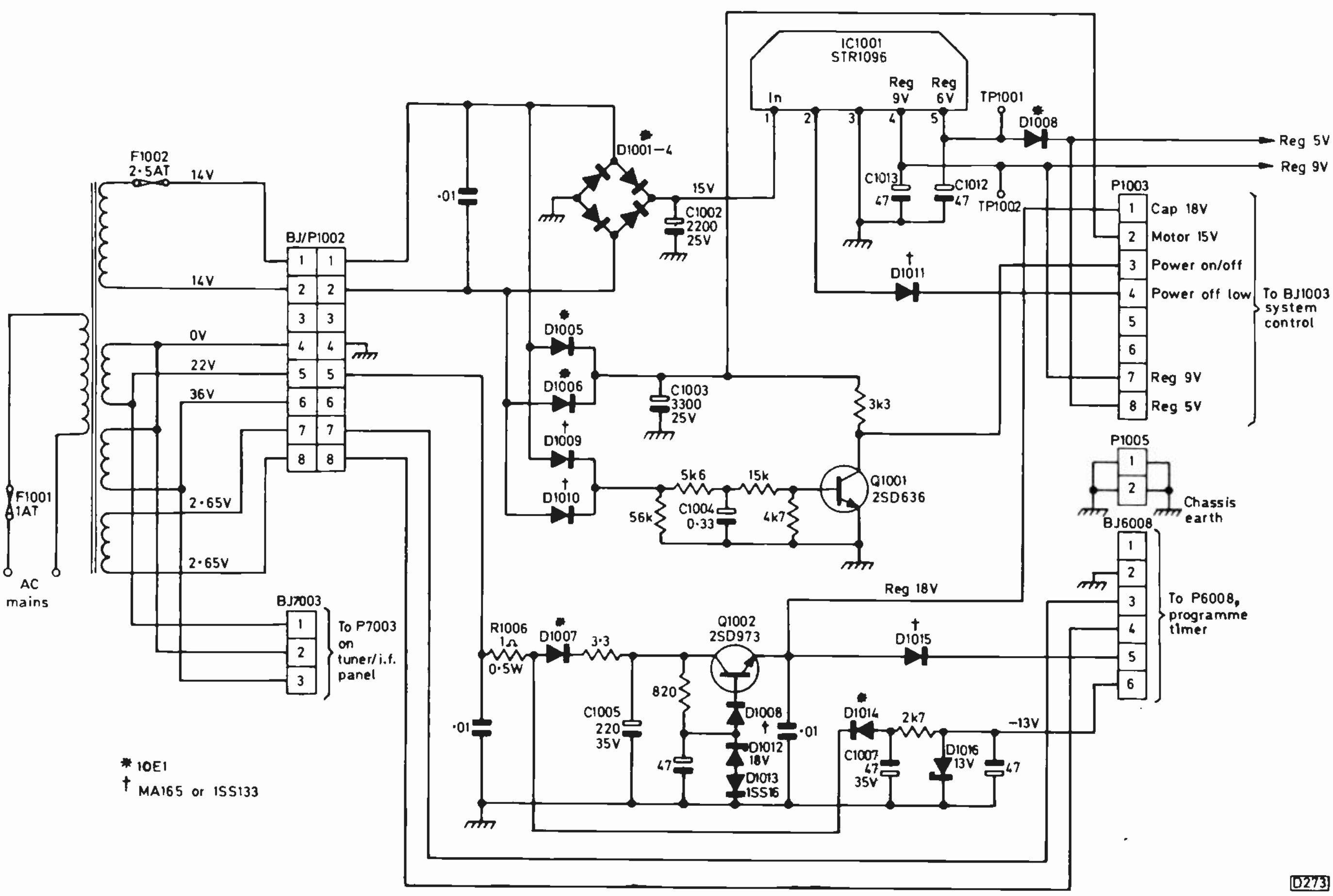


Fig. 1: The power supply circuit. Note that there are regulators elsewhere in the machine.

collector of Q1001. D1009-10 provide base bias for Q1001, which thus provides a power on/off indication at pin 3 of P1003.

The 22V output from the mains transformer is taken via the safety resistor R1006 to the cathode of D1014 and the anode D1007. D1014 develops a negative voltage across C1007. This is stabilised at −13V by zener diode D1016 and is used by the front panel control board. D1007 produces about 22V across C1005, the following regulator circuit providing a stabilised 18V output. If diode D1015 fails the clock display doesn't light. The same thing happens if Q1002 goes open-circuit.

The filaments of the clock display are provided with a 2·65V a.c. supply via pins 7/8 of BJ/P1002 and pins 3/4 of BJ/P6008.

All the components in the power supply can be quickly checked using a component tester. Remember that with time the electrolytic capacitors, especially the smaller ones, can dry out or corrode, with loss of capacitance.

The Syscon Circuitry

The logic circuitry, including the MN1405VKF microcomputer chip IC6001, is extremely reliable. Some puzzling faults can occur in this circuitry however.

Table 1: Logic levels at IC6001

Pin	*Reading*	*Function*
1	0V	—
2	H	—
3	L	—
4	L	Stop: H goes to L
5	L	Pause: H
6	L	Fast forward/cue H
7	L	—
8	L	Power off: H
9	L	Record: H
10	L	—
11	H	—
12	P + H	—
13	H + P + L	—
14	H + P + L	—
15	H + P + L	—
16	H + P + L	—
17	H + P + L	—
18	H + P + L	—
19	H + P + L	—
20	H + P + L	—
21	L	Play: H
22	L	Play: H then L
23	L	Play: H then L
24	L	Play: H
25	L	Stop: H then L
26	0V	—
27	H	—
28	H	—
29	L	—
30	H + P + L	60Hz oscillator
31	L	—
32	L	Rewind: H
33	L	Fast forward: H
34	L	Pause: H
35	L	Play: H
36	L	Record: H
37	L	Pause: H
38	H	Pause: L
39	5V	—
40	H + P + L	455kHz oscilator

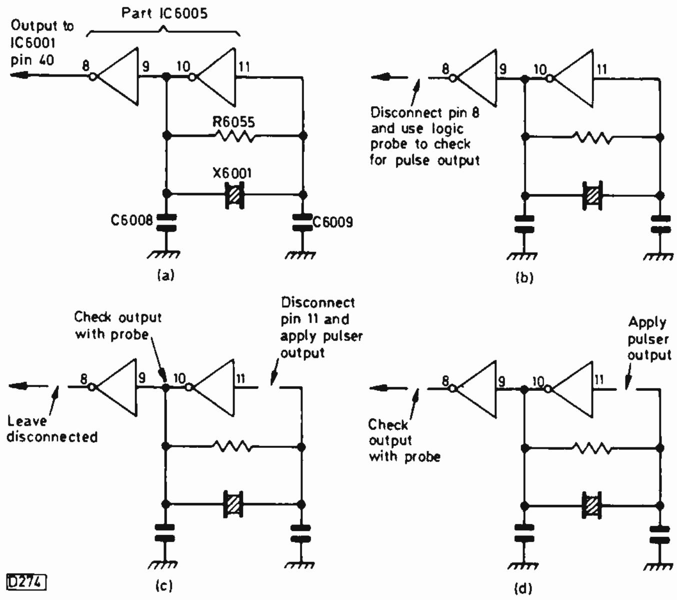


Fig. 2: Checking the 455kHz oscillator. (a) Basic Circuit. (b-d) Probe and pulser checks.

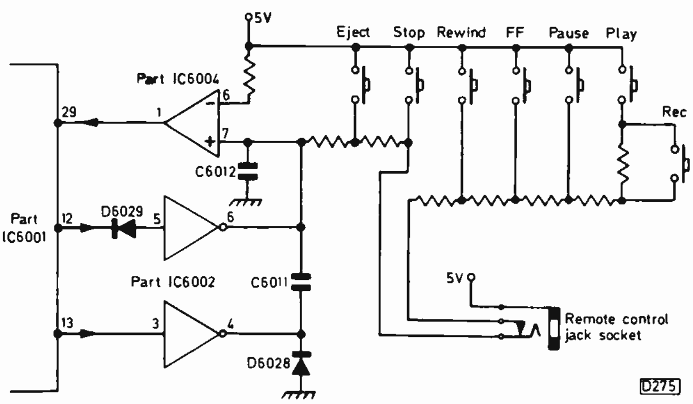


Fig. 3: Simplified analogue/digital function selector circuit (ramp circuitry).

Before you delve into the system control circuitry make sure that the problem is not a mechanical one (see *Television* November 1988). Check that the various switches such as the eject, cassette in and especially the mode switch are clean and in good order. If the drive belts are the original ones or are in any way suspect, fit a new set. You may then find that the machine works normally and that you don't need to get involved with the logic control circuitry. A slack loading belt for example will result in the capstan motor on signal remaining low when it should go high.

The usual faults in digital/microcomputer circuitry are short- and open-circuits and incorrect logic levels. Problems can also arise due to a stopped clock oscillator or, very occasionally, an off-frequency oscillator. For fast fault location you'll need a digital multimeter, a logic probe and a logic pulser. These two probes are also ideal for locating printed circuit breaks that might not be easy to detect visually. Further information on the use of these probes was given in the November 1985 and August 1987 issues of *Television.*

After making the previously mentioned mechanical checks, ensure that the d.c. supply voltages at the logic chips are present and correct. Then examine the board carefully for cracks and poor soldered joints – especially if someone else has had a go. You can then start to make checks in the logic circuitry. Table 1 shows the logic levels associated with the various pins of the microcomputer chip IC6001. To check these, connect the probe's positive supply clip to pin 39 and the negative supply clip to pin 1.

Check the oscillator (pin 40) first. If the probe shows that oscillations are not present the most likely cause of the trouble is IC6005 (μPD4069UBC), see Fig. 2. This chip contains six inverters, two of which with their associated components form a 455kHz crystal oscillator. IC6002 and IC6003, both type M53216P containing six inverters each, seem to be more reliable than IC6005.

