

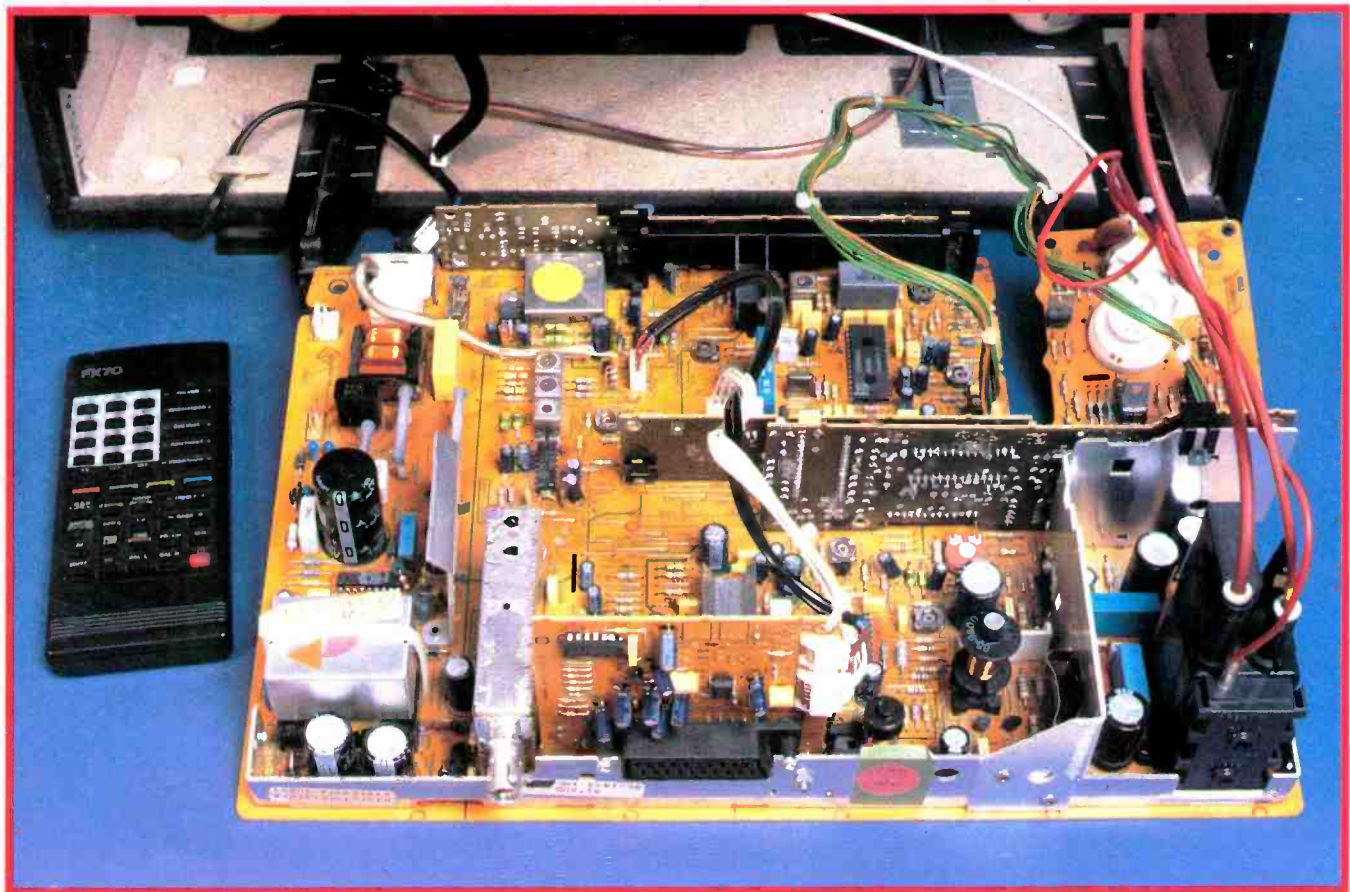
JULY 1992

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TELEVISION

SERVICING · VIDEO · SATELLITE · DEVELOPMENTS

FREE 32-PAGE CATALOGUE



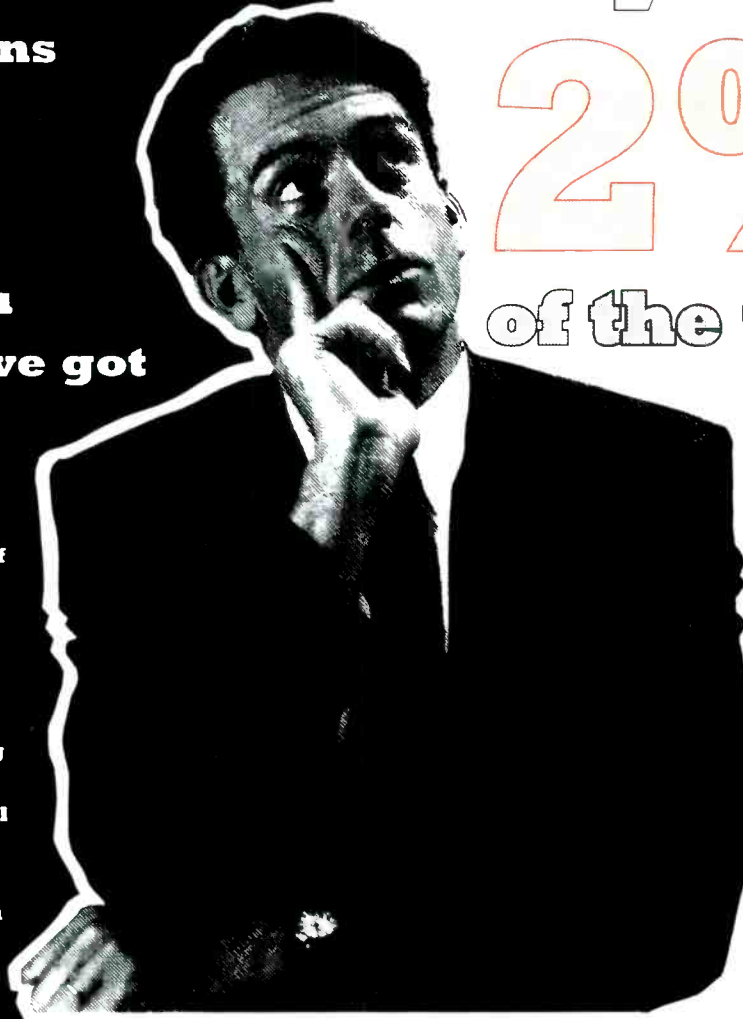
**Servicing the Tatung 160 Chassis
Scart Switching Unit • DX-TV
Channel 5 Reception Problems
Satellite Notebook • CD Casebook
VCR Clinic • TV Fault Finding**

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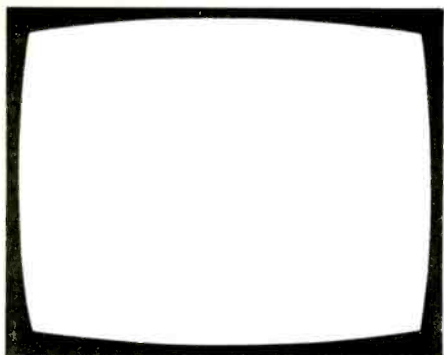
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QUERIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to published designs nor comment on alternative ways of using them.

this month

- 629 Leader**
- 630 A Scart Switcher Unit** *Keith Wevill B.Sc.*
Provides switching, manually or automatically controlled, between scart-connected VCR and satellite TV receiver inputs to a TV set, with priority for the VCR input. Also provides for recording of satellite TV programmes and the use of a second TV set independently.
- 634 Servicing the Tatung 160-180 Chassis** *Eugene Trundle*
These popular sets were also sold under the Deccacolour and other brand names and remained in production for several years. The model range caters for remote and non-remote controlled models and different screen sizes with 90° or 110° deflection. A detailed fault survey based on experience gained with large numbers of these sets.
- 639 Photostat Service**
- 640 Teletopics**
News, comment and developments.
- 641 Letters**
- 645 Next Month in Television**
- 646 VCR Clinic**
Reports from Eugene Trundle, Brian Storm, Alfred Damp, Michael Dranfield, Nick Beer, Ronnie Boag, Gerald Smith and John Edwards.
- 648 Filters for DX-TV Systems, Part 2** *Keith Hamer and Garry Smith*
Practical ways of using filtering techniques to avoid interference problems. Also the use of a second aerial to provide interference cancellation.
- 650 TV Fault Finding**
Reports from Philip Blundell, AMIEE, Mick Dutton, Steve Cannon, Chris Avis, Michael Dranfield, Roger Burchett and Stephen Leatherbarrow.
- 653 What a Life!** *Donald Bullock*
A particularly difficult customer can have unfortunate economic consequences.
- 656 Channel 5 Reception Problems** *Harold Peters*
Details of the Channel 5 transmitter allocations and coverage with an explanation of the causes of possible interference problems and the need for careful tuning.
- 660 Long-distance Television** *Roger Bunney*
DX conditions and reception and news from abroad, including satellite notes.
- 662 CD Player Casebook**
Reports from Mike Leach and P.J. Roberts, G1VUV.
- 663 Satellite Notebook** *Nick Beer*
Faults and problems experienced with satellite TV installations.
- 664 Test Case 355**

OUR NEXT ISSUE DATED AUGUST WILL
BE PUBLISHED ON JULY 15

AAY32	9p	B0332	40p	BT779	140p	TIP117	50p	DA47	10p	PCF801	110p	AN7145	195p	ICL7611	50p	LM3909	80p	STK436	490p	STK7228	800p	TA7310	100p
AC107	40p	B0361	60p	BU10A	110p	TIP120	37p	DA90	10p	PCF802	50p	AN7146	210p	ICL7612	50p	LM3910	80p	STK437	490p	STK7229	800p	TA7311	120p
AC125	30p	B0370	30p	BU105	80p	TIP121	47p	DA200	10p	PCF806	115p	AN7154	180p	ICL7660	240p	LM3914	160p	STK439	550p	STK7308	500p	TA7312	120p
AC127	30p	B0370	30p	BU108	100p	TIP125	47p	DA202	10p	PCH200	100p	AN7156	240p	ICM7555	60p	LM3915	160p	STK441	680p	STK7310	510p	TA7313	110p
AC128	36p	B0410	50p	BU109	80p	TIP126	56p	IN314	2p	PC182	80p	AN7168	260p	ICM7556	80p	LM3916	160p	STK443	740p	STK7348	410p	TA7315	200p
AC128K	36p	B0410	50p	BU109	80p	TIP127	56p	IN314	2p	PC182	80p	AN7172	270p	ICM7556	80p	LM3916	160p	STK443	740p	STK7348	410p	TA7315	200p
AC141K	45p	B0434	30p	BU111	140p	TIP130	30p	IN4002	3p	PC185	80p	AN7222	180p	KA2101	100p	M50117P	320p	STK459	560p	STK7358	500p	TA7324	200p
AC142K	45p	B0435	31p	BU124	60p	TIP131	30p	IN4003	3p	PC186	80p	AN7256	150p	KA2102	100p	M50117P	320p	STK460	720p	STK7402	600p	TA7325	90p
AC176	22p	B0436	30p	BU126	65p	TIP321	30p	IN4004	3p	PC186	80p	AN7256	150p	KA2103	100p	M50120P	650p	STK461	820p	STK7404	400p	TA7328	150p
AC176K	28p	B0436	38p	BU180	100p	TIP321	30p	IN4005	3p	PC186	80p	AN7336	200p	KA2209	125p	M50130P	650p	STK462	720p	STK7408	880p	TA7335	110p
AC187	40p	B0438	38p	BU184	100p	TIP142	90p	IN4006	3p	PL200	110p	AN7410	250p	KA2210	230p	M50130P	650p	STK465	720p	STK7410	1200p	TA7341	250p
AC187K	40p	B0439	38p	BU204	75p	TIP145	65p	IN4007	4p	PL2	60p	AY3-1015	290p	KA2212	80p	M50130P	650p	STK465	720p	STK7410	1200p	TA7341	250p
AC188	25p	B0440	40p	BU205	70p	TIP146	90p	IN4008	4p	PL3	60p	AY3-1200	800p	KA2214	150p	M51161	400p	STK465	720p	STK7410	1200p	TA7341	250p
AC188K	40p	B0441	40p	BU206	70p	TIP147	100p	IN4009	4p	PL4	60p	AY3-1350	450p	KA2216	100p	M51355P	300p	STK465	720p	STK7410	1200p	TA7341	250p
AC192	48p	B0533	50p	BU208	70p	TIP150	90p	IN5401	8p	PL5	180p	AY3-8910	360p	KA2263	100p	M51387P	200p	STK465	720p	STK7410	1200p	TA7341	250p
AD199	48p	B0534	38p	BU208A	60p	TIP151	90p	IN5402	8p	PL500	110p	AY3-8910	360p	KA2263	100p	M51387P	200p	STK465	720p	STK7410	1200p	TA7341	250p
AD199	48p	B0535	38p	BU208AT	90p	TIP2955	42p	IN5403	8p	PL504	120p	AY3-8910	360p	KA2263	100p	M51387P	200p	STK465	720p	STK7410	1200p	TA7341	250p
AF125	50p	B0536	38p	BU208D	90p	TIP3054	45p	IN5404	8p	PL508	200p	BA301	85p	KA2401	150p	M51545P	300p	STK465	720p	STK7410	1200p	TA7341	250p
AF125	50p	B0537	38p	BU209	140p	TIP3055	42p	IN5405	11p	PY81	100p	BA311	85p	KA2412	350p	M51545P	300p	STK465	720p	STK7410	1200p	TA7341	250p
AF139	30p	B0538	40p	BU225	190p	TIS44	40p	IN5406	12p	PY88	100p	BA311	85p	KA2412	350p	M51545P	300p	STK465	720p	STK7410	1200p	TA7341	250p
AF239	30p	B0643	50p	BU226	190p	TIS61	15p	IN5407	12p	PY88	100p	BA333	100p	KA2914A	300p	M51724P	300p	STK465	720p	STK7410	1200p	TA7341	250p
BA145	10p	B0647	50p	BU325	65p	TIP147	100p	IN5409	9p	PL84	80p	BA401	80p	LA1130	240p	M51742P	300p	STK465	720p	STK7410	1200p	TA7341	250p
BA148	10p	B0649	50p	BU326	75p	TIS93	20p	IN5410	9p	PL84	80p	BA401	80p	LA1130	240p	M51742P	300p	STK465	720p	STK7410	1200p	TA7341	250p
BA145	10p	B0649	50p	BU326	75p	TIS93	20p	IN5410	9p	PL84	80p	BA401	80p	LA1130	240p	M51742P	300p	STK465	720p	STK7410	1200p	TA7341	250p
BA157	12p	B0676	40p	BU406D	85p	VK1010	88p	SKE4F206	60p	3mm	250p	BA511	160p	LA1185	150p	M53206P	100p	STK465	720p	STK7410	1200p	TA7341	250p
BA157	12p	B0676	40p	BU406D	85p	VK1010	88p	SKE4F206	60p	3mm	250p	BA511	160p	LA1185	150p	M53206P	100p	STK465	720p	STK7410	1200p	TA7341	250p
BA205B	24p	B0678	40p	BU407D	80p	VN66AF	100p	SR2M	60p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC107	8p	B0679	40p	BU408	75p	VN88AF	115p			GREEN	8p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC108	8p	B0680	40p	BU408D	80p					RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC109	8p	B0681	40p	BU409	80p					RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC109C	10p	B0682	45p	BU426A	70p	ZTX107	11p	8PIN	5p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC118	11p	B0705	50p	BU500	100p	ZTX109	11p	14PIN	6p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC140	20p	B0707	50p	BU508A	70p	ZTX122	27p	16PIN	12p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC140	20p	B0708	50p	BU508AF	70p	ZTX122	27p	16PIN	12p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC142	20p	B0711	50p	BU508D	80p	ZTX301	17p	20PIN	12p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC143	20p	B0736	50p	BU508DF	75p	ZTX302	17p	22PIN	14p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC147	8p	B0826	50p	BU526	115p	ZTX303	24p	28PIN	14p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC148	8p	B0826	50p	BU526	115p	ZTX303	24p	28PIN	14p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC149	8p	B0829	50p	BU530A	100p	ZTX304	24p	30PIN	14p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC157	8p	B0899	50p	BU536	140p	ZTX320	29p	40PIN	18p	RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC159	8p	B0901	50p	BU562	150p	ZTX501	13p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC160	30p	B0937	60p	BU626	150p	ZTX502	13p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC171	10p	B0K32	100p	BU801	80p	ZTX543	25p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC172	10p	B0K33	60p	BU806	75p	ZTX504	25p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC177	14p	B0K65	80p	BU807	70p	ZTX550	24p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC178	14p	B0K65	80p	BU807	70p	ZTX550	24p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC179	14p	B0K65	80p	BU807	70p	ZTX550	24p			RED	5p	BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC182	7p	B0W93	50p	BU920	130p	2N696	26p	BZK61 RANGE	2V to 3V	9p		BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC182	7p	B0W94	50p	BU921	130p	2N698	26p	BZK61 RANGE	2V to 3V	9p		BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC183	7p	B0Y52	100p	BU932	130p	2N708	26p					BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC184	7p	B0Y52	100p	BU932	130p	2N708	26p					BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC184	7p	B0Y52	100p	BU932	130p	2N708	26p					BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
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BC184	7p	B0Y52	100p	BU932	130p	2N708	26p					BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
BC184	7p	B0Y52	100p	BU932	130p	2N708	26p					BA516	180p	LA1210	75p	M53274P	200p	STK465	720p	STK7410	1200p	TA7341	250p
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TD44551 300p	TD44552 300p	TD44553 300p	TD44554 300p	TD44555 300p	TD44556 300p	TD44557 300p	TD44558 300p	TD44559 300p	TD44560 300p	TD44561 300p	TD44562 300p	TD44563 300p	TD44564 300p	TD44565 300p	TD44566 300p	TD44567 300p	TD44568 300p	TD44569 300p	TD44570 300p	TD44571 300p	TD44572 300p	TD44573 300p	TD44574 300p	TD44575 300p	TD44576 300p	TD44577 300p	TD44578 300p	TD44579 300p	TD44580 300p	TD44581 300p	TD44582 300p	TD44583 300p	TD44584 300p	TD44585 300p	TD44586 300p	TD44587 300p	TD44588 300p	TD44589 300p	TD44590 300p	TD44591 300p	TD44592 300p	TD44593 300p	TD44594 300p	TD44595 300p	TD44596 300p	TD44597 300p	TD44598 300p	TD44599 300p	TD44600 300p

25D121 100p	25D122 100p	25D123 100p	25D124 100p	25D125 100p	25D126 100p	25D127 100p	25D128 100p	25D129 100p	25D130 100p	25D131 100p	25D132 100p	25D133 100p	25D134 100p	25D135 100p	25D136 100p	25D137 100p	25D138 100p	25D139 100p	25D140 100p	25D141 100p	25D142 100p	25D143 100p	25D144 100p	25D145 100p	25D146 100p	25D147 100p	25D148 100p	25D149 100p	25D150 100p	25D151 100p	25D152 100p	25D153 100p	25D154 100p	25D155 100p	25D156 100p	25D157 100p	25D158 100p	25D159 100p	25D160 100p	25D161 100p	25D162 100p	25D163 100p	25D164 100p	25D165 100p	25D166 100p	25D167 100p	25D168 100p	25D169 100p	25D170 100p	25D171 100p	25D172 100p	25D173 100p	25D174 100p	25D175 100p	25D176 100p	25D177 100p	25D178 100p	25D179 100p	25D180 100p	25D181 100p	25D182 100p	25D183 100p	25D184 100p	25D185 100p	25D186 100p	25D187 100p	25D188 100p	25D189 100p	25D190 100p	25D191 100p	25D192 100p	25D193 100p	25D194 100p	25D195 100p	25D196 100p	25D197 100p	25D198 100p	25D199 100p	25D200 100p
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JAPANESE TRANSISTORS		25A472 35p	25A473 35p	25A474 35p	25A475 35p	25A476 35p	25A477 35p	25A478 35p	25A479 35p	25A480 35p	25A481 35p	25A482 35p	25A483 35p	25A484 35p	25A485 35p	25A486 35p	25A487 35p	25A488 35p	25A489 35p	25A490 35p	25A491 35p	25A492 35p	25A493 35p	25A494 35p	25A495 35p	25A496 35p	25A497 35p	25A498 35p	25A499 35p	25A500 35p	25A501 35p	25A502 35p	25A503 35p	25A504 35p	25A505 35p	25A506 35p	25A507 35p	25A508 35p	25A509 35p	25A510 35p	25A511 35p	25A512 35p	25A513 35p	25A514 35p	25A515 35p	25A516 35p	25A517 35p	25A518 35p	25A519 35p	25A520 35p	25A521 35p	25A522 35p	25A523 35p	25A524 35p	25A525 35p	25A526 35p	25A527 35p	25A528 35p	25A529 35p	25A530 35p	25A531 35p	25A532 35p	25A533 35p	25A534 35p	25A535 35p	25A536 35p	25A537 35p	25A538 35p	25A539 35p	25A540 35p	25A541 35p	25A542 35p	25A543 35p	25A544 35p	25A545 35p	25A546 35p	25A547 35p	25A548 35p	25A549 35p	25A550 35p	25A551 35p	25A552 35p	25A553 35p	25A554 35p	25A555 35p	25A556 35p	25A557 35p	25A558 35p	25A559 35p	25A560 35p	25A561 35p	25A562 35p	25A563 35p	25A564 35p	25A565 35p	25A566 35p	25A567 35p	25A568 35p	25A569 35p	25A570 35p	25A571 35p	25A572 35p	25A573 35p	25A574 35p	25A575 35p	25A576 35p	25A577 35p	25A578 35p	25A579 35p	25A580 35p	25A581 35p	25A582 35p	25A583 35p	25A584 35p	25A585 35p	25A586 35p	25A587 35p	25A588 35p	25A589 35p	25A590 35p	25A591 35p	25A592 35p	25A593 35p	25A594 35p	25A595 35p	25A596 35p	25A597 35p	25A598 35p	25A599 35p	25A600 35p	25A601 35p	25A602 35p	25A603 35p	25A604 35p	25A605 35p	25A606 35p	25A607 35p	25A608 35p	25A609 35p	25A610 35p	25A611 35p	25A612 35p	25A613 35p	25A614 35p	25A615 35p	25A616 35p	25A617 35p	25A618 35p	25A619 35p	25A620 35p	25A621 35p	25A622 35p	25A623 35p	25A624 35p	25A625 35p	25A626 35p	25A627 35p	25A628 35p	25A629 35p	25A630 35p	25A631 35p	25A632 35p	25A633 35p	25A634 35p	25A635 35p	25A636 35p	25A637 35p	25A638 35p	25A639 35p	25A640 35p	25A641 35p	25A642 35p	25A643 35p	25A644 35p	25A645 35p	25A646 35p	25A647 35p	25A648 35p	25A649 35p	25A650 35p	25A651 35p	25A652 35p	25A653 35p	25A654 35p	25A655 35p	25A656 35p	25A657 35p	25A658 35p	25A659 35p	25A660 35p	25A661 35p	25A662 35p	25A663 35p	25A664 35p	25A665 35p	25A666 35p	25A667 35p	25A668 35p	25A669 35p	25A670 35p	25A671 35p	25A672 35p	25A673 35p	25A674 35p	25A675 35p	25A676 35p	25A677 35p	25A678 35p	25A679 35p	25A680 35p	25A681 35p	25A682 35p	25A683 35p	25A684 35p	25A685 35p	25A686 35p	25A687 35p	25A688 35p	25A689 35p	25A690 35p	25A691 35p	25A692 35p	25A693 35p	25A694 35p	25A695 35p	25A696 35p	25A697 35p	25A698 35p	25A699 35p	25A700 35p	25A701 35p	25A702 35p	25A703 35p	25A704 35p	25A705 35p	25A706 35p	25A707 35p	25A708 35p	25A709 35p	25A710 35p	25A711 35p	25A712 35p	25A713 35p	25A714 35p	25A715 35p	25A716 35p	25A717 35p	25A718 35p	25A719 35p	25A720 35p	25A721 35p	25A722 35p	25A723 35p	25A724 35p	25A725 35p	25A726 35p	25A727 35p	25A728 35p	25A729 35p	25A730 35p	25A731 35p	25A732 35p	25A733 35p	25A734 35p	25A735 35p	25A736 35p	25A737 35p	25A738 35p	25A739 35p	25A740 35p	25A741 35p	25A742 35p	25A743 35p	25A744 35p	25A745 35p	25A746 35p	25A747 35p	25A748 35p	25A749 35p	25A750 35p	25A751 35p	25A752 35p	25A753 35p	25A754 35p	25A755 35p	25A756 35p	25A757 35p	25A758 35p	25A759 35p	25A760 35p	25A761 35p	25A762 35p	25A763 35p	25A764 35p	25A765 35p	25A766 35p	25A767 35p	25A768 35p	25A769 35p	25A770 35p	25A771 35p	25A772 35p	25A773 35p	25A774 35p	25A775 35p	25A776 35p	25A777 35p	25A778 35p	25A779 35p	25A780 35p	25A781 35p	25A782 35p	25A783 35p	25A784 35p	25A785 35p	25A786 35p	25A787 35p	25A788 35p	25A789 35p	25A790 35p	25A791 35p	25A792 35p	25A793 35p	25A794 35p	25A795 35p	25A796 35p	25A797 35p	25A798 35p	25A799 35p	25A800 35p
VIDEO HEADS		AWA 66AV77	AKAI VS 105112115116125126201220250301	AKAI VFP100V77VS500V95009800	AKAI 8808A124510V50091000	ANIRAD VCR 4600S200900TVR1	ANIRAD VCR 7000	ANIRAD VCR 6006100	ANIRAD TVR2TV330CR4600VCR4600MKIIVCR4700	AUTHENTIC 1890	AWA 1890	BAIRD 890630189028039060228028	BAIRD 89048232489254893589418933934	BAIRD 8909812	BAIRD 890883189338940	BAIRD 8942	BAIRD 89478948	BAIRD 8950	BLAUPUNKT RTV1002002211214222224RTX100RTX200	BLAUPUNKT RTV306307309131315161520	BLAUPUNKT RTV31001A312317319320	BLAUPUNKT RTV32425	BLAUPUNKT RTK238	BLAUPUNKT RT424	BLAUPUNKT RT444	BLAUPUNKT RTX260	BOSCH BUA235	BOSCH VRH50	BOSCH VRR70	BOSCH VRR25	BOSCH VRR30	BRANDT ELECT VK13435	BRANDT ELECT VK32336373839454849511231319349495	BRANDT ELECT VK42642943943945	BRANDT ELECT VK437	BRANDT ELECT VK445	BRANDT ELECT VK449	BRANDT ELECT VK489	CANON VR10	CANON VR30A30B30E40A	DAEWOO VCP 11 RFAF	DECCA 8300	DUAL EVR 101	DUAL VR7071480819091	DUAL VR 8596	DUAL VR 87	EDISON VC130213371352140263029302932934122	EDISON VK21322512	EDISON VK2362340	EDISON VK2502532263254	EDISON VK2632	EDISON VK2637	EDISON VK42645	EDISON VK4382439	FUNAI E11VFP100VP1400VCR40012SVCR4500	FUNAI 4800V175200600400600VFP3000	FUNAI VCR4600S400600	FISHER FVH510520530615622710715720721722	FISHER 910VPH82071905060809119159165000	FISHER VBS700750076009000VBS35007007600	FISHER 980VBR330	FISHER VBS7000VBS100VBS9000	FISHER FVH11718721722VFDH720	GRANDATA LTD	K.P. HOUSE, UNIT 15,	POP IN COMMERCIAL CENTRE,	SOUTHWAY, WEMBLEY,	MIDDLESEX, ENGLAND	Tel: 081-900 2329 Fax: 081-903 6126	FOR EVEN MORE BARGAINS																																																																																																																																																																																																																																																																				

IDLERS & PULLEYS REPLACEMENTS			
AMSTRAD		Reference	
VCR7000		150280	£1.50
AKAI			
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	£4.50
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	£6.00
V9700	IDLER	BV321979	£6.00
VS125, 126, 155, VS165, 240, 244, VS245, 247, 248, VS250, 512, 515, 516	IDLER ASSY	MZ366960J2	£11.00
FERGUSON			
3V16-22	T-UP IDLER	PU47752	£4.50
3V16-22	T-UP IDLER	PU49280	£6.30
3V23, 3V29-30, 3V31-32, 3V35	REEL IDLER	PU48967	£3.00
3V23	ROLLER ASSY	PU49042A	£4.00
3V29-30, 3V31-32, 3V35-36, 3V38-39, 3V49	T-UP IDLER	51402	£1.45
3V29-30, 3V31-32	T-UP CLUTCH	PU51380	£2.60
3V35-36, 3V38-39, 3V49	REEL IDLER	PU55374	£2.85
3V35-36, 3V38-39, 3V49	T-UP CLUTCH	PU55373	£2.25
3V58-59, 3V64-65, FV10-11, FV12-13, FV14	IDLER ARM	PU58645	£2.50
3V42	CLUTCH ASSY	PU55822	£13.50
3V44	CLUTCH ASSY	PU57658	£11.50
3V42, 43, 48, 53, 56	T-UP CLUTCH	PU56043-1-4	£2.80
3V42, 43, 48, 53, 56	SUPPORT CLUTCH	PU56044-1-5	£2.80
FISHER			
FVHP520, FVHP530	FF-REW PULLEY	H1638531	£1.00
FVHP615	COMP IDLER ASSY	F11430420400300	£3.30
FVHP615	GEAR IDLER ASSY	F11430490400900	£5.50
FVHP840	REEL T-UP ASSY	F11430410400900	£6.50
FVHP905, 906, 908, FVHP910, 916	GEAR IDLER ASSY	F11430490402400	£6.20
FVHP975, 990, 999, FVHP5000, 5100	IDLER	F11430420400700	£5.20
GOLDSTAR			
	IDLER	435038A	£2.50
HITACHI			
VT11-33, VT63-64, VT14, 17, 19, 38, 57, VT86, 88	FF-REW IDLER	6886971	£1.50
	PLAY IDLER	V-6861482	£3.20
	CLUTCH ASSY	6879515	£7.50
VT120-220	CLUTCH ASSY	6886824	£7.50
VT8000-8300, VT8500-8700, VT8000-8300, VT8500-8700, VT8000-8300, VT8500-8700	FF-REW IDLER	6413663	£2.80
VT8000-8300, VT8500-8700	PLAY IDLER	6414221	£3.60
VT8000-8300, VT8500-8700	FF-REW PULLEY	6383531	£0.80
VT9300-9500, VT9300-9500, VT9300-9500	FF-REW IDLER	6861471	£3.30
	PLAY IDLER	6861482	£3.20
	IDLER	681505	£3.00
	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	£1.50
HINARI			
VXL3, VXL20	REEL IDLER	40000009	£1.50
ITT			
VR3905, VR3906	T-UP IDLER	PU51402	£1.45
VR3906	REEL IDLER	PU55374	£2.85
VR3913, VR3943	REEL IDLER	PU48967	£3.00
JVC			
HR330, 3660, 4100, HR7200, HR7600, HR7650, HR7655, HR7200, HR7600, HR7650, HR7655, HR7700	T-UP IDLER SML	PU49280	£6.00
	T-UP CLUTCH	PU53462A	£3.00
HR7200, HR7600, HR7650, HR7655, HR7700	ROLLER ASSY	PU49042A	£4.00
HR3300, 3660, 4100, HR7200, 7600, 7650, HR7655, HRD110, HRD120-121, HRD225, HRD110, HRD120-121, HRD225	T-UP IDLER LRG	PU17752	£4.50
	T-UP IDLER	PU51402A	£1.45
HRD110, HRD120-121, HRD225	T-UP CLUTCH	PU55373	£2.25
HRD110, HRD120-121, HRD225	IDLER ARM	PU55374-3-8	£2.85
MATSUI			
VX730, 735, 750, 755, VX810, 820, 880, 990	CLUTCH	850A00005	£6.50
MITSUBISHI			
HS306, 307, 318, 319, HS410, 710	GEAR ASSY	522P00201	£6.25