Desolder pin 8 of IC6005 and ensure that it's clear of the printed track. Touching pin 8 with the logic probe should give a pulsing signal indication. If not, check C6008 and C6009 (50V ceramic, originally 100pF later 300pF) with a capacitance checker or bridge. Then measure R6055 (1MΩ). Crystal X6001 (VSX0100 or EF0A45501V) could fail but we've not had this. To check the two gates, start by desoldering pin 11 and applying the output from your pulser at this point: your probe should show an inverted output at pin 10. If so touch the probe on pin 8 where a reinverted signal should be present. It's much better to test inverter gates in this way rather than attempting to check them in circuit.

Once oscillations have been restored at pin 40 of IC6001 the logic circuitry, provided all else is well, should operate normally. If you've a frequency counter, check that the oscillator frequency is 455kHz, using a 10:1 isolating probe. It's been our experience however that X6001 keeps the oscillator locked to the correct frequency.

If a pulsating H + P + L signal is not present at pin 30 of IC6001, check transistors Q6013/4 (both 2SD636) and diode D6041 (MA165).

If all or nearly all the logic levels at IC6001 are high no matter what signals are applied to its inputs this is a sure indication that IC6001 has failed. Fortunately this seldom occurs.

If a particular function fails to work, check that the correct logic levels are present at the relevant pins of IC6001 then make sure that the logic inverters in IC6002/3/5 are working correctly – check as previously described.

Analogue/digital ramp circuitry is used to select different functions, see Fig. 3. IC6004 (AN6912/μPC339C) contains four operational amplifiers, with pin 1 feeding data to pin 29 of the microcomputer chip. It's possible for IC6004 to fail, though the most likely causes of trouble with the function controls are dry-joints on the front panel and faulty solder joints around the function selection buttons.

Loading/eject problems

If the loading or eject operations do not work properly though the correct logic levels are present at pins 22 and 23 of IC6001, suspect transistor failure. Check Q601, Q6025, Q6030 (all type 2SD636), Q6024 (2SD1273), Q6026/7 (both 2SB819) and Q6028/9 (both 2SD1051). Then check D6050 and D6054 (both MA165) and the 12V zener diode D6042 (RD12JB2). Use of a component tester will give you a fast check on these devices.

Reel Motor Difficulties

If the reel motor doesn't operate correctly and the logic levels at pins 24 and 25 of IC6001 are correct, check Q6016/7 (both 2SB793), Q6018/9 (2SD973) and Q6020/1 (2SD636).

Books

Servicing TV and Video Equipment by Eugene Trundle, M.S.E.R.T., published by Heinemann Newnes at £25.

What more suitable book than this for readers of *Television?* It's written by one of our best known contributors, Eugene Trundle, who also writes the regular Test Case feature. Perhaps you feel you know it all? Even so there are times when a difficult problem can have you running around in circles. At such times the help provided by consulting an authoritative source can get you back on the right path. This book is eminently suited to the provision of such guidance, being based on many years of practical fault-finding experience and presented in such a manner that quick reference to advice on particular problems is easy – this is guaranteed by the extensive symptom index. To those new to the game this book should be a godsend, providing clear guidance on the problems that arise in day-to-day video/TV servicing.

The coverage is surprisingly wide, dealing with all aspects of TV receivers (including teletext and remote control systems) and domestic video equipment. This has been achieved by cutting out lengthy exposition of theory and sticking to what goes wrong with practical circuits and mechanisms. Provided you can read a circuit diagram, this book takes you in one jump into the world of expert servicing.

A line has to be drawn somewhere. So old TV sets using valves are not covered. There are not that many sets of this type still in service. The emphasis is on the sets of the transistor and i.c. era, going back as far as thyristor line output stages in the case of TV receivers and top loaders in the case of VCRs.

While most chapters consider a particular part of the set or VCR, e.g. power supplies, line timebases, VCR system control arrangements etc., there are in addition valuable chapters on test and diagnostic equipment (not forgetting test patterns and what they tell you), intermittent faults and repair techniques (including surface-mounted components).

The book has been carefully devised to meet the needs of today's service technician. It doesn't omit such practicalities as repair viability, the prevention of call-backs and safety. We feel that it represents a very worthwhile investment, presenting as it does a wealth of information that's either not available elsewhere or is spread through back issues of technical magazines. There is a special pre-publication offer until September 23rd at £22·50 inclusive of post and packing – see advertisement on page 865. **J.A.R.**

Digital Techniques by K. J. Bohlman, I.Eng., F.S.E.R.T., published by Dickson Price Publishers Ltd., Hawthorn House, Bowdell Lane, Brookland, Kent TN29 9RW at £9·95.

As we are all too well aware, more and more digital circuitry is being incorporated in TV sets and VCRs. Do you know exactly how i.c. memories, AD/DA conversion, input/output and interfacing arrangements work? I imagine that we could all do with a handy reference book on such subjects to refresh our minds from time to time. This one is certainly clearly presented and easy to read. It covers the Ditigal Techniques syllabus for part three of the City and Guilds course 224 on electronics servicing. Although written to cover this particular course it should prove of help to anyone wishing to understand the basics of digital circuitry. Its coverage inclines towards VDUs, keyboard encoders and the digital control of motors rather than specifically consumer electronics applications. Compact discs, teletext and the use of digital techniques in VCRs are not mentioned. **J.A.R.**

The ATV Compendium, edited by Mike Wooding, G6IQM, published by the British Amateur Television Club at £3·50. Available from BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN.

The BATC has produced some excellent publications over the years – including its magazine *CQ-TV* (whose distribution is restricted to members). This latest book provides details of a wide variety of video, r.f. and special projects. These have been selected on the basis that they employ up-to-date technology while not requiring the use of sophisticated test equipment. For space reasons, and because the editor feels that the time has come to place the emphasis on the higher bands, the r.f. section does not contain any details of 70cm equipment.

The extensive video section includes, amongst other items, a superimposing caption generator, an electronic ATV test pattern generator, a teletext pattern generator, a dual-standard colour coder and a video distribution amplifier. The r.f. projects consist of a GaAs f.e.t. 24cm down-converter, a 24cm f.m. ATV transmitter and a 3cm ATV transceiver. Special projects are a digital frame store, a universal sync generator and an EPROM programmer for use with the Spectrum range of computers.

The book is produced in the usual BATC style. It's a valuable source of information for those interested in building their own video/TV equipment.

BATC membership details can be obtained from Dave Lawton, G0ANO, Grenehurst, Pinewood Road, High Wycombe, Bucks HP12 4DD. **J.A.R.**

Books Received

A Concise Advanced Users Guide to MS-DOS by N. Kantaris, published by Bernard Babani (Publishing) Ltd., The Grampians, Shepherds Bush Road, London W6 7NF at £2·95.

PC-DOS and MS-DOS microcomputer system users who have mastered the basics and are looking for ways to improve the efficiency and appearance of their systems will find this book useful. As with the author's previous *Concise Introduction to MS-DOS,* you can use sections that interest you without having to read through the whole book. There are 68 pages with paperback.

More Advanced Midi Projects by R.A. Penfold, published by Bernard Babani (Publishing) Ltd., The Grampians, Shepherds Bush Road, London W6 7NF at £2·95.

This book is intended mainly for electronic music enthusiasts. The projects featured are more complex than those in the earlier *MIDI Projects* book. They include a merge unit, a programmer and a channeliser. Not a book for beginners. There are 113 pages with paperback.

TV Fault Finding

Reports from Nick Beer, Gerry Hoey, J.G. Grieve, Chris Orr, Alfred Damp, Ray Crockit and Ian Bowden

Ferguson SAP1 Satellite Receiver

The customer complained that the satellite TV picture intermittently became snowy. At the house we found that the receiver unit was very sensitive to tapping virtually anywhere on the PCB. This produced vision splashing. A careful look around showed that R149 had never been soldered – the legs were bent over and were making good contact. Soldering R149 into circuit certainly seemed to cure the problem. The manual doesn't seem to be available yet, so when we got back I phoned Ferguson who kindly faxed a circuit diagram. This showed that R149 provides the 12V feed to the r.f. modulator.

While in contact with Ferguson I took the opportunity to ask about the very high running temperature of these Pace made units. An engineer said the company was perfectly happy with the situation, but I can't help thinking that the heat will eventually lead to reliability problems. Another puzzling thing is that the regulators are rivetted instead of bolted to the heatsink. This would seem to me to be unwise for two reasons. First rivets tend to work loose, causing problems with overheating. Secondly replacement is more difficult. **N.B.**

Salora/Luxor Mk II/9570 Satellite Tuner

Following a night with a lot of lightning we were inundated with the usual dead equipment calls. Amongst the casualties was a satellite TV tuner at a local tourist attraction. It had not been bought from us as the owner had obtained it when living in another part of the country, and was of the type intended for Eutelsat/Intelsat reception, with a 1·8m dish. The fault was no output and no front panel operation. This is the tell-tale sign of a blown LNB fuse, which was the case. The in-line fuseholder was chewed up as the fuse had previously been replaced. A check on the 18V rail showed that it was at about 9V: the regulator was drawing excessive current as it had a 28Ω leak to chassis. Replacement calls for a fair bit of dismantling. **N.B.**

Ferguson TX90 Chassis

One of these 14in. portables would "go off" when changing channels. We found that there were dry-joints on both the field output transistors. It looked as though the heatsink on which they were mounted had received a knock, forcing the legs of the transistors farther through the board than they ought to have gone. **N.B.**

Thorn 1615 Chassis

This set had been seen by one of our field service engineers a few days previously. The complaint had been no results and he'd repaired some dry-joints on the coils in the line output stage. This time the set had to be brought in – there was an i.f. fault, i.e. no sound and a blank white raster. A check on the voltages in the i.f. strip showed that they were haywire. Resistance checks then showed that the first i.f. amplifier transistor VT1 was leaky while the third transistor VT3 was open-circuit all ways round. Replacing them made no difference and the base of VT1 was at over 6·7V! Not much more time was wasted before we changed the TCA270SB detector/a.g.c. chip. This finally restored the signals, but there was a severe striation down the left-hand side of the picture due to the line linearity coil's damping resistor being open-circuit while the c.r.t. was, as usual, very low emission. **N.B.**

Hitachi CPT2650

Not a fault perhaps but something that could catch you out – no picture at switch on, the picture appearing up to half an hour later. The cause is incorrect grey-scale setting. My first experience of this was after replacing a c.r.t. **N.B.**

Ferguson SRA1 Satellite Receiver

Ferguson has issued the following advice on the SRA1 Astra satellite receiver system in the latest issue of *Ferguson Feedback*.