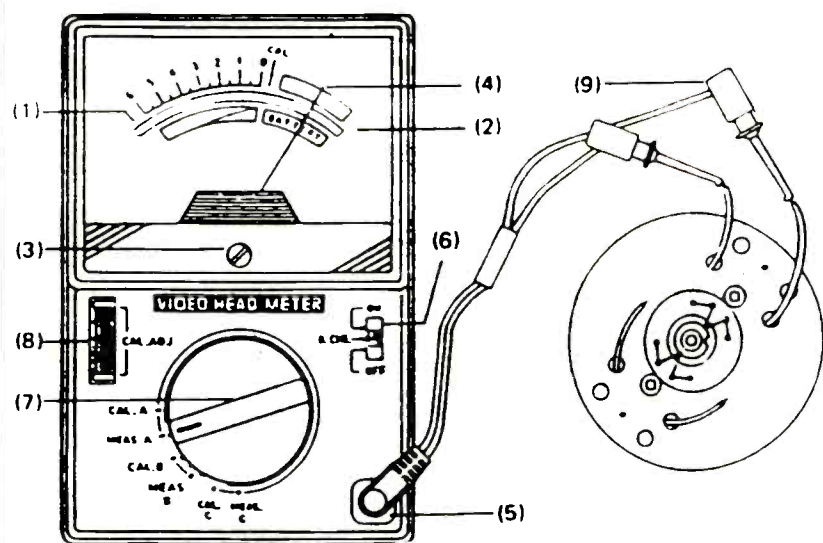
IDLERS & PULLEYS REPLACEMENTS — Cont.			
NATIONAL			
NV322, NV600, NV688, NV777, NV788	IDLER UNIT	VXP0463	£3.00
NV333	IDLER ARM	VXL0997	£3.60
NV333, NV366	IDLER UNIT	VXP0401	£0.75
NV333, NV366	PLAY IDLER	VXP0433	£3.00
NV333, NV3000	ACTION GEAR	VVG0016	£0.60
NV333, NV2000, NV3000	LOADING GEAR	VXP0325	£2.00
NV7800			
NV333, NV2000, NV3000	INTERMEDIATE GEAR	VXG0017	£0.65
NV333	CAM GEAR	VXG0158	£1.00
NV366	IDLER ARM	VXL0997	£3.60
NV370, NV430, NV730, NV830, NV850, NV870, NVG7, NVG10, NVG12, NVG18	IDLER ARM	VXP0521	£1.20
NV370, NV430, NV870, NV730, NV830, NV850	CAM GEAR	VVG0200	£1.20
NV730	IDLER UNIT	VXP0581	£2.50
NV2000, NV3000	IDLER UNIT	VXP0331	£1.20
NV2000, NV3000	IDLER UNIT	VXP0329	£1.20
NV2000, NV3000	CAM GEAR	VVG0069	£1.00
NV2000, NV3000	ACTION GEAR	VVG0016	£0.60
NV7000, 7200, 7800	IDLER UNIT	VXP0344	£1.00
NV7000, 7200, 7800	CLUTCH	VXP0343	£5.50
NV8400, NV8600, NV8610, NV8620	IDLER UNIT	VXP0245	£1.20
NV8610, NV8620	PLAY IDLER	VXP0243	£1.20
NV8620	CLUTCH	VXP0343	£5.50
NV600	IDLER	VXP0488	£3.50
NVG21-25, NVG40-45	PULLEY UNIT	VXP0767	£5.80
ORION			
VH200-201	IDLER	850A200004	£3.50
VH555-700, VH844-900, VH1000-1500, VH1800, VP200, VH530, VH535-630, VH635-640, VH893-1440, VH2500-2600, VH2700-4010, VH5010	IDLER	850A200005	£6.50
PHILIPS			
DV464, VR6462, VR6463, VR6660, VR6660	IDLER	52220334	£2.50
VR6460, VR6520, 6920, DB532, VR6542, VR6843	IDLER ARM REEL IDLER	40340162	£1.70 £7.50
SANYO			
VHR110, VHR1300, VHR1500	IDLER	1430662T14730	£5.00
VTC5000, VTC5150, VTC9100, VTC9300, VTC9300	FF-REW IDLER IDLER FF ROLLER ASSY	1430741T20001 1430551T01400 1430547T00200	£3.00 £1.20 £2.20
VTCM10-20	REEL DRIVE PULLEY	1430662T10350	£5.00
VHR2100, VHR2300	IDLER	6130374899	£5.00
VTC5000, VTC5150	PULLEY	143-0-662T-01201	£5.20
VTCM10	PULLEY	143-0-662T-10350	£5.50
SHARP			
VC651, VC681, VC685, VC7300, VC7700	IDLER ASSY PLAY IDLER KIT	NPLYV0107GEZZ NPLYV0041+ NDA1V1007	£6.15 £5.00
VC381, VC383, VC386, VC8381, VC9100, VC9300, VC9500, VC9700	IDLER	NIDL0005GEZZ	£1.50
VC300, VC387, VC481, VC482, VC483, VC496, VC571, VC585	IDLER	NH0L0006GEZZ	£1.50
VC780-781, VC785-787, VC793-VC772	REEL IDLER	NPLTV0111GEZZ	£7.00
SAISHO			
VR1100, VR1200, VR1200HD, VR1600, VR2500, VR3300, VR3500, VR3600	CLUTCH	850A200000	£6.50
SAMSUNG			
VT510-511, VT520-610, VT611-616, VT620-621-626	IDLER WHEEL	65224704220	£1.50
VT510-511, VT520-610, VT611-616, VT620-621-626	IDLER COMPLETE	69000250330	£4.50
SONY			
C6, C7	IDLER KIT ASSY IDLER ASSY	A-6706391 X-36533100	£3.50 £3.80
SL-C5, SL-C7	REW PULLEY	A-6706-348-B	£4.00
SL-C6	REW PULLEY	A-6706-391-A-B	£3.00
CASSETTE DC MOTORS			
6V MOTOR			£2.00
9V MOTOR			£2.00
12V CW MOTOR			£2.00
12V CCW MOTOR			£2.00
13.2V CW MOTOR			£2.90
13.2V CCW MOTOR			£2.90
CASSETTE TAPE HEADS			
MONO HEAD			£0.90
STEREO HEAD			£1.50
MINI HEAD			£2.30
AUTO REVERSE HEAD			£2.60

VIDEO MOTORS		
AMSTRAD		
VCR 7000	REEL MOTOR	£17.00
FERGUSON & JVC		
PU 45979, 3V16, 3V22, HR3300, HR3660	CAPSTAN MOTOR	£21.00
PU 55371V, 3V35, 3V36, 3V38, 3V39	CAPSTAN MOTOR	£19.50
8943, 8944, HRD110, HRD120, HRD121, HRD225		
PU 46414, 8904, 8922, HR3300, HR3320, HR3330, HR3360, HR3660, HR3660	DRUM MOTOR	£19.50
PU 51381V, 3V39, 3V30, 8930, HR7200, HR7300	REEL MOTOR	£26.50
PU 58635V, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430	CAPSTAN MOTOR	£29.00
PU 58636W, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430, HRD530	REEL MOTOR	£18.00
3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947, 8948, HRD140, HRD150, HRD455, HRD565, HRD725, HRD755, HRP50, R73AF	LOADING MOTOR	£8.00
MITSUBISHI		
288P02801, HS300, 301, 302, 310	MOTOR REEL SPOOLING	£33.50
288P02806, HS303, 304, 320, 330, 700	MOTOR REEL SPOOLING	£31.50
288P03401, HS303, 700	MOTOR REEL TAKE-UP GEN	£21.00
NATIONAL		
MYN 135V5L, NV332, NV333, NV340, NV366	REEL MOTOR	£13.50
VEM0212, NV730, NV770	MOTOR REEL GEN	£30.00
SANYO		
4-529V-10800 (RM11), VTC5000, VTC5150	REEL MOTOR	£6.30
SHARP		
RMOTV 1008GEZZ, VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700	REEL MOTOR	£13.50
RMOTV 1007GEZZ, VC387, VC483, VC486, VC585	REEL MOTOR	£16.50
RMOTV 1010GEZZ, VC300, VC402, VC471, VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC581, VC582, VC583, VC584, VC5F3, VC8481, VC8581	REEL MOTOR	£16.00
SONY		
BHF 1100D, SLC7	CAPSTAN MOTOR	£25.00
CASSETTE HOUSING		
FERGUSON & JVC		
3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, HRD110, HRD120, HRD121, HRD225		£24.00
3V42, 3V43, 3V44, 3V45, 8945, 8947, HRD140, HRD141, HRD150, HRD455, HRD725		£24.00
8948, 8950, FV10B, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD230, HRD430, HRD530		£24.00
3V58, 3V59, 3V64, 3V65, FV11R, HRD170, HRD180, HRD370		£24.00
VIDEO LAMPS		
UNIVERSAL VIDEO LAMPS 12V 60mA (300mm WIRES)		£0.30
PANASONIC VIDEO LAMPS		£0.50
SONY FLYBACK TRANSFORMERS		
Part No.	Models	Price
1-439-216-00	KV-2002E, 2010E, 2200E, 2015, 1820E, 2010SE, KV-2012ME, 2016ME, 2015ME, 2010ME	£14.00
1-439-256-11	KV-2704EC, 2704UB, 2704ET, 2704E(A), 2704E	£40.00
1-439-286-21	KV-2215UB, 2217UB, 2215E1, 2215FE, 2212EX, 2215ET	£30.50
1-439-289-21	KV-2705F, 2705FE, 2705UB, 2705E, 2706UB, 2720EC	£40.00
1-439-303-00	KV-2064EC, 20PS1, 2082ME7, 2056EC, 2060SA, KV-2062E(ESP)	£22.75
1-439-311-00	KV-1440AEC, 1440AS MK2, CPS-14CD3, CPV-14CD2, KTX-1350NF, KTX-1430UB	£22.00
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		8085A	300p			4N28	50p
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		8088	480p	75110	75p	4N30	90p
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		81LS98	130p	75154	95p	4N36	58p
		8224	240p	75162	100p	4N37	58p
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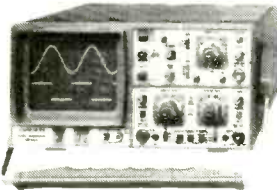


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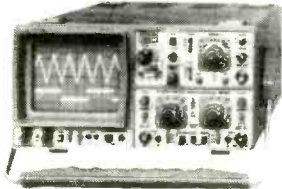
HM203-7 20MHz STANDARD



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

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 - * Bandwidth: DC - 60 MHz
 - * Sens: Ch.1, Ch.2, 1mV/cm
 - * Timebase: 2.5s - 5ns/cm
 - * Triggering: DC - 80MHz
 - * Active TV - Sync - Separator
 - * After delay trigger
 - * Sweep delay
 - * Delay line
 - * Trigger LED indicator
 - * Calibrator: 1KHz & 1MHz Sq. Wave
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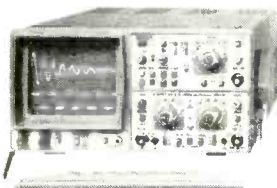
HM1005 100MHz UNIVERSAL 3 CHANNELS - UP TO 6 TRACES



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

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 - * Timebase Digital: 5s - 1µs/cm
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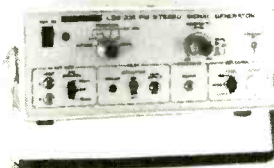
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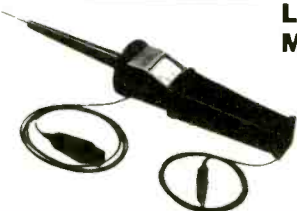
At last! A generator specifically designed for testing and fault finding on FM stereo and monaural VHF receivers including stereo multiplex circuits.

- FEATURES**
- * Carrier frequency 100 - 1.1MHz (adjustable).
 - * Output level 0.1mV - 10mV.
 - * Pilot signal 19KHz +/- 2Hz.
 - * L & R separation over 50dB.
 - * External Modulation 50Hz - 15KHz.
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 - * Comprehensive test lead set included.
 - * Mains powered.
 - * Size: 80 x 200 x 250mm.



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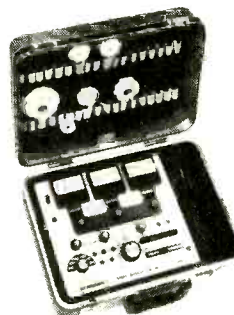


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Prices

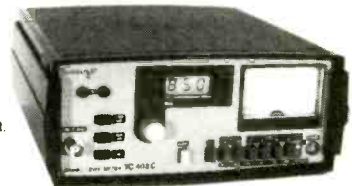
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The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-C and the TC90, allowing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

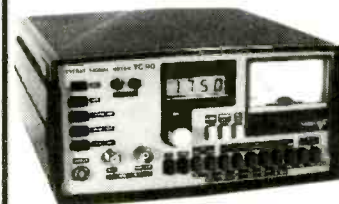
TC402-C VHF & UHF

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



Price £259.00 + £45.33 V.A.T.

TC90 VHF-UHF-SAT.



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

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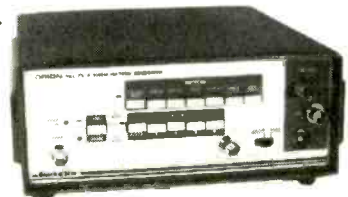
In addition to a switchable sound carrier facility which allows use with the majority of PAL TV systems, the Orion provides highly flexible RGB outputs, ensuring compatibility with most video monitors.

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- FEATURES**
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 - * Trigger Output.
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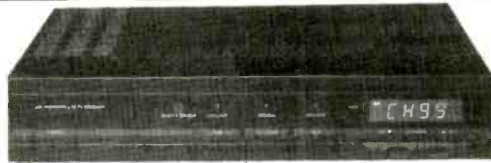
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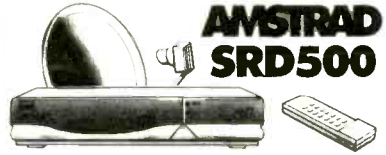


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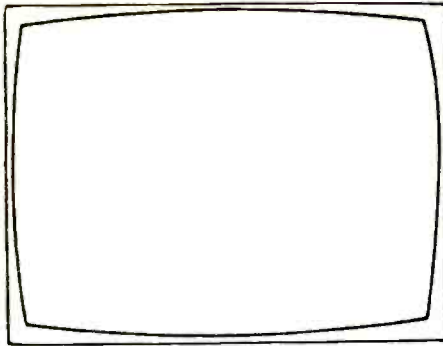
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COVER PHOTO

This month's cover photograph shows the Tatung 160 chassis. See servicing article on pages 634-9.