Always disconnect the receiver from the mains supply before removing or fitting the LNB. As the cable carries power to the LNB, an accidental short-circuit is possible when making the connection, leading to power supply failure. The LNB F connector must be water-tight to avoid serious signal degradation.

As a general guide to fault finding, if any of the LEDs light but the screen is full of snow, check the LNB's output with a portable spectrum analyser or a signal strength meter. Alternatively substitute a known good receiver. If only snow is still present, suspect the LNB or the cable. Before changing the LNB, make a visual check that the dish is correctly aligned. When doing this remember that the dish focuses light, heat and sound – beware of sun glare and sound from overhead aircraft.

If only half the channels can be received, the fault is due either to the polariser or the transistor that changes the polarising voltage.

Philips CP110 Chassis

An EW fault on one of these sets was traced to R3599 (47Ω) being open-circuit. While investigating this fault we noticed that two of the transistor types have been transposed in the circuit diagram, i.e. T7600 should be shown as type BC558 instead of type BF819 while T7601 should be shown as type BF819 instead of type BC558. **G.H.**

Philips CTX-E Chassis

This one kept losing its memory. The 2·4V cell 1777 had been fixed in position but never soldered. All was o.k. after soldering. **J.G.G.**

Philips 2A Chassis

These sets can give you a bit of trouble when one comes in with a short-circuit line output transistor. C2609 (9·1nF) in the diode modulator circuit is a known offender. Sometimes we have also replaced the EW modulator diodes D6609 (BY228) and D6610 (BYW95C), the protection capacitor C2618 (1·5nF) and the 140V h.t. reservoir/smoothing capacitors C2697 and C2701 (both 47μF – we use higher voltage ratings in these two positions). It has not been possible to pinpoint the primary cause of the trouble but we find that replacing these components avoids any comebacks. **J.G.G.**

Rank T20 Chassis

We find that it is often necessary to replace a number of components when the BU326 chopper transistor 7VT2 goes short-circuit. These items are as follows: 7THY1 (BR103), 7VT1 (BC252B), 7R17 (2·2Ω), 7C4 and 7C5 (both 47μF) – and of course the two fuses 7FS1 and 7FS2. In addition all the diodes in the power supply module should be checked. **J.G.G.**

Fidelity ZX3000 Chassis

This set was dead with the chopper transistor TR3 short-circuit and both fuses open-circuit – the mains fuse F1 (T2A) was blackened. When these items had been replaced we still had no results as R97 (4·7Ω, 4W) in the feed to the line output stage was open-circuit. Our experience with these sets has been that if any one of the diodes in the bridge rectifier circuit is faulty it's advisable to replace all four with the larger version of the BY127. It's tricky but it can be done. **C.O.**

Thorn 9600 Chassis

Insufficient width with the extreme verticals bowed inwards was traced to R865 (4·7Ω) in the diode modulator stage being open-circuit. It's a flat type located behind the tripler and replacement necessitates complete removal of the scan panel.

Another of these sets tripped at switch on. We found that the T9013V line output transistor VT801 was leaky. As we didn't have one of these to hand we decided to fit an R2010B – the chopper device used in the old 3500 chassis. A week-long soak test showed that it worked quite happily in this position. **C.O.**

Hitachi NP81CQ Mk II Chassis

There were no results and a check on the 111V h.t. line revealed that it was at 20V via the start up diode D908. Checks on the STR441 chopper chip IC901 showed that there was 0V at pin 4. R904 (82kΩ, 0·5W) was open-circuit. **A.D.**

Ferguson 16A2 (TX90 Chassis)

The reported fault was "only snow when the set first comes on". When we tried the set we found that this description was correct, but the customer had neglected to tell us that the fault lasted for only about thirty seconds. We tried a new tuner, then the M923 tuning chip, but neither of these was responsible. The set started to take longer and longer to come on, and at last we were able to get some sensible readings from the test equipment. The tuner unit's tuning pin was permanently high at 31V. A check at pin 19 of IC902 (M923) with the oscilloscope then revealed that there were no tuning output pulses. At this point the set returned to normal working and had to be left for another day.

The next time the fault occurred we immediately checked the 5V supply to the chip. It was missing from the 5V regulator which was without its 12V input. This comes from the main board and was present at the output from the 12V regulator. A check on the main board print showed that there was a hairline crack around the solder pad where the 12V supply is taken off to the tuning board. **A.D.**

ITT TX3446

This set came in with a blank raster. A quick scope check showed that a composite video signal was present at the digital video board, was of the correct size and shape and was entering the VCU2100A video codec chip. The digital signals on all the parallel data output pins were of incorrect shape and size however. Replacing the chip restored normal results. **A.D.**

Mitsubishi CT2227

This set suffered from field collapse. The old rule about looking first paid off: two electrolytics appeared to be very stressed. A check with the circuit diagram showed that they were the field scan couplers C412/3. They are both 330μF, 50V, and both had bulged tops. A cold check with the Avo showed that one of them was open-circuit and the other short-circuit. **A.D.**

Toshiba C2095

This set would trip and go off shortly after switching on. If you switched off, waited half a minute, then switched on again the cycle would repeat. All was well when the set was powered at 210V via a variac, and a check on the h.t. rail indicated that there were no problems here. After we ran the set for a quarter of an hour in this state we decided that the fault was probably in the fail-safe (over-voltage protection) circuit. This is centred around transistor TR471, but the voltages here were in order. Placing the meter's probe on the base connection produced a trip however, as did touching the 6·2V zener diode D472 which is connected between TR471's base and chassis. We checked TR471 out of circuit and found that it was o.k. Deciding that removal of the zener diode for a zenering test was hard work (that comes last) we removed its 1MΩ feed resistor R476 and found that it was open-circuit. A replacement cured the fault.

A number of Toshiba sets use this chassis, which was also fitted in some Bush/Murphy models (Rank T24 chassis). **R.C.**

Salora 26J40

This was an odd problem. The set had been in the workshop three weeks previously, when we had replaced a faulty LF0041 hybrid Ipsalo control chip. Its start-up regulator section had failed. This time the same part of the chip had failed and the set wouldn't come on. Examination of both the faulty chips showed that there were signs of excessive heat around the start-up regulator transistor. After fitting another chip we made some further checks around it. When running, line pulses should be present at pin 2. This is connected to the regulator's zener diode, the action of the pulses keeping the circuit off for most of the time. These pulses were not present because RB723 hadn't been fitted from new. Somehow the set had managed to work for around four years before failing. **I.B.**

Dealing with Video Tape Chewing

Eugene Trundle

Tape damage causes more customer hassle than almost any other VCR trouble. There are many ways in which a VCR can damage tapes – in spite of the built-in syscon, whose main function is to prevent this. Especially when intermittent, the fault can be difficult to trace and cure. But careful examination of the damage to the tape will give you clear evidence as to what's happening, and in many cases of which particular deck or control system component is faulty or misadjusted. If the fault is intermittent, the key to diagnosis is sight of the damaged tape – get the user to bring you a sample.

Basic Checks

When dealing with this problem, examine the surface of the tape and closely watch the behaviour of the deck during loading, unloading and normal running in the play, cue and review modes. A dental mirror is essential for this purpose, the illuminated type being ideal. Use it to examine the surface and edges of the tape as it runs across every component in its path, including the spool carriers within the cassette where relevant.

Some chewings occur only in the search modes (particularly review), which are well worth checking when the symptom appears to be intermittent – especially with Video 8 equipment. Where the tape oxide is being stripped or shredded, even on the tiniest scale, the point where the damage is occurring will almost certainly be given away by the presence of a pile of black tape debris immediately below, on the deck surface.

Types of Damage

The best starting point is the tape itself. In the following text ten typical tape damage patterns will be analysed, with notes provided on effects, causes and probable culprits.

Starting with the most dramatic cases, Fig. 1(a) represents the end of a clear leader tape that's been pulled out of its anchorage in the cassette's spool carrier. This can happen only at the end of the fast forward or rewind functions, and is normally prevented by the end sensors seeing the cassette lamp or LED. With one or two exceptions (early designs) lamp failure invokes shut down, so likely causes of this defect are incorrect position (slipped down?) of the end sensors or lamp, or possibly the fact that the lamp has been obscured by foreign material or a deposit of nicotine.

Conversely, auto-rewind or auto-stop will be unexpectedly triggered by a tape whose oxide layer has been torn off, as depicted in Fig. 1(b). To the end sensor the remaining clear backing layer looks like leader tape. The invariable cause of this one is dew – condensation on the surface of the video head drum – and corresponding black or brown patches will usually be found here. Heavy scrubbing with a solvent-moistened cotton bud will remove them. The most common cause of this symptom is use of the machine too soon after head cleaning by hand or with a wet cassette, though natural condensation, not always detected by the dew sensor, may be responsible. The operation and effect of the head heater and dew sensor, where fitted, are worth checking. Most sensors, surprisingly perhaps, go high resistance when moist.

Severed Tape

Fig. 1(c) shows a severed tape – the break usually occurs when a badly caught-up tape is extracted from the machinery by the user or an engineer. Video tape is very tough stuff, and a VCR's motors don't usually have sufficient torque to tear across it in this way. Ring-loading VCRs are the ones most prone to this "tape caught in the machinery" effect, with the tape trapped and tangled beneath the loading ring, its drive cogs and retainers. Failure of the spool drive system (motor, idler, etc.) to retract the tape into the cassette during tape unloading is the cause.

Tape Scrunching

Similar causes lead to the severe scarring and creasing shown in Fig. 1(d). This is the sort of trouble that makes you wince as you hear the tape passing round the head and see the picture disappear into a mass of lines, dots and snow – sometimes not to return until you've cleaned the heads. The scar material and loose oxide layer often blocks the head gaps. As well as removing the picture (and sound with the Video 8 system), hi-fi sound may with other formats be affected.

The cause of this type of damage is less easy to pin down, but it always means that the tape has gone adrift in the deck, way out of its normal path. Unless the tape creeps a long way up or down due to some influence that causes excessive deflection, this sort of snarl-up takes place during cassette or tape loading/unloading.

We'll take cassette loading first. A slack tape inside the cassette will produce this symptom. The cause is usually incorrect reel behaviour when the cassette was last ejected – see later. If the guides etc. are not fully retracted as the cassette comes down, the tape is crumpled on them. Check the mechanism phasing and the mode switch setting.

Both reels should be soft braked during tape loading. Check this if the reels spin and the tape bounces during the loading process. Conversely, fully-braked reels (due to the solenoid, mechanics or syscon) will result in the tape being stretched and strained during the attempt to load.

The greatest potential for the type of scrunching de-

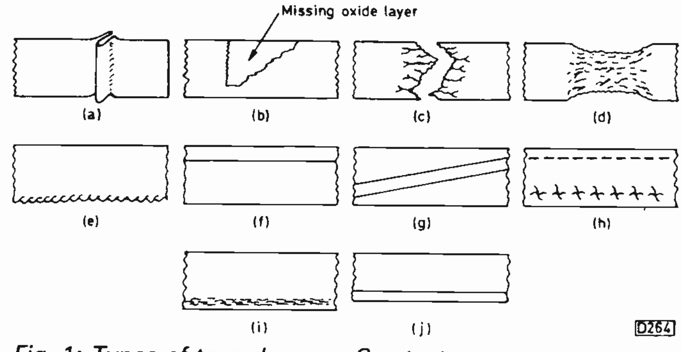


Fig. 1: Types of tape damage. See text.

picted in Fig. 1(d) is during the tape unloading phase, should one of the spools fail to take up the slack fully. Test at both ends of a three-hour tape. If a loop of tape is left hanging from the cassette's flap at eject suspect the reel idler, reel motor if separate, drive belts etc.

Tape looping, with subsequent crumpling when the cassette's flap closes, also commonly occurs at the end of fast tape transport, usually rewind. The most common cause of this is worn "hard" brakes or the levers that operate them – after rewind the right-hand brake should come on first to maintain tape tension across the front of the cassette. Check whether there are any manufacturer's modifications for this.

Some VCRs (Sharp for example) have a program for tensioning the tape as a prelude to ejecting the cassette (from the stop mode). This takes the form of a kick from the loading motor to a reel, a kick of the loading mechanism or a short fast-forward sequence. Check the mechanics involved as necessary.

Another cause of tape scrunching of the sort shown in Fig. 1(d) is failure, often intermittent, of the take-up spool to rotate in play or record. This is usually caught by the syscon before damage is done, but we have had a few cases where several metres of tape were wound round the capstan shaft, probably initially due to a sticky spot on one or the other. Zero or low take-up torque is typically caused by a slipping idler, clutch or belt: stop the spool and see what slips first.

Edge and Scratch Problems

Fig. 1(e) shows the serrated edge sometimes seen in tapes from old or worn machines. It's usually caused by a worn and grooved guide somewhere along the tape path, but can be the result of incorrect spool height settings, the tape scraping on the shoulder of the lower drum (tape too low) or scalloping as it passes a worn or faulty audio head stack. More than any other, this type of damage leads to a build up of oxide dust deposits or flakes on the deck, beneath the trouble spot.

A scratched or scored tape, as shown in Fig. 1(f), gives rise to a continuous horizontal line of dropout at some point across the playback picture. It can be seen best by holding the tape so that light is reflected across the whole width. The cause is an abrasive speck on one of the fixed components along the tape path – the lower drum, full erase head, audio head stack or the back-tension pole. Examine these carefully and clean the entire tape path.

If, as in Fig. 1(g), scratch lines run at an angle of about 5° to the edge of the tape there's no doubt that the damage is taking place while the tape is traversing the rotating upper drum. Foreign bodies are usually responsible, but a chipped or damaged ferrite head tip is a more expensive possibility.

Sometimes the scratching or creasing effect takes the form of regularly repeated dots, dashes or patterns on the tape, as shown in Fig. 1(h). The symptom is of rhythmically repeated dropout sequences in the playback picture. It's a sure sign of damage to or dirt on a rotating deck component – the capstan, the pinch roller and the exit/entry guide sleeves are the most likely culprits. If the cause of the trouble isn't obvious on inspection, a clue to the diameter of the offending part is given by the spacing of the pattern. Typical causes are dirty tape guides; grit, fluff or cotton on the pinch roller (replace it!); and a polluted/damaged capstan shaft.

Fig. 1(i) shows a tape with a wrinkled or corrugated edge. This may be at the top, giving rise to sound flutter and dropout, or at the bottom, in which case there will be poor control pulse transfer. This condition is often the result of excessive take-up torque, but a badly misaligned stationary guide can also be the cause. If it's confined to small areas of the tape, watch the action during and immediately after tape loading – the tape may be vertically misaligned for a brief period or stretched over a guide collar.

The same sort of defect leads to the damage shown in Fig. 1(j), where one edge of the tape is actually folded over, causing loss of sound or the control pulses (top/bottom respectively) and producing an audible sound as the video heads hit the overlap. Grossly incorrect reel height settings can also be the cause. The ultimate progression of a folded tape is a reversed one, with no sound or vision at all.

Tape Repair

At the current low price of blank-tape cassettes, attempts to repair a damaged tape are rarely worthwhile. Spending time on this is justifable only when the software is very precious.

Tape splicers are available commercially and work well with new blades and the use of cotton gloves by the operator. Cut back to good tape and follow the instructions to the letter. Where, as is usually the case, the damage is near the end of the tape, cut back and splice to the clear leader. It's possible to dismantle a cassette to retrieve or anchor tape. Reassemble it with care and mark the cassette with its new shortened playing time.

Old video tape strung across the vegetable patch makes an excellent bird scarer. . .

The Room at the Back

J. LeJeune

Summer had settled at Milldale and a new name had been decided upon for Topcut's Discount Store – "Electric Dreams". There had been a hot debate about this. Ralph Topcut had wanted "The Milldale Home Entertainment Centre", but Sid Bias had argued that this was not a complete description of the business since the store also sold washing machines and refrigerators. "I know that some of our customers are mad" he'd said, "but I doubt whether many of them get much entertainment out of watching their front-loaders in action with the dirty linen." So he'd won, and Electric Dreams in Terry Green's pink and green neon tubes was attracting scores of younger people into the store. It had proved to be a great success, and as a result Ralph Topcut was in a good mood.

Peace reigned in the service department. Norman Gates was deep in the bowels of a Toshiba V8600 VCR, while Andy sighed resignedly over an anonymous-looking VCR that turned out to closely resemble the Ferguson 3V35. It was probably an ex-rental job and was plagued by head speed hunting. Andy was terrified of servo systems – even though CD players, about which he was supposed to be an authority, have four of them.

Loss of Line Drive

Young Gareth's job was a Sony KV1810 that no one else had wanted to repair. Its line driver transistor Q509 had failed. Fitting another one got the set going again but all was not well – the replacement seemed to run hot. Gareth probed around the area with a scope and found that the transistor's drive was too low. A dab with a wet finger confirmed the problem. There was ample drive on the far side of the coupling capacitor C538 (0·47μF). Gareth didn't like the idea of an electrolytic being run at line frequency, so he replaced it with a low-inductance Mylar type. The effect was immediate: Q509 now ran happily and was cool. He put everything back together and mercifully had no screws left over.

Modulator Problem

Meanwhile Norman had established the cause of the Toshiba's lack of output signal and was busy changing Q661 in the modulator. He spent a few minutes with the equivalents book looking for a more powerful replacement but the terminology used was not helpful. So the Toshiba type was fitted. This restored the r.f. output and the machine was put on soak test in the E-E mode.

Scheming

Sid sauntered over to Norman's bench and pulled a drawer open, resting his foot on it. "What do you think of this scope?" he said, showing Norman an advertisement in a popular trade magazine.

Norman briefly scanned the advertisement and looked up at Sid. "I suppose your idea is to catch Ralph T. while he's in a good mood and get us a new scope" he suggested.

"You could put it like that" replied Sid.

"In that case go for the most expensive one and haggle as long as you can. We badly need a sixty-meg scope around here what with all the high-tech goods he's putting on the shelves out front" said Norman.

"A good point" Sid agreed. "They make extravagant claims about our service and then expect us to operate on a shoestring. It's time they backed their claims with some extravagant test equipment."

A Couple of VCRs

Andy was not feeling too happy. He'd let his meter probe slip and the 3V35 lookalike now had two faults, the original one plus the consequences of his inattentive moment. The head drum still didn't revolve. While Sid and Norman continued to whisper together Gareth was immersed in his next job, a Sanyo VTC5000 VCR. Andy took the opportunity to nip across into the stores for a replacement IC404.