First Fruit

Consumer electronics markets are doing poorly worldwide. This is partly due to recessionary economic conditions and partly due to market saturation. The latter may be cured by the introduction of innovative new products; that's the hope, anyway. Leading Japanese manufacturers have been reporting poor results. Matsushita has announced a pre-tax profit fall of 39 per cent during its last trading year while Sony, despite a 5.7 per cent increase in sales, recorded a pre-tax profit fall of 44.1 per cent and its first loss since being listed on the Tokyo Stock Exchange in 1958. JVC reported its first loss in four decades, Hitachi recorded a pre-tax profit fall of 37.4 per cent and Pioneer a pre-tax profit fall of 13.4 per cent. Many of these companies envisage no improvement in trading conditions during the present year. Matsushita says that the Japanese consumer electronics market has been flat for five years now: according to Hitachi there has been a two-year downturn in the domestic AV market. There are hopes that new products – CD-I, DCC, the Mini Disc, multimedia devices and so on – will lead to a revival. But it will take a time for consumers to respond to these new offerings.

Some years ago Japanese consumer electronics companies jumped into semiconductor device manufacture as a way of spreading their interests. All that this seems to have done is to increase competition and reduce profitability in tight markets. Possible ways forward were outlined by Toshiba in an interesting presentation on new uses for microelectronics. These include new memory technology to replace the use of hard discs, multiplex wiring arrangements for cars, "neuron" chips for networking in buildings, using mains electricity lines, processor-controlled smart cards and signal compression/expansion technology for use in multimedia devices, HDTV receivers and digital VCRs. Interesting that Toshiba sees a move to the lower operating voltage of 3V for microelectronics.

Although R and D expenditure is being cut back, progress continues to be announced by Japanese consumer electronics manufacturers. Despite disappointing sales the cost of HDTV sets for the Japanese MUSE system continues to fall. Toshiba has just introduced a 36in. model that sells for the equivalent of about £10,500. Sharp recently announced a set to sell at the remarkably low figure of about £4,500 equivalent. It's not clear whether there is a significant performance difference between these sets. But the major hope for the future of the consumer electronics market lies with multimedia devices that combine computer with other technologies. In this connection it was significant that Apple Computer was able to show a prototype of its new "digital personal assistant", the Apple Newton, at the recent Chicago Consumer Electronics Show. It's the result of collaboration between Apple and Sharp.

As with other things from Apple, operation of Newton depends on icons that are printed on the screen. You use a pen to write on the screen, using the device like a note pad – there are no buttons except for the on/off switch. The prototype measured about 7 x 4½ x 1in., the screen being 5 x 3in. You can write words or draw sketches on the screen, though you can't at present use joined-up writing – this is being worked on. Even so the handwriting recognition programme is sophisticated and has already won acclaim. It can handle rough sketches and will make them symmetrical: a rough circle for example can be automatically rounded and centred. Speech recognition will be added to later Newton products. Newton stores what you tell it, filing information in appropriate places to give easy access when required. It has for example an electronic calendar for appointments. The exact specification for the initial models has not yet been finalised and will depend on the price, which is likely to be in the £275-£400 range.

A major feature of Newton is that it can communicate via fax, telephone or a computer network. Early models will use an IR system to exchange data with a computer over short distances. At a later date Apple envisages incorporating radio facilities for communication over longer distances.

Software support will be required. An example given by Apple describes the use of Newton to help with a visit to Paris. Newton could obtain information such as a Metro map, a phrase book or a guide to well-known places by phone. Using the pen to point to a station on the Metro map would tell you how to get there while Newton could translate items written on its screen.

Newton uses a RISC microprocessor designed in the UK by Advanced Risc Machines. Flash memory cards that can store up to 20Mbytes of data are used – they are similar in size to a credit card.

There is a possibility that Newton will be available in the UK some time next year, at around £300. Competition could put in an appearance quite soon: Tandy announced at the Chicago Consumer Electronics Show that it will be developing and producing personal information devices in conjunction with Casio. There could be standards battles of the type we've seen in the computer and video fields. To get its Newton technology established, Apple is prepared to license other manufacturers – in fact Apple expects royalties to contribute a significant proportion of its Newton revenue within a few years. The company expects the multimedia device market to be around \$315 million million a year by the start of the next decade.

The concept of a product that combines computer and communications technology to provide information services and entertainment is attractive and it seems that getting such products to the market at reasonable prices will be no great problem. Maybe by the time that consumers have got over their present debt burden and reluctance to spend they will be ready for it.



A Scart Switcher Unit

Keith Wevill, B. Sc.

My brother recently moved house. To celebrate he bought a new all-singing, all-dancing Nicam stereo TV set and VCR with remote control units that would not look out of place on the flight deck of Concorde. The previous owners of the house had left a complete satellite TV receiver, which must say something about the quality of the programmes, so he had the problem of connecting these three units together. He also wanted to be able to watch the output from the satellite TV receiver or the VCR in another room without interfering with the use of the main TV receiver.

The initial arrangement he adopted is shown in Fig. 1. It's probably the most common arrangement for a TV set, a VCR and a satellite TV tuner. The input from the u.h.f. aerial is passed to the TV receiver via the satellite TV tuner and the VCR. The VCR is tuned to the satellite receiver's u.h.f. output so that satellite TV programmes can be recorded, the TV set being tuned to the satellite receiver and the VCR on separate channels.

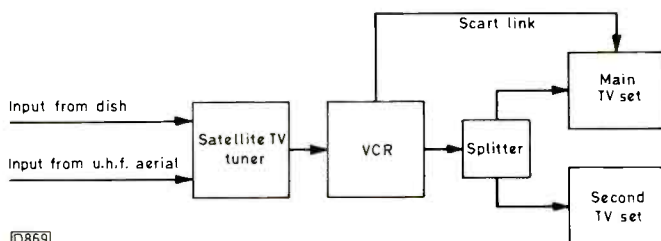
This worked but didn't allow the outputs from the VCR and the satellite tuner to be heard in stereo or the satellite tuner's output to be recorded in stereo. There was also some interference due to interaction between the two u.h.f. modulators and it was difficult to tune the TV set. These modern tuning systems have a lot to answer for – and complex instructions.

A splitter in the u.h.f. feed to the main TV set enables a second TV receiver to be connected. This will give only mono sound from the VCR and the satellite TV tuner, which was considered to be perfectly acceptable.

The interference was minimised by retuning the VCR's modulator to about ch. 31, but this still didn't permit the output from the VCR or the satellite TV tuner to be heard in stereo.

All the units have scart connectors however, so the obvious thing to do was to connect them all together using scart cables. This brought a new problem: the TV set has only one scart connector. Initially we connected the VCR to the TV set via a scart cable, leaving the satellite TV signal at u.h.f. The result was an instant and dramatic improvement in the picture quality from the VCR, with stereo sound. But there was only mono sound from the satellite TV tuner and, as before, the VCR recorded only mono sound from the satellite tuner. The simple answer to this was to move the scart cable between the TV set, VCR and satellite tuner as required. But scart connectors aren't designed for repeated plugging in and unplugging, especially by my brother. A more elegant solution was thus required and the scart switch was born.

The basic requirements of the switch unit were to provide switching between the outputs from the VCR and the satellite



D859

Fig. 1: Usual method of connecting a satellite TV receiver, VCR and TV set, with optional scart link and splitter to add a second TV set.

TV tuner, with the VCR having priority, and to enable the VCR to record the satellite tuner's output. The requirement to be able to watch the output from the VCR or satellite tuner on a second TV set without affecting the use of the main TV set made the control logic more complex, but the final solution permits either automatic or manual control of the source switching for the main TV set.

Fig. 2 shows a block diagram of the switch. The video signals from the VCR and the satellite TV tuner are buffered before being fed into the video switch, whose output is buffered before being fed to the TV set. The satellite TV

Components list

Resistors:

R1	75Ω	R17	75Ω	R33	47k
R2	4.7k	R18	3.3k	R34	47k
R3	4.7k	R19	1k	R35	470k
R4	3.3k	R20	5.6k	R36	47k
R5	1k	R21	10k	R37	47k
R6	5.6k	R22	1k	R38	470k
R7	10k	R23	3.3k	R39	10k
R8	1k	R24	100Ω	R40	10k
R9	3.3k	R25	1k	R41	10k
R10	100Ω	R26	1.2k	R42	10k
R11	1k	R27	100Ω	R43	10k
R12	1.2k	R28	270Ω	R44	100k
R13	100Ω	R29	75Ω	R45	100k
R14	270Ω	R30	10k	R46	100k
R15	75Ω	R31	47k	R47	2.2k
R16	10k	R32	47k	R48	10k

Capacitors:

C1	33μF, 16V	C10	220nF
C2	47μF, 16V	C11	220nF
C3	47μF, 16V	C12	2.2μF, 16V
C4	10μF, 16V	C13	2.2μF, 16V
C5	100nF	C14	220nF
C6	220μF, 16V	C15	220nF
C7	33μF, 16V	C16	2.2μF, 16V
C8	47μF, 16V	C17	2.2μF, 16V
C9	220μF, 16V		

Semiconductor devices:

D1-6	N4148	Tr5	BC337
IC1	4053	Tr6-8	BC548
IC2	TL084	Tr9	BC558
IC3	4081	Tr10	BC337
Tr1-3	BC548	Tr11	BC548
Tr4	BC558		

Hardware:

S1	One-pole, four-way switch
SK1-3	Scart sockets

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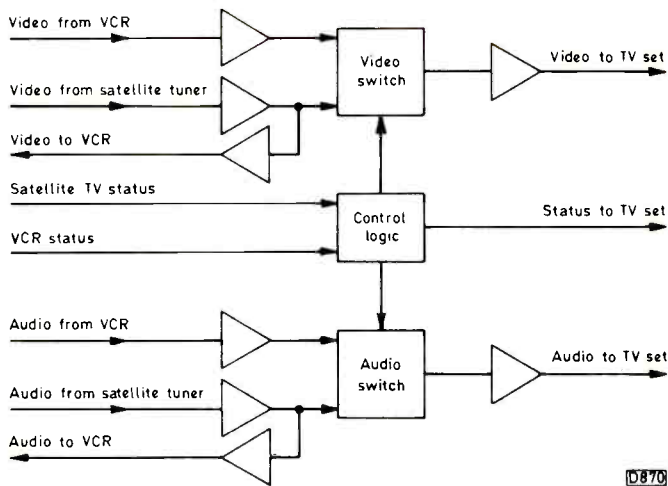


Fig. 2: Block diagram of the scart switcher unit. The audio inputs and outputs are in practice in L/R form.

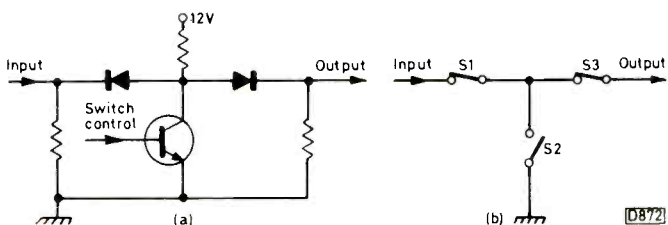


Fig. 3: Operation of the discrete component video switches. (a) Circuit arrangement; (b) equivalent mechanical switch system.

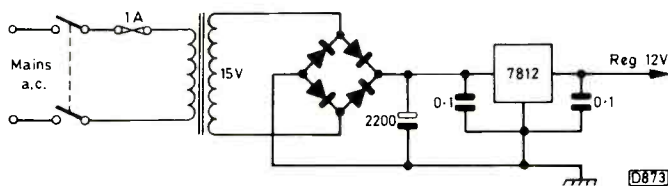


Fig. 4: Suitable power supply. Transformer rating 10VA.

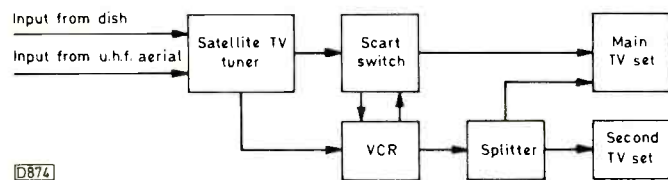


Fig. 5: Block diagram showing the connections to the scart switcher unit.

tuner's output is also buffered and fed to the VCR to enable it to be recorded (always assuming that this is worthwhile!). The control logic uses the source switching signal at pin 8 of the scart sockets or the mode switch to determine which input is passed to the TV set.

Switching Circuitry

Fig. 6 shows the circuit diagram of the scart switcher unit. Each video input is terminated by a 75Ω resistor and fed to an emitter-follower (Tr1 and Tr6) whose output is fed to a switch that consists of two series diodes (D1/2 and D3/4) and a parallel transistor (Tr2 and Tr7). Fig. 3 shows how the diodes and transistor are arranged and the equivalent circuit. When the transistor is off the two diodes are forward biased, which is equivalent to S1 and S3 being closed and S2 being open. Thus the video signal passes through to the TV output

buffer amplifier (Tr3-5). When the transistor is switched on however the diodes are reverse biased, which is equivalent to S1 and S3 being open and S2 closed, and no signals can pass through. This form of switch, with both series and parallel elements, provides excellent isolation in the off state with virtually no breakthrough of the unwanted signal.

The outputs from the switches are buffered before being fed to the TV CVBS output socket SK3. The output buffer amplifier has a gain of two which, with the 75Ω output resistor, gives an output of 1V into 75Ω for an input of 1V. An identical output buffer amplifier (Tr8-10) is used to feed the satellite TV signal to the VCR socket SK1.

Two sections of a 4053 triple analogue switch (IC1) are used to select the VCR or satellite TV left and right channels. The third switch in this i.c. is used to control the switch transistors Tr2/7 by earthing the base of one of them. The outputs from the switch are buffered by two sections of IC2 and fed to the audio outputs of TV socket SK3. The satellite TV audio signals are also buffered before being fed to the VCR socket SK1.

Control System

The control circuit uses three gates of a 4081 CMOS and gate (IC3) and has four modes of operation, automatic, TV, VCR and satellite, which control the state of SK3's status pin. In the automatic mode, if either the satellite or VCR status input is high the output status is high, switching the TV set over to its scart input, and the video and audio outputs from the switches come from whichever input, satellite or VCR, has its status pin high. In the event of both status inputs being high the VCR has priority, as the video and audio switches are both controlled by the VCR status signal. In the TV mode the output status pin is held low irrespective of the state of the satellite or VCR input status, enabling the satellite receiver and VCR to operate independently of the TV set.

When the VCR or satellite mode is selected only the VCR or satellite receiver respectively can switch the status pin. These modes permit remote viewing of the VCR or satellite TV receiver via the u.h.f. cable without affecting the off-air viewing via the main TV set. They also allow the VCR's output to be viewed via the main TV set while the satellite receiver's output is being viewed via the second TV set by switching S1 to VCR and vice versa by switching to satellite. This facility can be removed if not required. In this case delete IC3 and link together pins 4 and 5, 1 and 3 and 8 and 10.

The audio and video switches are controlled by the VCR status input signal via one of the and gates: when the signal is high, the VCR input is selected. Controlling the switch in this way ensures that the VCR has priority over the satellite receiver and that when the mode switch is set to satellite the audio and video switches are set to select the satellite inputs irrespective of the state of the VCR status input.