Gareth had a fierce, unreasoning hatred of the VTC5000 but was determined not to let this one get the better of him. Its capstan motor ran at top speed and Gareth concluded that the problem shouldn't be too difficult. He checked around the central control chip IC3001 and to his horror found that the 5V rail was at nearly 9V. Out came the 5V regulator transistor Q3001 but there was no spare in the stores. It looked as though a BFY50 or a 2N3053 would do. Gareth tried the former and the machine then worked normally. Very satisfactory, he thought. And time for a stroll.

Sid had gone through to the shop, waving a magazine in his hand and saying over his shoulder to Norman "I'll try him on it now – won't be long!" Norman picked up his toolbox and departed to make some outside calls.

3V35 Problem Solved

Gareth stopped alongside Andy and asked about his problem. "Why not take a look at Norman's 3V35 manual?" he suggested. "Norman notes every fault in his manuals and puts the correct voltages on the diagrams." As Norman was out they borrowed his 3V35 manual and found the drum speed control part of the circuit. There was a circle around R446, which should be 270kΩ. When it was removed and checked the reading was around 800kΩ! A replacement restored normal operation and Andy remarked that making such notes seemed worthwhile.

Sid's Return

Sid looked pleased with himself when he returned to the workshop. "Ralphie boy has just agreed to buy us a sixty-meg scope" he announced. "Trouble is, he says it should enable us to find faults in half the time."

"He can't really believe that" commented Andy.

"Oh yes he does" said Sid. "He'll expect to see it used for everything, even mending kettles. Seriously, the time will come when one won't be enough. We'll need one each."

"We'll have to prove that this one, when it comes, earns its keep" added Andy somewhat gloomily.

"That's right" replied Sid, "and the only proof Ralph Topcut understands is our output figures."

Eye Protection

David Botto

We tend to take the precious gift of sight for granted. But if proper care is not taken it's all too easy to suffer eye damage in a TV/VCR workshop. The precautions required are quite well known but are not always observed as conscientiously as they should be.

The TV/VCR workshop can be full of hazards to your eyes. These are considerably reduced if the workshop is well organised, tidy and spotlessly clean. For guidance on this, see my article in the December 1988 issue.

Sections of aerials jutting out, TV sets left with their backs off so that the end of the picture tube sticks out, and various sharp objects left dangerously exposed are potential eye accidents waiting to happen. The insides of delivery vans can also present plenty of hazards if not kept in a tidy state.

Glasses

Many people need to wear glasses in order to see clearly. In a workshop it's possible to shatter a glass lens accidentally on a sharp corner of the TV/VCR chassis on which you are working, with possibly disastrous consequences for the eye behind the lens. It's far safer – ask any optician – to have the lenses made of plastic that doesn't shatter so easily. Modern plastic lenses are as hard as glass ones and don't suffer from the scratching and other problems that affected older types.

Eye Tests

It's worth having your eyes checked regularly – despite the current fee. If you don't normally wear glasses you may nevertheless find that you need them as you get older. With the passing of the years the lens of the eye loses some of its elasticity and is thus not able to focus as accurately as it once did at close range. As an example, a twenty-year-old person with normal eyesight can see objects clearly at a near range of about 250mm. A forty-year old person will have difficulty in seeing clearly at a range of less than 500mm. Fortunately it's easy to correct for this by obtaining glasses from a *qualified* optician. Make sure you find one who really knows his job and is prepared to take time and trouble with your lens prescriptions. Ask for the best frames and plastic lenses that are available. Money spent in this way is a wise investment.

Safety Goggles and Spectacles

A pair of safety goggles is an essential item of equipment for the TV/VCR engineer. Each engineer should have his own personal pair – using goggles that someone else has worn can easily spread eye infections.

Suitable goggles can be obtained from RS Components for less than £3 plus VAT. They incorporate a soft PVC frame and polycarbonate lens, are easily adjusted to suit different head sizes, and are "Kitemarked" to BS2092. They can be worn over most spectacles without loss of protection. The RS order no. is 551-980. Halfords and B & Q also supply suitable goggles. Make sure that the goggles you buy have the Kitemark and the number BS2092.

If your eyesight does not require optical correction, obtain a pair of safety spectacles (RS order no. 551-996, price about £4·85 plus VAT) in addition to your safety goggles. Safety spectacles look like ordinary ones with protective side pieces. They are easier to wear if you wish to keep them on all day. For some jobs however safety goggles give your eyes better all-round protection.

Always keep your goggles and safety spectacles spotlessly clean. Goggles can be washed in hot (not boiling) water. A proper lens-cleaning fluid is best for safety spectacles.

Chassis Cleaning

When a TV set or a VCR is cleaned out with a vacuum cleaner and brush the dust and fine particles can, if they reach the eyes, cause infection. Furthermore dust can scratch the cornea of the eye. It's wise to wear safety goggles during the cleaning process.

CRT Replacement

We all know that we ought to wear safety spectacles or goggles when replacing cathode-ray tubes. In the workshops I visit however only a few TV/VCR engineers now seem to take this necessary precaution. The modern c.r.t. is soundly constructed of course and seldom implodes, but don't get over-confident. Accidents can still happen and it's simply not worth taking chances.

Soldering

Soldering and desoldering present a constant risk to the eyes – a risk we seldom consider. Solder can splutter and if it hits your eye the result can be permanent damage. If you wear optical spectacles with plastic lenses you've a degree of protection. If you don't, always wear safety spectacles when handling a soldering iron, and avoid shaking the iron to remove surplus solder. Instead, carefully wipe your soldering iron on a proper cleaning pad.

Lifting Heavy Objects

Lifting extremely heavy objects can not only cause back troubles but can also result in a burst blood vessel in the eye. This can lead to partial or complete blindness. This is an important warning – I've talked to a man who lost his sight in this way. Ask your own doctor.

Glues and Sprays

Fibreglass body-filler is sometimes used to repair damaged TV cabinets. The danger here is the hardening catalyst that's mixed in with the filler paste. This catalyst is an organic peroxide (methy-ethyl-ketone peroxide – MEKP). A bodyfiller kit I have to hand contains only an incomplete warning in extremely small print.

A spot of this MEKP catalyst in the eye will at once begin to destroy the sensitive eye tissue, causing either immediate or eventual blindness. The recommended procedure if you have such an accident is to wash the eye with copious amounts of water for at least ten minutes. This must be done within *three to four seconds* otherwise permanent eye damage will occur. There is no known chemical neutraliser. Thus it makes sense *always* to wear a pair of properly fitting safety goggles and to have plenty of water to hand whenever you use fibreglass fillers.

In fact it cannot be too strongly emphasised that you should wear your safety goggles when using any kind of glue, especially those that need added hardeners and super glue.

Aerosol cleaning fluids, freezers, circuit varnish and special fluids to clean audio and video heads are found in virtually all TV/VCR workshops. None of these will do your eyes any good if the spray or liquid reaches them. Safety goggles are essential protection when using these products.

Lasers

Some domestic electronic equipment, such as the CD player, incorporates a laser. A stick-on label on the chassis – it should never be removed – warns the TV/video engineer. Provided the manufacturer's service procedures are followed all should be well. But take care when servicing such equipment. The laser beam should never be viewed directly – it will cause eye damage.

In Conclusion

Finally, if you should be unfortunate enough to suffer any kind of eye injury, or get some foreign body in your eye, immediate qualified medical attention should be sought.

The information provided in this article is not intended to alarm or scare readers but perhaps to prevent someone from suffering some injury or accident to his eye(s). If it succeeds in this aim, the article will have been well worth the research and writing.

Servicing Compact Disc Players

Part 7

Joe Cieszynski

This month we continue our account of the data frame format used with the compact disc system. The next item to consider is the eight-bit subcode word that's added to each frame following the sync word. Just to refresh your memory, the data recorded on the disc consists of a succession of frames each of which have 588 data bits. Each frame contains six left/right audio samples, P and Q parity check words, the frame sync and one subcode word. The composition of the frame was shown in Fig. 11, Part 5 (page 694, July).

The subcode contains data to control the player's LC display. It also contains the cyclic redundancy check code (CRCC) data, which is used to detect and correct any errors within the subcode. Before we go any farther, let's see how the subcode data is processed.

Processing the Subcode

Although the subcode section of each frame consists of eight bits it's not in fact an eight-bit word. Each of the eight bits is one part of a much longer (96-bit) word that's spread over a number of frames. Thus as the subcode data is detected by the player it must be stored until enough data is available to recreate the 96-bit words. During playback the decoder locates the eight-bit subcode in each frame, extracts it and stores it in a RAM. When 98 frames have been played, this RAM will hold 98 subcodes – see Fig. 1. As shown, each word has a length of 98 bits, but as the first two eight-bit subcode symbols are subcode sync the usable word consists of 96 bits. The subcode sync is required because, with the subcode symbols being continuously extracted during playback, something has to tell the decoder when a new word is about to start. The two sync symbols are of a particular pattern that's recognised by the decoder. As a result the decoder clears the RAM and begins to load new data at the start of the third subcode symbol.

The rate at which these words are formed and processed is very fast. With 7,350 frames per second and 98 frames per subcode block, there are 7,350/98 = 75 blocks per second. So the central processor is receiving 75 data blocks per second, each one containing eight 96-bit words.

What do these words say? In the CD specification the letters P, Q, R, S, T, U, V and W have been allocated to each bit of the subcode. When 96 eight-bit symbols have been collected in the RAM we have words that are labelled P, Q, R etc. At the present time only the P and Q words contain any data. The others are reserved for future developments in the system. A word of warning: don't confuse the P and Q subcode words with the P and Q parity words discussed last month. They are quite different and the name similarity is unfortunate.

The P Word

The P word informs the microcomputer chip when a music track is about to start or end, enabling it to take the appropriate action such as mute on/off. The word has two statements: when music is playing P = 0, whereas when music is about to start or end P = 1. Thus when a music track is about to end P goes to one for about two seconds. The end of this one period marks the start of the next music track. During the lead-in track (table of contents) P goes to one, the end of this one indicating the start of

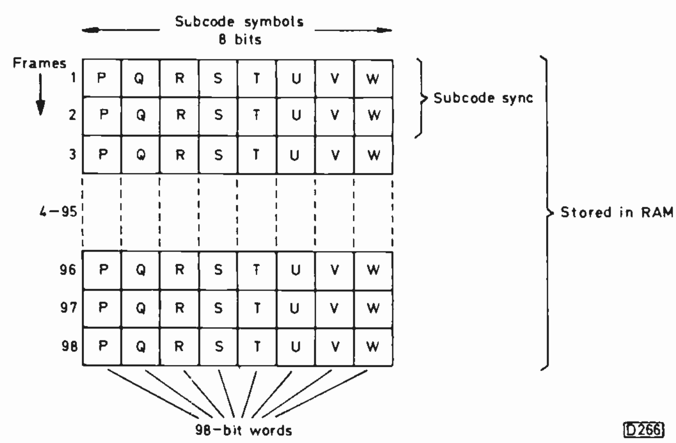


Fig. 1: A subcode block stored in RAM.

Subcode sync 2 bits	Control 4 bits	Address 4 bits	Q data 72 bits	CRCC 16 bits

98 bits D267

Fig. 2: Q word composition.

music. During the lead-out track P toggels between zero and one at about 2Hz, telling the microcomputer to initiate the stop mode (unless it has been programmed otherwise).

The ones between tracks can be used for track search, enabling the player to locate a particular track of the user's choice. If for example you wish to skip two tracks the microcomputer will look for the one signals and begin playing when it reaches the third one. Although this is a feasible approach it's not often used because the microcomputer may not realise which part of the disc it's actually dealing with, making track search in this way rather limited. Any player of even modest quality employs a more sophisticated search technique that makes use of the Q subcode data – we'll consider this later in the series.

The music start flag can be inserted between pieces of music that fade into one another. In this case the P subcode will carry the flag two seconds before the end of one track, enabling you to miss the following track in the search mode if you so wish. As the subcode is not part of the audio data there's no audible interference.

The Q Word

The Q word consists of a number of sections as shown in Fig. 2. These are as follows:

(1) Subcode sync. We've already explained the function of this.

(2) Control. This tells the microcomputer chip if the disc player has (a) two audio channels without pre-emphasis, (b) four audio channels without pre-emphasis, (c) two audio channels with 50μsec pre-emphasis or (d) four audio channels with 50μsec pre-emphasis.

(3) Address. This carries the data required by the microcomputer to enable it to function.

(4) Q data (see Fig. 3). The make-up of this is highly complex. When decoded by the microcomputer it gives:

(a) Track number – the number of the music track being played.

(b) Index. This is required only when more than one disc is being used to form an album. The disc's number in the album is displayed on the LCD.

(c) Playing time. This is the time that has elapsed during a particular track. It's reset to zero at the start of the next track.

(d) Separation – this section contains no usable data.

(e) Running time. This is the elapsed time from the start of the disc. If a track has been skipped the running time displayed will be the time that would have elapsed if the skip had not taken place. This data can also indicate the number of tracks that have passed up to the present time, including any that have been skipped.

Table of Contents

The table of contents information is also contained in the Q data. As you may recall, this track appears at the start of the disc and is automatically read by the player as soon as the disc is inserted. Its information tells the control microcomputer the number of tracks on the disc and the length of each one. This information is used in the track search mode to enable the player to locate a track of the user's choice quickly.

Track number	Index	Min	Sec	Frame	Sep	Min	Sec	Frame
		Playing time				Running time		

D268

Fig. 3: Make-up of the 72-bit Q data.

CRCC

Last month we considered the problem of incorrect data during music passages, describing the ways in which errors can be detected and corrected. Errors can also occur in the subcode of course. The cyclic redundancy check code data included in the subcode enables these to be corrected.

The way in which this is done is highly mathematical and makes the CIRC principle we looked at last month appear simple! Basically what happens is that the Q data bits are multiplied by another binary number during encoding. Dividing the Q data in the microcomputer by the same number during playback should restore the original information. If there's enough data for the microcomputer to decipher what the original basically was, it can correct the Q subcode when errors occur. Like CIRC, CRCC is effective until a large amount of data has been corrupted.

Other Subcode Words

As previously mentioned the R-W subcode words don't at present contain any useful data. The designers have left the space provided by these words for system expansion, and will use it as and when necessary – one hopes after international agreement, which is likely since Sony and Philips have a tight control over the system. Whenever I have the opportunity I ask manufacturers whether there are any concrete proposals for the use of these subcode words. They usually look at the floor and mutter something like "nothing definite yet". At the time of writing it seems that the most likely use is for controlling a VDU, but it's not clear what the VDU would display!

What Next?

In these last three instalments we've looked at the theory of compact disc data encoding. This provides a good introduction to the operation of the decoder, which will be our next subject. Looking further ahead, this basic theory will be relevant when we come to filters, oversampling, the disc servo, track search and central control processing. Furthermore as conversion of the familiar analogue TV signal to digital form for processing in various ways becomes more common, this theory will be seen to have wider relevance. Finally a word of comfort for those who may be finding all this theory a bit overwhelming. Didn't PAL colour seem very complex when it first came on the scene? Didn't you go hot and cold the first time a VCR came in for repair? Yet nowadays all this is commonplace. Likewise sampling, quantisation, A-D conversion, eight-to-fourteen modulation and CIRC will before long all be part of the day-to-day job. It's not as bad as it sounds!

Service Bureau

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SONY SLC20

The initial problem was a regular sudden increase in take-up tension at a rate of about three-four times a second. This produced wow on music though speech was just acceptable. With the top cover removed the tape loop between the capstan and take-up spool could be seen jerking. The problem has got worse and now the take-up fails completely towards the end of a cassette.

There are two possibilities here. First check whether the take-up turntable spins freely by hand with the brakes off. If not, check whether its nylon bearing is loose in the brass tube. Where necessary the bearing can be pushed down and the tube squeezed. Alternatively the cause of the trouble may lie in the drive system. Replacement of the pendulum arm assembly X-367-911-43 and rotor X-262-220-13 often cures the problem. After the repair has been carried out RV309 on board SS16 must be set for 80g/cm. This is difficult without torque test cassette SL-0003C.

PIONEER SV2801

The problem is with the teletext function. If the teletext is mixed with the picture it works except that the text is black. By itself you get only a bright green screen. Selecting subtitles (page 888) locks up the teletext.

First check transistor TV36 (BC548B) on the decoder panel. Then if necessary transpose the connections to pins 7 and 8 of BV06 on the text panel. If the fault now appears in red, the SAA5040 chip is the most likely culprit. If there's no difference the U4606B chip is suspect.

HITACHI VT64

There's no mention of lubrication in the service manual. I'd welcome guidance on this.

The manufacturers consider routine greasing or oiling of the deck to be unnecessary. In practice we find that one small drop of light machine oil is permissible on any shaft that squeaks while a touch of light (we use graphited) grease is often required at the bottom tip of the capstan shaft.

FERGUSON TX90 CHASSIS

This set works perfectly apart from the presence of teletext lines at the top of the picture.

First check that the 95V supply is correct at pin 5 of the line output transformer. If so check D106, D107 and C171 before suspecting the field output transistors TR104 and TR105. If the latter have to be replaced they must be of exactly the correct type, preferably sourced from Ferguson.

GRUNDIG CUC2401 CHASSIS

This set goes into the standby mode after about half an hour. Operating the on/off switch or the remote control unit will restore normal results for about a quarter of an hour, then it's back to standby. Use of heat and freezer has failed to reveal any cause of the fault.

There are several possibilities for this fault in these sets. First check R641 (100kΩ) and the condition of and connections to R631 and R632. If these items are in order the next suspects are R661 (1·5Ω) and C661, then the TDA3640 chip IC665.

FERGUSON 3V23

The problem is overloading when prerecorded tapes and tapes recorded on other machines and cameras are played back, i.e. whites tend to go negative and there's hum on sound that varies with the intensity of the negative whites. The playback level control in the video circuit has been set as low as possible and the odd thing is that the machine records and plays back its own tapes normally.

It's likely, but check, that the signal level at the video output socket is correct (1V pk-pk) or low. If so the problem is in the u.h.f. modulator and can be cured by very careful adjustment of the small preset potentiometer inside. No details of the modulator are given in the manual.

AMSTRAD VCR4700

This machine seems to work quite well but is rather noisy on playback – best described as a cyclic clattering in the cassette region. The noise is no longer present to any extent with the cassette removed and the sensors disabled. Rewind is also a bit noisy but fast forward is reasonable.

There are two reasons why the VCR4700 is noisier than many VCRs. First it's a "cost effective" design, and secondly it uses pinion rather than idler drive to the reels. Ensure that the cassette cradle bottom plate is not bent or damaged and that the reel turntables are perfectly free to rotate. Grease the reel drive pinions with a *light* graphite grease.

PHILIPS G11 CHASSIS

This set can be tuned in correctly using the pushbuttons on the front panel but when the remote control handset is used to change channels all the stations go off tune, some of them quite considerably.

We suggest that you check the alignment of the a.f.c. coil L5630 in the U5600 vision detector module, then if necessary check the operation of transistor T5060, ensuring that field sync is being received via R5062.

SAMSUNG CI514F

The problem with this set is that R428 (1·3kΩ, 2W) and the starter transistor Q403 (KTC2229) burn out after a few weeks. We've been unable to find fault with any of the associated components.

It's almost certain that the set is trying to run continuously on its start-up system. Normally Q403 works for only a second or two at switch on, i.e. until the 16·5V line is established. Confirm that 16·5V is developed at the anode of D405, then suspect D405 and D401. The latter should be reverse-biased after start-up, relieving Q403.