Miscellaneous Points

Construction is not unduly critical. The circuit can be built on Veroboard or a similar universal PCB. Keep all lead lengths short, especially around the video amplifiers, and use sockets for the two CMOS i.c.s. These i.c.s should be inserted after all the other components have been fitted.

The circuit requires a 12V supply. Fig. 4 shows a suitable circuit using a 7812 regulator which should be mounted on a heatsink.

No details of the case are given. Individual constructors can choose a case to suit their own requirements, bearing in mind that three scart connectors need to be fitted.

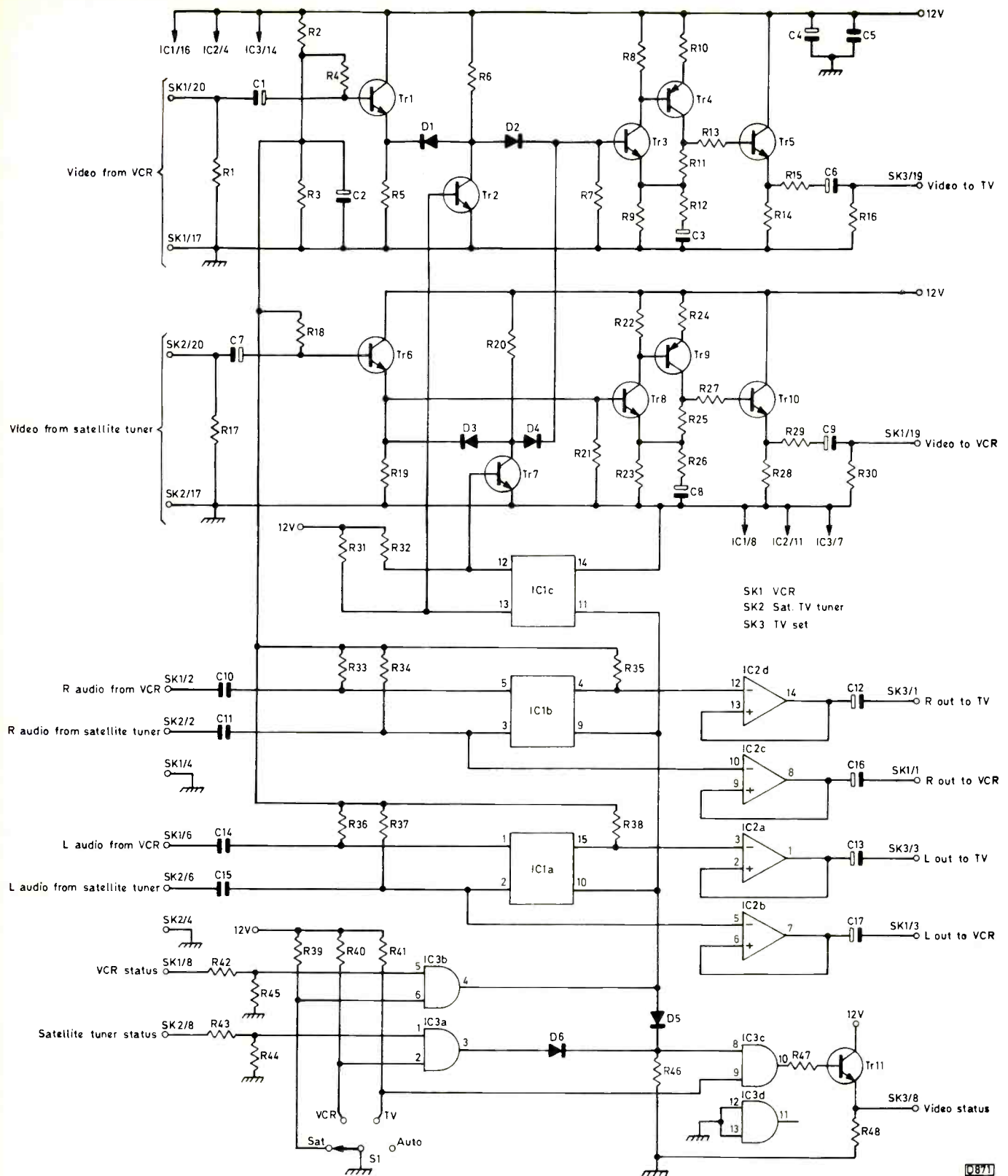


Fig. 6: Circuit diagram of the scart switcher unit.

The final arrangement of the TV sets, the VCR, the satellite TV tuner and the scart switch is shown in Fig.5. If the u.f.f. signal strength is low or noise is evident on the picture it may be necessary to add an amplifier to boost the signal level before splitting it to feed the second or even a third TV receiver. When recording from the satellite TV tuner remember to select the line input from the VCR.

The scart switch could be used to connect two scart equipped VCRs to a TV set instead of a satellite receiver and a VCR. Alternatively a camera or computer could be connected. These arrangements would enable the TV set to mon-

itor the input while the input is being recorded by the VCR.

As it stands the circuit doesn't cater for RGB inputs. I hope to add this facility at a later date.

Finally some errors were introduced during the editorial preparation of my previous article (October 1991) that described a scart interface circuit. D6 and D9 were shown the wrong way round in Fig. 3: their cathodes go to the collector of Tr1. Tr5, type BC337, was omitted from the components list. With the Ferguson TX10 chassis the point at which to connect the i.f. disable input is at pin 5 of plug 4 (pin 9, as printed, is correct for the TX9 chassis).

Servicing the Tatung 160-180 Chassis

Eugene Trundle

Tatung has been manufacturing TV sets in the UK for over a decade now, having taken over the Decca operation in 1981. The first UK-produced Tatung sets used the very good Decca 120/130 series chassis, which had been designed in Bradford. They were followed by the 140 series chassis then the 160 series, the subject of the present article. The Research and Development Department moved to Telford in 1985 and went on to produce the 165/170/180 series chassis, which are also covered here. These chassis are only now being superseded by a new type. Throughout the development of the chassis mentioned above there has been continuous evolution. This is quite a contrast with the sudden and radical changes in TV design adopted by some manufacturers.

The 160 is a basic "live" chassis with manual operation (no remote control) designed to drive 90° picture tubes with screen sizes from 14 to 22in. Apart from that on the tube base panel all the circuitry is on a single PCB which carries the user controls at the front. Fig. 1 shows the basic arrangement in block diagram form. Potentiometers are used for channel selection, there's manual grey-scale setting and a simple audio channel. The main innovation at the time was the use of the TDA4503 chip which took the place of three or four earlier generation chips.

The 165 chassis is similar but incorporates remote control (RC60 system) and a more comprehensive control system based on an M491 chip. Features include voltage-synthesis tuning, digital channel readout and remote control of channel changing, volume and standby.

The 170 series chassis, introduced in early 1988, is again similar in construction and design but has an isolated power supply to enable a scart connector to be incorporated. It also has the more advanced RC70 remote-control system, with a 30-programme frequency-synthesis tuning system and search and memory facilities. With minor circuit variations it drives

90° tubes with screen sizes from 14 to 21in. Stereo sound and teletext can be fitted, the latter in CCU or Fastext form.

The 180 is a development from the 170 for use with 25 and 28in. tubes with 110° deflection. It differs mainly in the line scan drive section and the tube base panel circuitry.

The model number gives a great deal of information about the set. Brand is indicated by the first letter - T for Tatung, D for Deccacolour. The second letter indicates the screen size in inches as follows: N 14; O 15; P 16; T 20; U 21; V 22; Y 25; Z 26; B 28. Next comes the first digit: 1 indicates non-remote control, 8 remote control and 9 teletext. The second digit is used for chassis designation: 6 for 160 series, 7 170 series, 8 180 series. The remaining digits are styling numbers, giving no useful engineering information. The later 170/180 series chassis sets have a third prefix letter to denote the following features: Q FS tube; S pseudo or playback stereo and scart socket; T Secam and scart; U Secam only; V scart only; X German broadcast stereo, scart and Secam. Before home entertainment gear all went charcoal grey the suffix letter gave information on cabinet colour: R rosewood; T teak; W walnut; A alternative. As an example of all this, Model TBS9816 is a 28in. Tatung set with teletext and stereo, using the 180 chassis.

Fault History

Most of our experience has been gained with the 160/165 series chassis. In general therefore our comments relate to them, though many are relevant to the 170/180 series chassis. In the latter case you'll have to bear in mind that component reference numbers may differ from those given here. Where a common fault relates to a specific chassis this will be stated.

We'll start with the construction and physical characteristics. The controls at the front of manual sets (160 chassis)

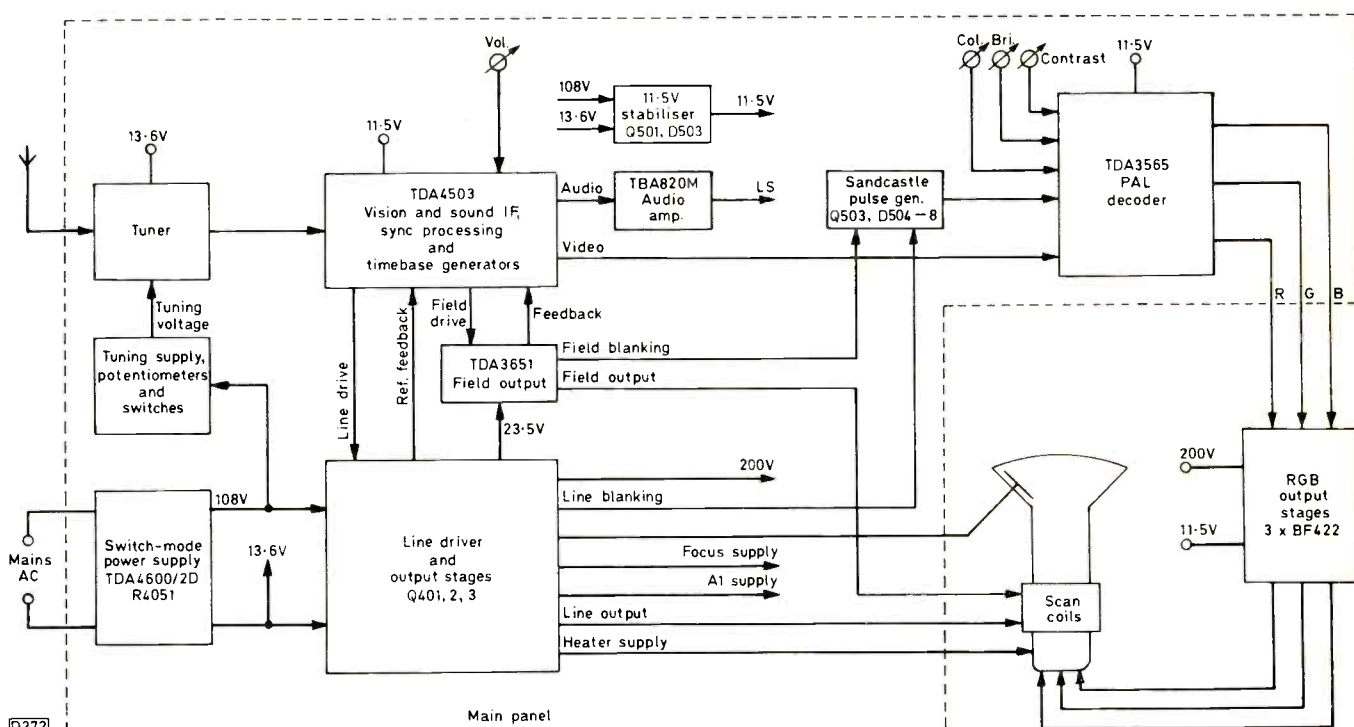


Fig. 1: Block diagram of the 160 series chassis. The 165 is similar, with the addition of remote control.

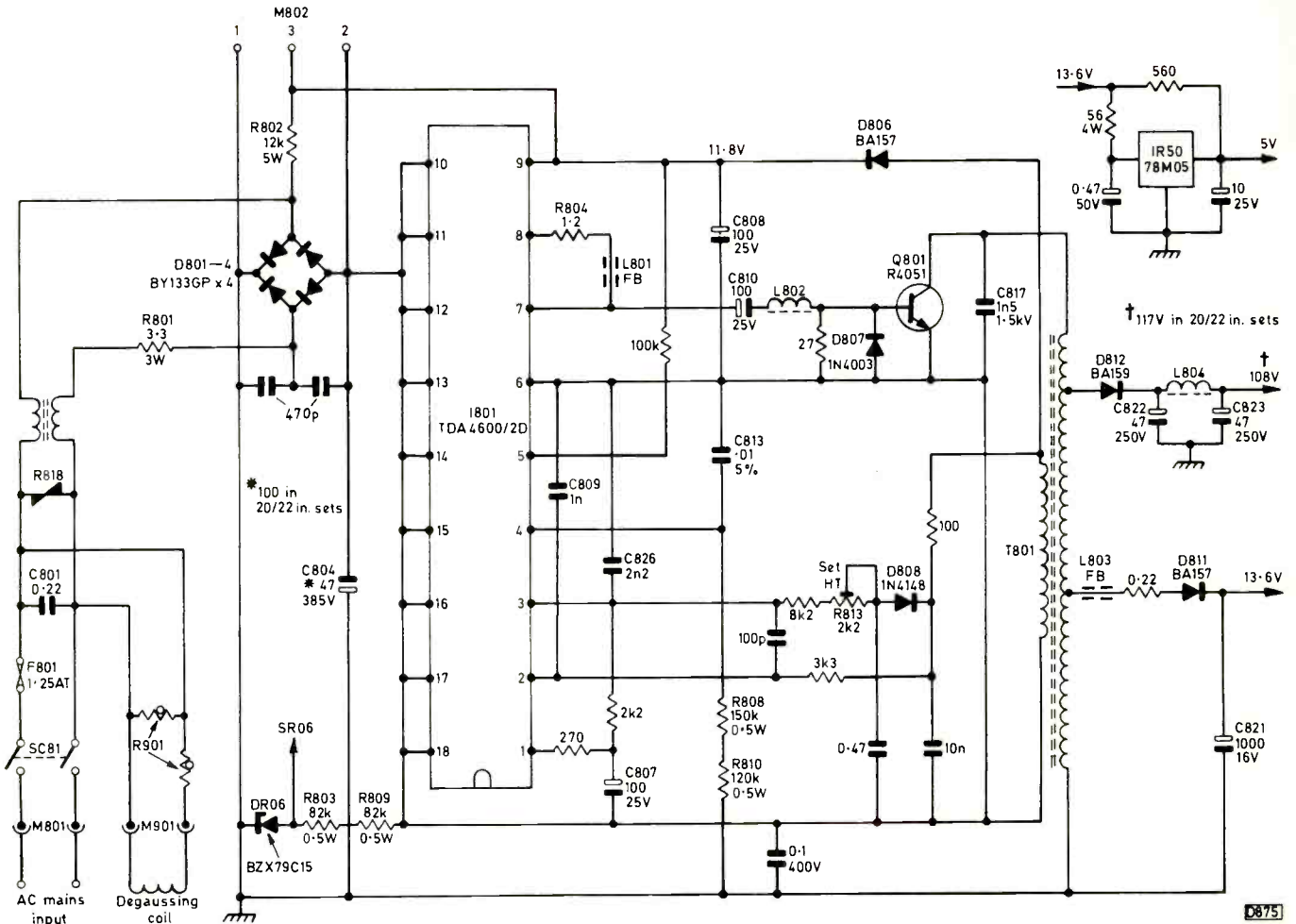


Fig. 2: The switch-mode power supply circuit used in the 160/165 series chassis. DR06, R803 and R809 are omitted in the 160 chassis sets. I801 pin functions are as follows: 1 4V reference output; 2 waveform crossover point sensing; 3 feedback voltage input; 4 chopper transistor collector current simulation; 5 undervoltage sensing; 6 0V; 7 Q801 switch off; 8 Q801 switch on; 9 11.8V supply; 10-18 0V.

break off very easily, necessitating replacement of the potentiometer and knob, which is usually lost. With these sets the station-selector buttons tend to become noisy and intermittent. If the tuner buttons are all pushed in simultaneously (this usually occurs when the set is being carried) they can be released by pushing the flat-blade end of the tuning tool or a small screwdriver into the little hole at the right of the switch-bank and rotating it. This trips the latching bar, releasing the buttons.