TEST CASE

321

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

The causes of intermittent faults in VCRs can be very difficult to trace. Given an adequate fault description however such problems can often be sorted out without the technician actually seeing the symptoms. This applies particularly to "borderline" conditions like excessive back tension, insufficient take-up torque and tape path problems.

It was with reasonable confidence then that John confronted a Sharp VCR, Model VC7700, that arrived on the bench with a ticket bearing the comment "sometimes goes to stop during play or record, depends on make of tape". A very common cause of this problem is low take-up torque, so this was the first check made. It came out at 110g/cm, which is within the maker's tolerance. The machine was then set to run on soak test while other repairs were attended to.

An hour later a click and whirr of machinery signalled that the fault had appeared. John set the machine to playback again and settled down to watch the mechanism. After a minute or two the reels stopped and a few seconds later unthreading occurred. Clearly the control microcomputer chip was responding to a lack of reel sensor pulses. What might stop the reels turning? The take-up torque was checked again and found to be over 100g/cm. So the machine was once more returned to the playback mode. After a run the tape again stopped moving and the machine went into the stop mode. This time however the deck was being closely watched. As a result, two important clues were obtained. First, the head drum continued to rotate until the unthreading was complete. Secondly no slack loop of tape developed downstream from the capstan. Indeed all the tape throughout the deck stopped moving.

By the time these points had been noted the deck was back in the stop mode of course. The first possibility that occurred to John was that the capstan motor was stopping sporadically, perhaps due to a dead spot in its commutator. In fact this was highly unlikely once the motor was up and running, and further tests and observation from below showed that the capstan motor continued to run after the tape had stopped. So did the belt and capstan flywheel.

Thus the capstan was turning while the tape stood still. When he asked around the workshop fraternity John learnt that excessive back-tension could cause this, as could too much friction around the lower drum. He inserted a back-tension gauge cassette into the machine and watched the dial. It registered 27g/cm, which is within the range specified in the service manual. Then a funny thing happened: the tape stopped moving and the gauge actually dropped back. Certainly the fault was not due to an excessive back-tension setting.

How do you check for friction around the lower drum? By now the machine had started to behave itself for long periods (don't they always?). A rough check on before-and-after drum tension was carried out by deflecting the tape with a plastic rod just upstream of the entry guide and just downstream of the exit guide. Certainly the tape was tauter after the exit guide, but to some degree this is to be expected.

In view of this another possibility occurred to John – that the pinch-roller pressure was insufficient. To check this you have to fool the machine into thinking that it's got a cassette in then select play and heave on a spring-type tension gauge, looking for a force of about 1kg at the lift-off point. As he set up this test John saw what the trouble was – not the pinch-roller spring pressure! Any ideas? See next month for the answer.

ANSWER TO TEST CASE 320
– page 778 last month –

Last month's test case concerned a Sanyo VHR3100 whose tuning memory didn't work. The seek process operated correctly, but as soon as an attempt was made to store the tuning point data this was lost. Much time was also lost in unnecessarily changing chips and panels to arrive at a diagnosis that was perhaps obvious.

The type of EAROM used in this and many similar designs operates with serial data fed via a single bidirectional port, the addresses being defined and the operation synchronised by the main microcomputer chip. The memory chip is non-volatile and requires a negative supply of about −30V to erase (over-write) the data it already holds. Under all other circumstances, including complete loss of operating power, the data is held securely and without corruption.

The fault lay with the −30V line of course – as was clear from the dimness of the fluorescent display, which is operated from the same negative voltage source. In fact the line was at only −15V. It comes from the series regulator transistor Q5003 in the power supply section, all three of whose electrodes were found to be at around −15V. The associated resistor R5008 (47Ω) was open-circuit, the voltage that was getting through arriving via Q5003's base-emitter junction and R5006/7.

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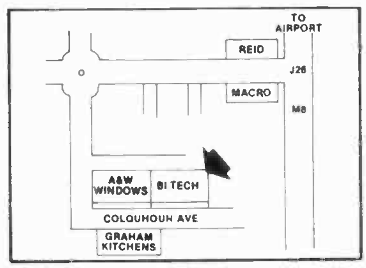

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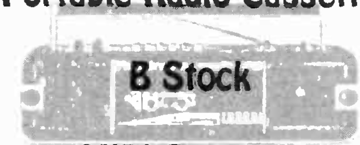

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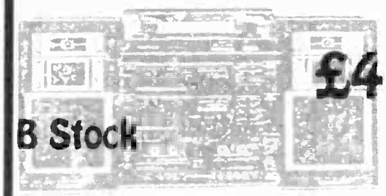

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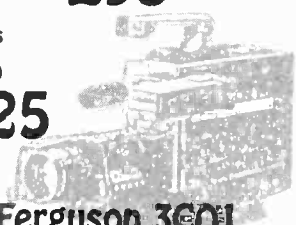

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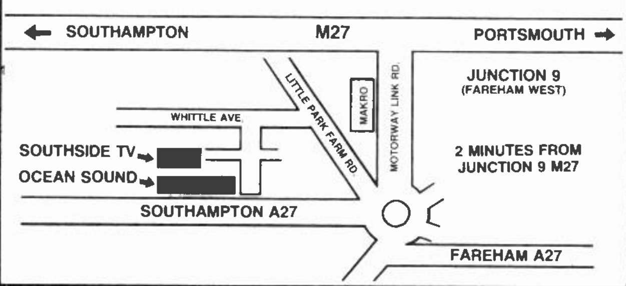

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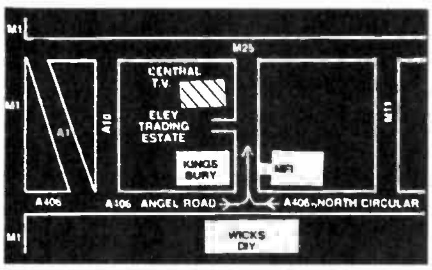

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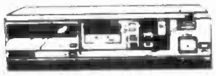

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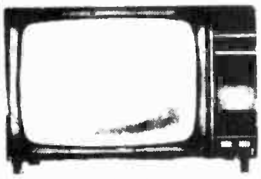

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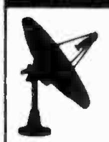

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K4 Focus Pot £1.00

Fidelity Tube Base with transitor & focus pot £1.50

Bush Tube Base on panel £1.00

TX10 Tube Base on Panel £3.00

Line Transformers

G8 Lopt £5.00
G9 Lopt £4.00
6 Diode Tripler, Mullard 75p
Line O.P. Trans. Mono T.X. 12"-14"
Philips G8
27482 £10
4822 £10
10273 £10
Thorn 1690 LOPT £7.50
2 J/Pots 3,500 1 off each type £3.00
G8 Trans. Philips £7.00
G11 Split Diode £12.00
CVC820 Split Diode ITT £10.00
Thorn B/W AD5308F + Stk + Lead £1.50
GEC 2040 £3.00
GEC 2110 £7.00
Mullard AT 2036 £1.50
Pye 169 Line Trans £3.00
Pye mono £3.00
Rank mono T704A £3.50
Split Diode Trans £7.00
GEC 20 AX Rank Z522 £3.00
Rank L.O.P.T. Z970 £3.00
CVC800 Line Trans £6.00
CVC825 Split Diode £10.00
CVC 45 £5.00
GEC Portable G1OT2041 £3.00
GEC Portable G1OT2046 £3.00
EHT Split Diode Leads ITT £1.00
3500 L.O.P.T. & HT Trans each £2.00
LOPT Rank Z763 £5.00
K35 Split Diode 3122/13835930 £10.00

Universal Tripler

with small focus pot. Green type £7.00

Black Triplers

KT3 Triplers £6.00
S.T.C. Universal Tripler £6.00
11 TJT £2.50
11 TGA £2.00
ITT CVC 5-8-9 £3.50
Rank T25LE Tripler £2.00
Rank 11TCP A823 £3.50
TU 25 30K Rank £3.00
11 TEZ Rank £3.00
G9 Philips £4.00
GEC 2110 £4.00
3500 Thorn £3.00
8500 Thorn £4.00
9000 Thorn £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
11TBQ Pye 731 £3.00
11THY £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 PO7 BG2087 £5
T/text ultrasonic rec'r panel £14.00
12-14V 20 for £5.00 200 for £25.00
GEC 8 touch unit assy complete with all I.C.'s + pots £4.00
G11 E.W. Transformer 50p
G11 E.W. coils £1.00
G11 Transient Suppressors 245V 20p
G11 Scan Coils £5.00
G11 100K tuner pots 12 for £1
KT3 IF panel £6.00
KT3 line OSC transformer £1
KT3/K30 infra-red receiver head £1
K30 drawer unit with IC's (home) £10
K30 drawer unit with IC's (export) £10
KT3 AE Sockets 50p
KT3 receiver panel £8
KT3 line driver transformer 50p
Pye, K30, GEC, etc. Pre-mains stand-by switch £1
Decca 80/100 IF panel £5
NPN PNP 80V 6 Amp TO66 O.P. Trans. pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T £7.00
Control panel 5 sliders + mains lead £1.50
G11 8 touch button unit replaces old 6 P.B.U. £24
Tube base + base unit for 820 Euro chassis £4.00
GEC Line O/P Trans. & Rec Stick for Portable £3.00
CVC 20/25/30/35/40 decoder panel £10
CVC 20/25/30/35/40 decoder panel (untested) £5
CVC 40/45 IF panel £5
40K Transducer 50p
PHILIPS NE511N £1.20
LM337M Reg 30p
20 GEC Black Spark Gaps £1.00
KT3 Front Panel Control Assy £2.50
BTW 30/50 50p
BTW 92/800R £3
25A473 PNP C/P 10p