In later, large-screen models the front cabinet feet often break off, leaving the set dangerously unstable if it's not stand-mounted. Front flaps and doors tend to be shed easily due to the flimsy plastic fixings. Replacements come without labels and badges. Order these separately if you can't transfer the old one(s). The front glass retaining strip on early monitor-style sets can become statically charged: a resistive earthing lead, part number 05-3312-2, was added during production and can be fitted in older sets if necessary.

When refitting the 165 chassis ensure that the lens on the IR receiver doesn't foul the cabinet - if force is used, something will be broken! The IR filter can be removed by releasing the clips inside the cabinet to enable the lens to be "steered" through the cabinet front. Refit the filter after doing this. Leaving the filter out reduces the sensitivity in remote-controlled sets. Some early 170/180 chassis panels tended to slide backwards in use to the point where the mains on/off switch wouldn't latch: this was due to inaccuracy in drilling the securing-clip fixing hole at the rear.

In the 160/165 chassis there's a tendency for dry-joints to develop on all the electrical components heatsinked on the

rear metal wall: this is a rife source of trouble in the power supply and timebase departments. The 170/180 chassis don't suffer in this way but bad joints between mother and daughter boards are very common, giving rise to all sorts of intermittent symptoms. The most common sufferers are the text board and the panel that carries the scart connector. To ensure good contact it's necessary to clean inside the sockets of the connectors. In chassis where the customer controls are on a front daughter board user pressure generally leads to dry-joints with the mother board. The main panel becomes very discoloured at half a dozen different points beneath hot-running components in the 170/180 chassis. No carbonisation has set in so far but we've had to replace at least two 180 panels with holes burnt in them due to arcing at a dry-jointed capacitor, C433, alongside the line output transformer. It's worth checking the connections to this capacitor on every 180 chassis you come across.

When servicing Tatung sets it's a good idea to have a spare mains lead complete with flying-socket PCB termination. This saves straining or breaking the cable retaining strap in the cabinet and ensures that you don't forget to replace it after carrying out the repair.

The Chopper Circuit

These models all have a switch-mode power supply fed from a full-wave mains rectifier. The 160/165 chassis use a TDA4600/2D chopper control chip with an R4051 chopper transistor and non-isolating transformer. The circuit is shown in Fig. 2. A basically similar arrangement is used in the

170/180 chassis, but the chip is type TDA4601, the transistor is type S2000AF and the transformer provides mains isolation.

The failings and foibles of power supplies that use the TDA4600 family of control chips have been covered in previous articles in these pages. J. LeJeune's article in the November 1991 issue is particularly well worthwhile reading.

For blowing the chopper transistor, failure to start or shut-down after a few minutes' operation, check the ramp generator resistors R808 and R810 (R813/814) – component reference numbers in brackets apply to the 170/180 chassis. A shorted chopper transistor generally takes the control chip with it. In this event the following items should also be replaced: C810 (C807), D807/8 (D806/7) and R804 (R805). Get the replacement from Tatung when you have to replace the chopper transistor Q801 in the 170/180 chassis: beefy and reliable transistors of Toshiba manufacture are supplied. This also applies with the line output transistor Q403.

A shattered mains input fuse F801 doesn't necessarily mean a disaster story in the chopper department – it's very common for the degaussing resistor R901 to go short-circuit. Replace it with the correct type obtained from Tatung. The mains filter capacitor C801 rarely fails. Some very early production sets were fitted with a fast 1A or 1AT mains fuse: replace it with a 1.25AT type and fit a label (part no. 83-2536-7) to show the new rating. Another cause of a blown mains fuse, with possibly damage to Q801 and its friends, is C817 (C813). This capacitor, which is in parallel with the chopper transistor, sometimes has a bulge in its plastic shell.

If the set is quiet and dead with the mains fuse intact the mains switch SC81 (SC801) may well be open-circuit internally. The surge limiter resistor R801 (R802) can do the same thing – sometimes there's a visible crack in its body. In this case check the rectifier diodes D801-4 as well. It's an odd fact that when lightning gets into the set, presumably via the mains lead, the chopper control chip I801 can be destroyed without any damage to other components.

You may come across a set that will come on after a remote-control command but not from the action of the mains on-off switch. Check the auxiliary (momentary) contact in the mains switch then, in the 165 chassis, R803 and R809. A disconcerting hiss during standby operation with the 165 chassis can be cured by replacing C826 with a series combination consisting of an 0.1 μ F capacitor and a 330 Ω resistor.

Incorrect power supply output voltage is not unknown! If the voltage is low the symptom may be no worse than foldover at the top of the picture. Check whether the track of the control potentiometer R813 (R808) has fallen in value, then check the resistors that lead back to pin 3 of I801. High output voltage, with the line output stage throbbing and bristling, can be the result of D808 (D807) going short-circuit or low-resistance.

Failure of the mains rectifier's reservoir capacitor C804 (C805) will put a raucous 100Hz ripple on the h.t. line, with the picture torn in three and a rasping buzz from the speaker.

The power supply is amenable to checks with a light-bulb load and being supplied via a variac.

The metal plate on the 170/180 chassis chopper transformer sometimes buzzes or squawks in operation. Reclamping it generally provides a cure. Another odd fault with early-production 170 chassis sets is interference to VCR-derived pictures from the power supply. It shows as bright white dots that move across the screen. The cure is to fit a mains filter, part no. 15-7636-2, in location Z801 on the main PCB after removing links J851 and J853.

Finally a fault whose cause may seem to be in the power supply but isn't! Sets fitted with the 160/165 chassis will go dead if the 12V supply fails due to breakdown of the little

stabiliser. Check Q501, D503, R507 and R508. The job is done by a three-legged chip, I802, in the 170-180 chassis. It also implements the standby function. Before condemning this item check for dry-joints at its legs and that the standby switch circuit consisting of Q802 etc. is in order.

Timebase Generator Section

The sync separator and timebase generators in these sets are very reliable. In early versions of the 160 chassis the value of R114 should be changed to 2.7k Ω to reduce flutter at the top of the picture, and for improved VCR operation R117 should be changed to 1.2k Ω and C111 to 0.22 μ F. The value of R106 can be increased to 150k Ω or 180k Ω to improve picture stability in the VCR search modes and, surprisingly, to reduce sound buzz with some VCR/TV combinations. Early 160 chassis that suffer from instability in the VCR trick modes benefit from the value of the tuner a.g.c. decoupling capacitor C004 being increased to 22 μ F.

In the 170/180 chassis I401 (TDA2759) can fail due to c.r.t. flashover. This generally removes the line drive.

Apart from the feed resistor R401 going open-circuit the line driver stage has never given us any problems. As with all sets however there are several things to talk about in the line output stage.

The Line Output Stage

Very common indeed is a short-circuit efficiency diode. It's D401, type BY133GP. Replace it with the more reliable BY228 or BY299. The line output transformer T402 can fail in either of two ways. It can develop internal shorted turns/leakage, putting a heavy load on the power supply which shuts down with a low purr or squeal. Alternatively, typically in the large-screen 180 chassis, it can fail spectacularly, with vivid blue sparks flying from its casing to the adjacent chassis bar. In the latter case check the tuning capacitor C405 (C421) for dry-joints or internal failure: dry-joints on this capacitor will sometimes make themselves known before any other failure occurs. Other dry-joint favourites in the 170/180 chassis are at D401 and C423, the symptom with the latter being a vertical white line down the centre of the screen. Dry-joints at C433 in the 180 chassis can cause severe burning of the PCB. Also confined to the 180 chassis is failure of D405, affecting picture width and EW pincushion correction. Apart from the line output transistor Q403 dry-joints are not so prevalent in the 160/165 chassis.

The thick-film focus and first anode potentiometers are mounted on a plastic moulding that's fixed to the back of the diode-split line output transformer. The first anode section sometimes fails, the result being fluctuating brightness. The potentiometer assembly is not available separately from Tatung. We have however successfully transplanted the controls from transformers that have failed in other ways, so don't throw away dead LOPTs! Because of the different chassis and tube type variations several different types of line output transformer are used: make sure that you order and fit the correct type for the set being repaired.

Occasionally one or other scan collapses intermittently to a line. In this event check for dry-joints at the soldered connections to the deflection coils.

Field Scanning

The field generator and output stages are in different chips. In the 160/165 chassis the drive is generated by the TDA4503 chip and then applied to the TDA3651 output chip which is on the rear panel. The 170/180 chassis have a

TDA2579 sync/timebase generator chip, the field output chip being a TDA3651 in the 170 chassis and a TDA3654 in the 180 chassis. In general the field timebase reliability is good. Bear in mind that most cases of field collapse result in the black-screen symptom, a protective measure to prevent tube damage – the action depends on the sandcastle pulse feed to the colour decoder chip. Turn up the first anode control to confirm that there's no field scan.

The most common cause of field collapse in the 160/165 chassis is dry-joints at the pins of the TDA3651 output chip I301. This can sometimes destroy the chip and take out the power supply surge limiter resistor R411. The value of this resistor varies in different models: replace like with like and for BEAB's sake get it from Tatung.

Also confined to the 160/165 chassis is a fault that results in picture roll as the set warms up. The three resistors R301/2/3 in the field hold network are usually responsible. Replace them all.

The field timebase is more reliable in the 170/180 chassis because the output chip's mounting position avoids dry-joints. All we've had with these sets is the odd failure of the output chip I301 and, apparently for internal reasons, of the fusible safety resistor R433, again resulting in picture tube cut-off.

Receiver Section

The tuner and i.f. sections of the 160/165 and 170/180 chassis are quite different, but neither of them give much trouble. For tuning drift or zero tuning voltage (stuck on ch. 21) check the 33V stabiliser I001 (I002) then if necessary its feed resistors R007/011 (R005/6). Failure of I001 in the 170/180 chassis can also stop the TDA/SAB3035 CITAC chip working. Replace the TAA550 stabiliser in the 160/165 chassis with the more reliable ZTK33B type.

The tuner itself is occasionally responsible for tuning drift or low gain. Ensure that the replacement is of the correct type: you may stock or buy types that look similar and will fit but give low gain or no results due to incompatibility. We seem to have more trouble with water coming down our customers' aerial leads. This can write off the "direct entry" tuners used in the 170/180 chassis or the rear-mounted isolator socket used in the 160/165 chassis.

We've had one or two failures of the a.g.c. decoupling capacitor C105 in the 170/180 chassis. This upsets tuner gain. Otherwise the i.f. department is very well behaved.

Video and RGB Departments

The 160/165 chassis, unsullied by text or auto grey-scale correction, has a very simple video section consisting of a TDA3565 chip and its peripheral components. These items give virtually no trouble. Failure of R518 in the line blanking circuit can give rise to strange colour and brightness effects by upsetting the sandcastle pulses. The TDA3562A chip used in the 170/180 chassis is not as reliable as the TDA3565: it can fail, typical symptoms being a blank white raster or no colour. Check the sandcastle pulse at pin 7 however before replacing it. If the picture brightness "pumps", check R523 at pin 18.

Low contrast faults can occur in all chassis, generally due to a defect in the beam-limiting department. Check zener diode D501, diode D502 and bleed resistor R408 in the 160/165 chassis. Their equivalents in the 170/180 chassis are D503 and R430. To replace the latter you have to remove the line output transformer! A very bright raster with flyback lines indicates that the supply to the RGB output stages has failed: check R201 and, in the 160/165 chassis, R410 which

is just behind the line output transformer.

R201 brings us to the tube base panel and a very common source of trouble with these sets, the multiway connector which links it to the main panel. If you get spasmodic fluctuations of either the brightness or individual colours check the contacts to the wire conductors, at both ends if necessary. In the later chassis types (mainly the 170/180 series) the set-background potentiometers sometimes become noisy: all that's required is a squirt of switch cleaner and movement to and fro.

In all except the 180 chassis the RGB output transistors' collector loads consist of three 47k Ω , 0.5W resistors connected in parallel. If one of these resistors goes open-circuit or changes value correct grey-scale cannot be achieved and suspicion may well fall on the tube... Check each resistor in the afflicted stage out-of-circuit. The little BF422 transistors never seem to fail, and apart from a couple of cases of flashover at the focus spark gap we've had no other problems on the tube base panel.

Tubes

The tubes fitted in Tatung TV sets are generally reliable and perform well: all we have to report here are a couple of cases of internal flashover/arcing in 14in. Toshiba tubes and a tendency, shared by many other makes and models, to "hot bulge" in the large, wide-angle tubes used in 180 chassis sets. The effect of this is local impurity in bright picture highlights, typically text displays. The cure is in the hands of the user: turn down the contrast or select another picture!

If you replace a picture tube minor modifications to the circuitry may be required to accommodate differences in tube base and scan yoke characteristics.

Teletext

Apart from occasional chip failure, which is not difficult to diagnose, the only problem we've encountered in the text section has been drop-out of one or other of the primary colours from the display. The cause has been poor contact between the text panel and the main board.

It's possible to convert a CCU text system to Fastext by replacing the text board, swapping IR01 (MAB8441P) over with one that has a 123 suffix, removing link JR03, adding link JR01 and fitting a new fascia panel to the remote control handset – but this is not recommended as a routine service job!

Audio Section

The sound quality is not good in the small-screen sets with very small loudspeakers, but this is common with little TV receivers. Some of our hard-of-hearing customers have dislocated the cones of these small speakers by running them at high volume continuously – the result is severe rattling and distortion.

Early production 160 chassis sets suffered from noisy and fierce volume control operation. This was cured by adding a 10 μ F capacitor across the track (negative side to chassis), changing R606 to 5.6k Ω and R607 to 560 Ω . An occasionally encountered fault is weak or non-existent sound with a vision buzz: check ceramic filter Z601, type SFE6.0. The audio output chip in mono-sound sets gives little trouble: to date we've had to replace only one.

The stereo-sound models in the 170/180 range have a separate a.f. PCB in the top right-hand corner of the cabinet, viewed from the rear. There are two versions, 5 + 5W and 15 + 15W, the latter working at full power only when external

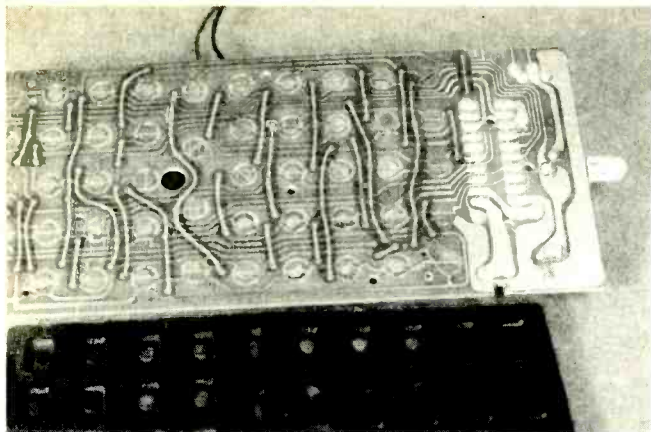


Fig. 3: Inside the remote-control handset. The PCB with IR emitter and the troublesome membrane.

4Ω speakers are connected. We've had several failures of the TDA1521A and TDA2030 audio power output chips, with various symptoms – crackles, distortion and internal short-circuits. For distortion in or loss of one channel without any sign of an electrical overload check the TDA1524A stereo preamplifier chip IA03 first: it's easy to do with an oscilloscope.

Remote Control

The remote-control handset is the Achilles' heel of these sets! The contact membranes wear rapidly or become polluted: we order ten or twenty of them at a time. The ceramic resonator (XT01) breaks away from the PCB, usually at one leg: after repair we glue it down on to the board. The solder pads break or become dry-jointed at the i.c. or at the transmitter LED. When it's roughly handled the PCB cracks and is better replaced than repaired. Finally the battery contacts are fragile and become latched. Again it's wiser to replace them than carry out repair or retensioning.

Loss of on-screen graphics is usually due to "pilot error", with the user having inadvertently cancelled them via the remote-control handset.

Control Systems

The IR receiving photodiode sometimes becomes noisy, the result being insensitivity or complete lack of remote control. Ensure that the IR handset is working before suspecting this however, and don't forget to refit the optical filter as absence of this makes the system insensitive.

Occasional loss of the channel 1 memory data in the 165 chassis can be caused by a mains-borne transient that coincides with switch on. The cure is to fit a 10μF, 35V electrolytic capacitor across RR34 (base of QR06), negative side to chassis. Intermittent failure to come out of the standby mode with early 165 chassis sets can be cured by changing RR60 (IR01, pin 26) to 3.3kΩ.

The microcomputer chip used in the system employed by 170/180 chassis sets can fail, giving rise to faults on the I2C bus. A quite common fault is failure of the 4MHz crystal X001: the symptoms are inability to tune in stations and the display digits incrementing at about five-second intervals. Breakdown of the PCD8572 memory chip gives rise to various troubles, the most common being failure to store channel tuning data.

If you have to replace the MAB8441 microcomputer chip IR01 make sure that you fit one with the correct suffix: several types of internal software (indicated by the suffix) are in

use to give various feature options, and the MAB8441 chips you have in stock may well be for different TV makes altogether!

In Conclusion

The long list of faults given above shouldn't be taken as indicating that these sets are less reliable than those from other manufacturers. It arises because we deal with these sets in large numbers. With the exception of the remote-control handset these receivers are as good as most other designs. Spares are easy to obtain from Tatung and their prices are reasonable.

Finally I'd like to acknowledge the help of my colleagues Ted Callow and Dion Watson in the preparation of this article.

PHOTOSTATS SERVICE

Newer readers may have missed important servicing features that have appeared in *Television* over the past few years. We have therefore in operation a photostat service to make this information readily available. Photostats of the following servicing features, listed in alphabetical order, can be supplied at the prices shown. Please send requests to: Television Editorial Department, Room L323, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Cheques/POs should be made payable to Reed Business Publishing Ltd. There are two standard prices, see below.

Feature	Price
B and O L/LX2500/2800 chassis	A
Decca 80/100 chassis	A
Decca 120/130 chassis	A
Ferguson FV31R VCR	A
Ferguson TX10 chassis	A
Ferguson TX100 chassis	A
Finlux 1000 series chassis	A
Fisher FVH-P520 VCR	A
Mitsubishi CT2227	A
Mitsubishi Euro-4 chassis	A
Mitsubishi HS304 VCR	A
Panasonic D1 VCR deck	A
Panasonic G VCR deck	B
Panasonic NV333/366 VCRs	A
Panasonic NV370/830/850 VCRs	A
Panasonic NV730 VCR	A
Panasonic NV777/780 VCRs	A
Panasonic NV2000/2010/3000 VCRs	A
Panasonic U3 chassis	A
Panasonic U4 chassis	A
Panasonic U5 chassis	A
Salora F chassis	A
Salora G and H chassis	B
Salora J chassis	A
Salora K and L chassis	B
Sanyo CTP7130/1/2	A
Sony KV2252/2256/2752/2762	B

Prices, A = £2.50, B = £3.50
Please allow 28 days for delivery.

Teletopics

BBC SELECT

The launch of BBC Select is taking the BBC into subscription TV. BBC Select is a commercial company whose main role is to sell airtime to programme makers wishing to use the service, which operates during the night-time hours, between 2 a.m. and 6 a.m., when BBC-1 and BBC-2 are normally off the air. The service will be aimed at specialist audiences, particularly in the professional and business spheres. As we write this at the end of May some initial programmes, for example a nursing news service, are being transmitted in the clear and tests are being carried out for scrambled transmissions which are expected to start in late June or early July. The service will be built up gradually.

Over £10 million has been invested by the BBC in BBC Select, which is now selling the service to production companies, investors and other interested parties. Programme makers will earn revenue via a variety of methods including subscription, sponsorship and advertising. A decoder, called a Selector, will be required for the reception of scrambled programmes. The scrambling system is VideoCrypt S, which is a version of the VideoCrypt T system used by BSkyB.

The Selector is a small box that's connected to a VCR. It uses a smart card system: in addition to unscrambling the VideoCrypt signal it automatically switches the VCR on and sets it to record. The Selector is compatible with VCRs that have an IR receiving window. Users simply have to remember to insert a blank tape and leave the VCR on in the standby mode. Selectors will be sold direct by the BBC's Subscriber Management Centre in Bristol, the price being £275 which includes VAT and installation. Initial enquiries should be sent to BBC Select, Woodlands, 80 Wood Lane, London W12 0TT (081 576 2000). Rental or leasing are a possibility being considered.

The Subscriber Management Centre is to be run by SSL, a subsidiary of the Post Office. It will collect subscriptions, handle customer enquiries and manage the smart cards.

BBC Select services will include Executive Business Club (management training), Business Education Club (for business studies students), Accountancy Television Service (training and news), Legal Network Television (training and updating), Farming Now (weather, news and information), Computer Look, a medical programme for hospital staff and GPs and various language teaching services. Clear programmes include Nursing Update and The Way Ahead, a series from the DSS made by Thames TV. Advertising and sponsorship will be allowed only with scrambled services. Sport, film and music services may be added at a later date.

BROADCASTING NEWS

The ITC has awarded the licence for the Channel 3 (ITV) public teletext service to Teletext UK Ltd. BBC engineers are leading an international project that will develop optical routing systems for studio centres. The EC sponsored project is part of the RACE (it stands for R and D in Advanced Communications technologies in Europe) programme that is expected to lead to a Europe-wide wideband digital optical-fibre communications network using WDM (wavelength and time division multiplexing).

Videodat, a new data broadcasting service that transmits digital data to users via satellite, is now available in the UK. Following a test launch at the Cable and Satellite 92 exhibi-

tion, Cambridge Computer has been appointed exclusive UK distributor of the decoders and software required to receive the German-developed service. Over 25,000 decoders have already been sold in Germany, where the service was introduced fifteen months ago. It's said to be cheaper than the use of dial-up modem line systems while providing higher standards of graphics presentation than teletext, viewdata etc. Cambridge will be selling the new decoder and related software for £120 plus VAT. The service transmits text or graphics data during the field flyback blanking part of a video signal. You fit the decoder between a satellite receiver's video output and a PC.

The EC has formally adopted a directive requiring all HDTV transmissions to use the HD-MAC standard. All other widescreen broadcasts must use the D2-MAC standard. At the NAB Technology Exhibition in Las Vegas last April Vision 1250, a consortium whose object is to promote the HD-MAC system, showed a 1,250/1,050-line converter developed by Thomson. A system for 35mm film to 1,250-line HDTV conversion and vice versa was also on show. The BBC is to screen an HD-MAC OB of a Welsh National Opera production later this year, also to selected audiences HD-MAC pictures from this year's Wimbledon.

According to the *Financial Times* Satellite Monitor some 71,000 dish installations were carried out in April, a decline compared with March and with April 1991. A Euromonitor report suggests that by 1996 satellite TV will account for twenty per cent of all UK viewing. This compares with five per cent at present.

SPARES NEWS

The Amstrad spares operation at Newcastle Under Lyme (see last month's spares guide) has been closed. Spares are now available from Amstrad Spares and Service, Fleet House, River Way, Harlow, Essex CM20 2EE. The spares ordering line is 0277 209 508, the spares enquiry line 0277 209 509. Fax no. is 0277 209 559.

SEME has been appointed official supplier of Pioneer spares to dealers and service engineers who are not authorised Pioneer distributors.

Wizard Distributors has been awarded BS5750 Quality Assurance Certification. It's understood that Wizard is the first company in the component distribution field to be given this certification, which is now required by many local authority and educational customers.

LAUNCHES

Matsushita is to launch the Panasonic RSDC10 digital compact cassette player in Japan on September 21st. Features will include a twelve-letter LC display that shows playing time, tape title, artist's name and track number and title, Dolby B and C for analogue cassettes and optical digital input and output sockets. Production will initially be 1,000 units a month and the price around £575. No UK launch details have been released. The Technics brand name is expected to be used in Europe for the players while Panasonic will be used for the tapes. Philips and Polygram have announced that the prices of prerecorded DCC tapes will be similar to those of current compact discs. BASF expects to sell blank DCC90 cassettes at about £5 when they become available in September. BASF's DCC-Maxima range will employ chromium-dioxide tape and provide playing times of 60, 75 and 90 minutes. Cassettes with 105- and 120-minute playing times are expected to be introduced early next year.

Sony plans to launch its Mini Disc system in Japan by November 1st, with launches in the main overseas markets

by Christmas. Record/playback machines are expected to sell for around £340 with playback only models selling for some £255. The 64mm discs have a playing time of 74 minutes. Sony's ATRAC (Adaptive Transform Acoustic Coding) signal compression system uses only about a fifth of the data required by the CD and DAT formats.

TECHNOLOGY

Matsushita has demonstrated a 26in. (diagonal) flat-panel display that uses plasma technology. The company considers that about 15in. diagonal is the limit for thin-film transistor

LC displays. Mass production of the 26in. plasma displays could start within two years, offering HDTV quality. Within the last two years Matsushita has succeeded in increasing the brightness produced by its plasma displays from 30 to 100 candelas/sq.m. About 64 high-voltage driver chips are required, which is a disadvantage compared with LC displays that can be driven by low-voltage driver chips.

Texas Instruments has developed a new type of solid-state image sensor for consumer electronic products. Instead of using charge coupling to provide the scanning action the new sensor is a bulk charge modulated device (BCMD), employing an active CMOS array that works like a memory.

Letters

CHANNEL 5 PROBLEMS

Bill Wright's letter (May) is the most sensible thing I've read on the subject of Channel 5. I wholly agree that it will be clumsy and unfair to meddle with channels 35-38 which were long ago set aside for home entertainment use by items such as VCRs, camcorders, computer games, satellite TV receivers and other equipment that uses an r.f. modulator. Not only will VCRs need to be retuned to avoid the local Channel 5 frequency, other r.f. modulators will also require off-setting, especially those used with VHS-C camcorders when playing back tape from the camera to a TV set. Another problem is posed by the "non-licensable in the UK" video-sender: will these illegal (to use but not to buy!) transmitters be officially adjusted as well?

The ITC has allocated channel 37 to Croydon for Channel 5 reception in the London area. Reception of the existing four channels in North London is patchy. That's why a 70W relay station was installed at Alexandra Palace, to provide a fill-in service for adjacent areas like Wood Green. Unusually, this relay service uses horizontal polarisation. More recently the erection of new high-rise buildings in various parts of North London has caused problems with reception of all four channels transmitted from Crystal Palace. Reception of a Channel 5 u.h.f. signal transmitted from even farther away (Croydon) and at a higher frequency will present even greater difficulty.

Our local newspapers here have for some weeks reported reception problems in the Enfield/Lea Valley areas caused by reflection of Crystal Palace signals from the new steel-cladded, 800ft Canary Wharf tower, the result being severe ghosting. Poplar, which was also affected, was given four alternative frequencies from a local fill-in, but some 100,000 viewers in Enfield and the Lea Valley, who still have to pay the full licence fee, have been told that they cannot be helped because no frequencies are available there. A cable company operates in the area, but not everyone can afford the extra expense.

In the main the ITC has allocated channels 35 and 37 for Channel 5 use. Channel 34, only one channel space away at one end, is already used in several areas by low-power relays and for BBC-2 from the high-power (500kW) Caldbeck station in Scotland. At the other end of the slot channel 39 is used by about a hundred transmitters. These are mostly low-powered ones but there are a few high-power, horizontally polarised transmissions including those from Hannington (Southern region) at 250kW and Rosemarkie (Scotland) at 100kW. I regularly receive BBC-1 Chatton (100kW) sound and vision using a loft-mounted aerial. Thus existing high-power transmitters could interfere with new low-power adjacent channel transmissions and existing low-power relays

could suffer interference from new low-power adjacent channel stations. To expect a revised channel 34-39 spectrum to be able to accommodate so many signals satisfactorily seems to be asking rather a lot.

Wouldn't it be better to transmit Channel 5 using frequencies away from the existing u.h.f. channels, with either up or down conversion to channels 35-38 at the viewer's end? An active aerial with a built-in converter could be used, either weatherproofed outdoors or, where the signal strength is high, as a set-top unit. The present ITC proposals require the use of a new aerial and possibly a booster, so a system using up or down conversion should involve little extra expense. Before anyone says that there are no spare channels outside 35-38, why not consider reclaiming part of Band III for TV use? With today's digital technology it should be possible to accommodate colour information and stereo sound at v.h.f. and the service area would be greater. Incidentally if the proposed Channel 5 eventually includes a teletext service would the average installation correctly display all the information transmitted?

*Ivor Nathan,
Southgate, N. London.*

I was impressed with Bill Wright's arguments (letters, May) for not transmitting on channels 35-38 the proposed Channel 5 service. With the termination of the BSkyB transmissions via the Marco Polo satellite at the end of the year, couldn't the ITC allow a fifth channel plus the present four terrestrial ones to be transmitted via this satellite? This would solve all the interference problems mentioned by Bill Wright. In addition the BBC and the Channel 3 franchisees would have a proven, copyright secure system to expand into widescreen and HDTV, while use of one of the excellent MAC systems would give a boost to the UK's TV industry. BBC-2 and Channel 4 could be phased out from the terrestrial transmitters over a time scale of say two-three years, leaving space for local/regional TV. I feel that local TV is something the public would like but has been neglected.

I rather like the phrase "sub PAL" which fits the standard of BSkyB transmissions from the Astra satellite very nicely. It seems odd that France, Germany, Norway and Sweden can afford D2-MAC satellite TV transmissions while the UK can't go forward in this way. So I ask the ITC to think carefully before losing the use of this system: let's resurrect Marco Polo.

*Brian Webb,
Havant, Hants.*

I can appreciate Bill Wright (Letters, May) regretting the change that Channel 5 will bring to the outstandingly well engineered four-channel u.h.f. system. But I do think that he overlooks what will be a transformation in the aerial industry, not just for manufacturers but for installers as well. At present the market is dominated by the "one small aerial" that

requires very little skill to install. Channel 5 will call for all those unique skills that Mr. Wright and other quality installers possess. A typical installation will require the measurement of the current four channel and the new fifth channel signal levels then selecting the right combination of aerials and combiner. At the same time the customer may need help with retuning of his/her VCR and satellite TV system.

It's up to the franchisee of course to provide the really attractive programmes that the consumer will see as value for money. The one-off cost of the new aerial installation and the VCR retune will be followed by twenty plus years of free viewing since the fifth channel will be advertisement funded.
*Alan Pedersen, Sales and Marketing Director,
Antiference Ltd., TV Division,
Aylesbury, Bucks.*

UNECONOMIC JOBS

Over recent months a number of jobs have proved to be more than a little troublesome, i.e. taking longer to repair than the item's current value. Here are a couple of examples.