Thorn TX90 Chassis with Line Linearity Width P.C.B. PC1183 £20.00

S4471 £1.00
2SD1878 £1.00
TDA8443/C3 £1.00
TDA3506 £1.00
SAA5241 P/A £5.00
SAA7020 /01 £3.00
HD614080SA90 £4.00

225m + .25m 380v £1.00
220m 385v £1.00
240m 400v £1.00
G11 470m 250v £2.00
400m 400v £1.00
175m/100m/100m 350v £1.00
TX9 500m + 500m 175v £1.00

C7 Hand Set £6.00

G8 LOPT Panel £7.00
G8 Tuner Unit + Panel £4.00
G8 IF & Chroma £6.00
G8 Chroma £3.00

G11 Chroma Panel £4.00
G11 LOPT Panel £6.00
G11 IF Panel £5.00

G11 IF Detector £3.00
G11 Selector gain module £3
Pye G11 Front panel with transducer, pots, tuner pots, 6 pb switch+lead £5.00
Pye 6 button switch portable £1.00
GEC V/cap VHF/UHF tuner and IF+ sound O/P PC 706B3 (Export) £12.00
GEC Line O/P PC 659B3 £6.00
2110 GEC Power Panel £8.00
CVC 20 Front panel with sliders + mains input panel £4

CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots 8 button units £9.00
Universal Focus. Fits Pye, Thorn and Decca Units
T147 Rank tube base on panel £1.00
Z718 Focus Unit £1.50
T20 Focus Unit £1.00
Large Type 75p
Decca Small 75p
KT3 Focus Unit 75p
K30 Focus Pot 75p
K30 Tube base on panel £1.00
TX10 Focus Units £8.50
CVC 32 Focus Unit 75p
Fidelity Focus Unit 14R–14S 30p
3500 Thorn Focus Unit £1.00
ITT Small for use with Split
Z718 Bush Focus £2.00
Diode 50p
Remo TV12SP 50p
1600 Thorn EHT Rec and Lead 50p
TV14 50p
TV20 £1.00
TV45 50p

TX9 8 Button Unit £6.00

TX90 8 Button Unit £6.00

TX90-TX925 8 Button

TX100 8 Button Unit £6.00

TX10 8 Button Unit £10.00

TX10/TX100 16 Button UHF-VHF BAND S.W. £10.00

G11 drawer ASS 3 pots Mains switch and lead £2.00

K30 Drawer Ass with pots cable forme £1.00

TX10 Drawer with 8 way pots. ass. £2.50

TX10 Ex. port with band switch (drawer) £2.50

Hills Meter for the car man, volts, amp, ohm with dwell and r.p.m. £35.00

Hills 9 piece tool kit in case £5.00

Abbey Security Smoke Alarm Model 101 £5.00

Philips Coaxial Cable Stripper SBC325 £7.50

420M 400V £1.00
470M 380V £1.00
220/400V £1.00
1200PF 15KV 10p
.01 2KV 10p
150m-385v 50p
1000m-160v TX90 £1.00
1+1 MFD Mains Filter ITT 3 Pin 15p
1/100 × 10 30p
22/100 10p
4.7M/100 6800pf-1000v 5p
470/100 20p
4700/100 75p
47/160 10p
300 300/300V in 1.6KV 80p
800/160 50p
1/250 Pulse 5p
2.2 250v 10p
7N5 1500V 15p
3n3/250 A.C. 10p
.33/250V 20p
.39/250V 15p
4n7/250 tested 5KV 25p
22/250 15p
47/250 10p
100/250 20p
GEC600/250 60p
700/250 £1
2.200PF-2Kv 10p
300+300 MFD 350v £1.00
800/250 40p
32/300 20p
4/350 5p
8/350 8p
4.7M/350v 10p
33/350 20p
220/350 30p
300/350 40p
400/350 50p
22/375 15p
220/385 (ITT) 75p
330/385 CVC 820ITT 60p
0.1/400 15p
KT3 E/W .39/400 15p
.56K 400v 20p
4700pf/400 10p
.22/400 10p
8/400 15p
33/400 20p
400/400 40p
394K/400V 20p
1000m-160v £1.00
220/450 40p
.47/500 25p
0.1/600 15p
0.1/1200V wire end 20p
0.1/450 A/C wire end 20p
.22/1000 20p
.047/600 15p
0.047/1000 10p
0.01/1000 10p
0.11/1600v
150m/385v £1.00
.47/1000v 65p
.47/250V A.C. 10p
.001K 1250 10p
0.0047/1500 10p
.005/1500 10p
.0105/1500 10p
1n8/1500 15p
2n2/1500 15p
.01/1600 15p
G11.8200/2KV 15p
0.1/2KV 20p
3n9/2KV 15p
0.0015/2KV 10p
6n2/2KV 15p
2n2/2KV 15p
470pf 4KV 10p
7500pf/2KV 10p
3000PF/3000V 10p
4n7/2KV 15p
6n2/2KV 10p
7n1/1500V 10p
8n2/1500V 10p
9n1/2000V 10p
8n2/2KV 15p
0.0082/2500 15p
150/3500 10p
1800/4KV 5p
4.7nf/5KV 10p
170/8KV 10p
180/8KV 10p
210/8KV 10p
1000/10KV 10p
.47/100V 80p
Tube Thermpath 167 £1.00
Rank Secam Decoder Panel UHF & VHF T115A £13.00
10 off .91 CAP G11 £2.00
Philips K4 CAP 150M/385V 50p
Philips Coaxial Cable Stripper SBC325

CVC 20-25-30 Mains Switches 60p
Infra Red and Ultrasonic G11 Teletext Decoder Panel £30
RANK & ITT Mains Remote On-Off Switch (720R) £1.50
RANK & ITT Remote Switch 2800 ohm £1.50
G11 Mains Switch 50p
4 amp Mains Switch 25p
GEC Mains Switch 4 amp 30p
KT3 Mainswitch £1.00
G8 Mains Switch 75p
G11 Preh Red LED P/Button for C.H. Change 20p
RANK TOSHIBA Transductors TPC-2011 50p
Mains Switch ITT Long Type Print 75p
Mains Switch Philip Long Type TAG 75p
Mains Switch GEC Long Type TAG 75p
2000 Chassis Fidelity Mains Switch (4 TAG) 60p
250V/4A White Lorlin Mains Switch 60p
KT3-K30-K35 Full Remote Mains Switch (6 TAG) £1
Teletext Adaptor Kit TY-500 Panasonic £12
Philips Battery Tester All Types and charger vis £6
Philips K4 Mains Switch with standby 80p

Philips Handset IC £3.00
SAA3010P £3
MAB8461/WO63 £3

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

M58484P £2.00

Hand Sets
Fidelity
£15.00 to £35.00

ITT 8 and 6 Push Button £1.00
Pye 725 LOPTs £6.00
Pye 731 LOPTs £6.00
Thorn 8500-8800 LOPTs £5.00

CMC 301 front panel £5.00
CMC 303 front panel £5.00

CMC 302 Panel with TC mains switch etc £5.00

CMD 800 Decoder £8.00

G11 £1.50
I.T.C. Receiver Panel

3 I.C. Power Supply G11 Full Remote Receiver Panel £3.00

PHILIPS SBC 469 Stereo Microphone £23.00
Meters Hills 520 £17.00
Meters Hills 420 £10.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MRG Rangers £28

HT100 Multimeter £6.75
HT300 Multimeter £7.75
HT500 Multimeter £9.00
HT700 £15.00
HD1000 Digital £20.00
HD3000 Digital £25.00
HD5000 Digital £25.00
HD5500 £29.00
HD6000 Digital £32.00
HD8000 Digital £37.00
HD9500 Digital with capacity Temp Trans Volts Ohms and Amps ranges £60

Infra Red
Hanset Tester

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

Handset Tester with LED £4.50

Repaired Handsets

Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day £10.00
RC4001 Full Remote KT3 K30 Teletext Handsets exchanged £15.00

NEW Type RC4001 9 CH not 12 £6.00

GEC Full Remote Infra-red, 1983 models £15.00

TOSHIBA HAND SETS

CT9185 £7.00
CT9176 £7.00
CT9133 £7.00

Rediffusion MK3 £5.00

TOSHIBA
HAND SETS

24 Button CT938 Fulremote £5.00
32 Button CT983 Videotext £6.00

THORN

VCR Front Display Panel £7.00

Large type ITT TV and V.C.R Handset £15.00

GEC Ultrasonic 8CH Full Remote £10.00

G11 Full Remote Ultrasonic £32.00
G11 Ultrasonic Teletext Handset £20.00
8 C.H. Ultrasonic GEC Full Remote C2014H/C2219H £15.00
New Replacement for G11 Ultrasonic Full Remote £12.00
Thorn 4000 insert with 7 buttons £5.00
Decca RC 11 £14.00
Decca RC 12 £14.00
G11 Infra-red full teletext £20.00
Dynatron-Full remote CTV 62, 63, 64 £19.00
Hitachi infra red handset £18.00
Philips full remote KT3 16C928/20C934, 7228/7324, K12 26C 797/1ST 66K 1826 £12.00
G11, Full remote top button assy £12.00
G11, Full remote repair service (exchange unit) £18.00
GEC infra red full remote 8 channel (I.C SAA1250) £14.00
Philips infra red full remote 9 channel for 60 CP2605 £6.00
Philips infra red full remote 12 channel for 60 CP2605 £12.00
K35
KT3/K30 T/Text £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-RC5171-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

ITT

T/V & Video Processor 1200 Type £10.00

PHILIPS
UNIVERSAL HAND SET £12.00 RC5
KT3 – K45

We have all parts for Philips Handsets

RC5353 £15.00
RC 5300 £12.00
Philips RC5 £15.00

TEXT-TYPE

Replace Hand Set for Philips KT3-K30, K4 etc £12.30

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