The first was a Bush 2114 colour portable. It arrived with a report which said that there was slight picture jitter and some interference after a few minutes' viewing. Several hours were spent trying to trace the cause of the trouble – a dry-joint was suspected. To cut a long story short, the cause turned out to be the line output transformer: a pinhole in the plastic casing provided a shorting path to chassis via the mounting bracket. A new transformer cured the fault but cost the customer some £55!

A more recent job concerned an electronic clock-radio which required a new mains transformer with one 12V and two 5V tapplings, each rated at 0.5A. Including labour the repair would have cost £12. So the customer decided not to bother. But this was after I'd spent over half an hour on a job that didn't warrant a charge.

Isn't it strange how one profitable job is usually followed by two that aren't?!

*M.J. Austin,
Yelverton, Devon.*

COLOUR CHIP VARIATIONS

In his May column Donald Bullock mentioned a problem with the Telefunken and Philips versions of the TDA3562A colour decoder chip. I'd like to draw attention to a similar problem with the TDA3561A colour decoder chip. Our difficulties started when we had a Philips K35 set with teletext in for repair. The fault was no luminance, and we concluded that the colour decoder chip was responsible. The set uses a TDA3560 chip, but we'd none in stock. We did have a couple of TDA3561As and had fitted these in the past with no problems (some data books list this i.c. as a suitable equivalent). After fitting one the luminance fault had been cured but when the remote text button was pressed there was a blank screen. Selecting the text mixed mode (picture with teletext superimposed) gave us a picture with teletext luminance only (or monochrome teletext), i.e. no RGB signals. When we fitted the other TDA3561A chip we had beautiful text and pictures – but didn't know how lucky we were!

A few weeks later a K30 came in with the same no-luminance fault. We again fitted a TDA3561A chip, having restocked, and guess what? Perfect luminance but exactly the same teletext fault. To cut a long story short we didn't at the time know that there are two versions of this chip, one of Philips and the other of Telefunken (TFK) origin, and that they are not always interchangeable in teletext sets. I never

did get the chance to find out the technical differences between the two chips. Does anyone know?

And why has this anomaly only recently come to light? We now fit the Philips version in Philips equipment and the Telefunken chip elsewhere. This policy has worked – so far!

In the same article Donald mentioned having to replace a TDA4600/4601 chopper control chip in a Bush 2020T receiver. When a TDA4600/4601 chip fails you should always replace the high-value resistors connected to pins 4 and 5, also the surge limiter resistor, before switching on – not the other way round as described. These resistors often go open-circuit intermittently.

*Graham Richards,
Rochdale, Lancs.*

TELEPHONE TEST SET

There was an error in the presentation of my telephone test set article in the May issue. In Fig. 2 (page 503) relay RLA was shown switched to the negative supply in its rest position: this would result in no switching action with S2 closed.

Here are a couple of modifications that may be helpful to others. I used a sluggish relay in a unit I recently built for another engineer and found that its action could be improved by adding a 1N4148 diode between R3 and S2, with its cathode to S2. The switching point was improved by using a 7815 regulator in the IC1 position.

*Ian Rees,
King's Lynn.*

MARCO POLO RECEPTION

Having read Colin McCormick's letter (April) I too purchased a brand new BSB receiver, aerial and remote control unit, for just £40. I already have an Amstrad SRD400 that gives excellent results with Astra but couldn't resist the opportunity to gain hands-on experience with a BSB unit despite the fact that transmissions will cease in December.

My upstairs workshop faces almost south. After connecting the units and adjusting the TV set to receive the built-in test signal I pointed the aerial at the window and brought it slowly around to a south-westerly direction. The signal-strength bargraph displayed on the screen enabled me to optimise the direction for maximum signal strength with nil noise – this with the aerial peering through double-glazing. I asked the BSB people to authorise the receiver but unfortunately its number couldn't be authenticated. A return visit to the supplier produced an exchange unit and this time on completion of my telephone call to BSB I was able to receive a first-class picture and sound.

I'm delighted at being able to receive the signals without having to mount the Squarial outdoors: it's a beautifully manufactured unit – too good to bolt to a wall and expose to the elements. Its bracket is now clamped to my workbench, adjacent to the window, and it's providing superb sound and vision.

*Harry Hughes,
Rhondda, Mid-Glamorgan.*

THORN 1590 POWER SUPPLY

I feel that J. LeJeune's suggested power supply modification for the Thorn 1590 series chassis (May issue) is unnecessarily complicated while as a routine repair it would be uneconomic. For some years I've been using a TIP42C as a replacement for VT21 and have never had one burn out. It takes five minutes to fit. Where there's been a burn up in the original circuit an LM7812 regulator chip can be used, see

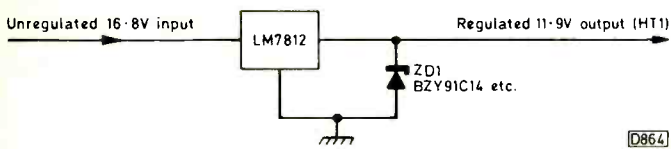


Fig. 1: Use of a regulator chip in the 1590 chassis.

Fig. 1, and is very effective. I include zener diode ZD1 across the output as a crowbar in case the regulator chip should go short-circuit. This will prevent damage to the set such as the c.r.t.'s heater burning out.

L. Mackenzie, T.Eng., Stellar TV and Video, Edinburgh.

PANASONIC G DECK

I would like to comment on M.P. Prakash R. Lewis's short article on the Panasonic G deck in the December 1991 issue. My earlier article on the G mechanism didn't include extensive reference to the power supply in VCRs that use the G mechanism simply because we've had few failures - in our experience Panasonic switch-mode power supplies are amongst the most reliable we've come across. From the model numbers he quotes I assume that Mr. Prakash R. Lewis is an overseas reader. This could explain our different experiences. Where the mains supply is lower than in the UK the power supply will have to work harder, which could increase its likelihood to failure.

One other small point that may be correct for these non-UK models but isn't for some early UK ones is that there are more than the two brass screws to secure the cage over the cassette carrier: the points made in my article regarding the

correct screws in these other positions is most important (specifically Models NVG21/5).

Incidentally I wonder whether Donald Bullock tried replacing the loading belt in the 3V35 with intermittent timer operation? This symptom is common to most VCRs: the belt becomes slack but the fault shows up initially only with timer operation when the machine has been dormant for some time and/or is in a cold room, e.g. at night.

Nick Beer,
Bideford, N. Devon.

PATTERN PARTS

I read with interest Nick Beer's letter (April) on the pros and cons of VCR mechanical pattern parts. As an "authorised nationwide distributor of spares for Ferguson, Hitachi and Philips and the "sole non-account distributor" for Sanyo, we have a policy of supplying genuine parts wherever possible. On the rare occasion when an alternative part has to be offered for these four major manufacturers we state that the part is an alternative and do not show the manufacturer's part number on it. For example replacement type video head part numbers are prefixed with either VH or VID and the abbreviation ALT is included alongside the description to indicate that an alternative part is being offered. Should we experience a quality problem with a pattern part that product is quickly withdrawn. Those items that have a manufacturer's part number alongside the CHS part code are specifically of that manufacturer's origin, supplied by the manufacturer concerned.

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3V29/HR7200	PU 51402: PLAY
3V35/HRD110	PU 55374: REEL
FV11/HRD170	PU 58645: PLAY
8902/HR3660	PU 49282: REWIND

FISHER	PT. NO.
725/840	1430420400400: FF/REW
975	1430420400700: FF/REW

HITACHI	PT. NO.
VT11/17	6886971: FF/REW
VT5000	6413144: REWIND
VT8000	6414221: PLAY
VT9300	6861471: FF/REW
VT9300	6861482: PLAY

MITSUBISHI	PT. NO.
HS318	TIRE

NEC	PT. NO.
19013/9033	1618081: PLAY

PANASONIC	PT. NO.
NV300	VXP 0433: PLAY
NV300	VXP 0401: FF/REW
NV370	VXP 0521: PLAY
NV600	VXP 0515: FF/REW
NV600	VXP 0488: PLAY
NV730	VXP 0581: FF/REW
NV2000	VXP 0331: PLAY
NV2000	VXP 0329: FF/REW
NV7000	VXP 0344: FF/REW
NV7000	VXP 0343: PLAY
NV8600	VXP 0245: REWIND
NV8600	VXP 0243: PLAY

SANYO	PT. NO.
VHR1500	143-0-662T14730: PLAY

SHARP	PT. NO.
VC481	NIDL0006GE22: TIRE
VC9300	NIDL0005GE22: TIRE
VC699	NPLYV0107GE22: TIRE
VCA100	NPLYV0111GE22: TIRE

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SLC7	6706342B: TIRE

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alternative description from a variety of sources, the pattern types being of predominantly Konig origin whose quality we've found to be of an excellent standard with almost no complaint from our customers.

*Freddie Whipp, Sales Manager,
Charles Hyde and Son Ltd.,
Prospect House, Barmby Road,
Pocklington, York YO4 2DP.*

USE OF DECIBELS

I must thank C.J. Boyce for his comments on my letter about VCR to TV receiver interfacing using the scart system. I had hoped that my simplified approach, quoting the instance pertinent to the case in point, would have been adequate: I didn't want to cloud the issue with a dissertation on dBs. Since Mr. Boyce has opened this Pandora's box however I feel obliged to reply.

I agree that dBm can be referred to any impedance; many instruments, e.g. spectrum analysers, quote a reference level of 0dBm into 50Ω. However dBm has its roots in the audio communications business, where the use of 600Ω lines is common. So does dBV, but I don't agree with Mr. Boyce when he states that dBV figures are also meaningless unless related to the system impedance. The term dBV was introduced in 1951 and originally applied to high-impedance microphones which could be used to drive valve amplifiers of typically 5MΩ input impedance. Sensitivity for such microphones is expressed as dBV (0dBV = 1V) for a sound pressure of 1 dyne/sq. cm. If the microphone is loaded, a correction factor is applied to determine its output, or perhaps it's expressed in other terms, e.g. dBm. So although dBV relates to energy, i.e. the sound received by the microphone, no power is provided by the microphone in its unloaded condition and the decibel level is referred to voltage alone, developed across the terminals.

The next historical step allowed dBV to refer to the open-load voltage developed across the terminals of any signal source. (The impedance need not be known at this stage but can be measured by loading the source with a resistor that halves the voltage output. The value of the load resistor is then equal to the source impedance.) Logically, we can now apply the reciprocity principle: for example, when connecting a communications recorder across telephone lines (recording telephone conversations is permitted in many applications, including banks, financial dealing rooms and air traffic control). The recorder must be invisible to the system, and is designed to present a high impedance that absorbs negligible power when bridged across the signal line. It's appropriate therefore to refer to the recorder's input sensitivity in dBV, which can be simply cross-referred to dBm by invoking the appropriate voltage relationship, e.g. 0dBV = +2.2dBm ref. 600Ω. Mr. Boyce may raise his eyebrows at this but dBV appears in this context in both regulatory documentation and equipment specifications. Now you can see why I dropped so naturally into the use of dBV for specifying the audio output of a VCR. This brings me to my next point.

Mr. Boyce appears to chide me gently over my "6dB attenuator" (a pity about the negative sign in the caption to Fig. 1 of my original letter – fortunately the text was o.k.: I referred to -6dB networks, not attenuators!). As a communications man I think in dBs. The output from my VCR has a source impedance of 1kΩ, the maximum allowed by the scart standard, while the TV set has an input impedance of 100kΩ.

Rule of thumb says that since there's a two orders of magnitude difference between these impedances an attenuator will yield a result close to a 6dB loss if its two elements are of equal value and each are an order different from the source

and terminating impedances, that is 10kΩ. As I'd run out of 10kΩ resistors I used 15kΩ instead. If you do the full calculation the precise attenuation works out at 6.95dB. The 0.95dB makes no perceptible difference in this instance of course, but experience is needed when applying rules of thumb: I sometimes work with equipment where errors in excess of 0.1dB are unacceptable, and then there's no substitute for accurate calculations and precise measurement techniques.

Finally, getting back to my Hitachi VCR, like Mr. Boyce I believe that its audio carrier modulation level is low compared with that of prerecorded tapes. The machine gives excellent results however, and since the work that prompted my first letter I have had no further problems.

*Keith Cummins,
Holbury, Hants.*

DIFFERENT DECIBELS

I feel that I should add a few words to C.J. Boyce's discussion on the decibel (May). It's far more important to understand the various definitions of the decibel in practice than to get bogged down in the exact science behind such measurements.

The dBm is an abbreviation for dB(mW), which is the ratio of a power level to 1mW. It's important to appreciate that it is the wattage portion of this that's the reference. A signal can be of 0dBm (i.e. 1mW) in any impedance, but to avoid confusion this is usually specified, e.g. 0dBm (50Ω) which equals approximately 220mV and not 4.472mV as C.J. Boyce states. In practice the dBm is rarely used, and is often erroneously used when it is.

The dBu refers to a ratio of voltages without any reference to impedance. 0dBu is taken to be 0.775V in an "unspecified" impedance, hence the little "u". This is what is loosely referred to as "dB", a measurement of voltage ratios rather than a power ratio. It's therefore perfectly correct to specify a measurement in dBu without stating an impedance, as it's the comparison of one voltage to a reference. What load impedance you choose to put across the circuit is your decision, it's nothing to do with the way in which the measurement is specified.

dBV is where 0dB equals 1.000V – note the upper case V. This is commonly used in Japanese Home Studio equipment, where the standard level is -10dBV, i.e. 100mV. It should not be confused with dBv, with lower case v, which is used by some British manufacturers and means 0.775V into a high-impedance load. For practical purposes it can be considered as being equal to dBu.

While on the subject of dB, a word is needed on the "Vu meter". A Standard Volume Indicator consists of a Vu meter and a calibrated attenuator in series, both connected across an audio circuit. Levels are measured by adding the meter reading and the attenuator value. The most common setting is with 0dBu equal to a reading of -4 on the meter. What this means in practice is that 0Vu = +4dBu. This setting is commonly found on sound mixing desks and some "home studio" gear. With most cassette recorders however a setting of 0Vu is equal to 0.775V at the output terminals, i.e. 0dBu. Sometimes "0Vu" equals 1.000V (0dBV). All these ways are equally valid in the Vu specification. Care should be taken however to ensure that you know how the meter is set before attempting to align equipment. It's not uncommon to find equipment where "0Vu = 1.000V (0dBV)" has been wrongly aligned to read 0Vu = 0.775V (0dBu). The best idea is to get a millivoltmeter that's scaled in both dBV and dBu and make sure that you read the correct scale!

Finally a plea. If you write specifications in dBs, stick to

dBu unless you have a really good reason not to. It's also a good idea to write them in the form of say +6dBu (0.775V), with the "0dB" reference in brackets. Please also include a specification chart at the front of manuals, detailing the exact specification of the measurements within. It can save much guesswork.

Ron McCaskill,
Aberdeen.

HELP WANTED

Wanted: Service manuals for the Bush/Murphy A823B CTV chassis and the Philips G11 chassis with teletext. H.E. Chamberlain, 70 Cromwell Road, St. Judes, Plymouth PL4 9QP.

Satellite TV enthusiast requires remote controls, polariser and actuator arm for the Sky Scan K1. Holmes, 14 Anthony Close, St. John's, Colchester, Essex CO4 4LD. 0206 841 561.

Can anyone provide or indicate a source for: (1) spares and information on the IRTE 1.5m dish; (2) similarly for the Ferguson 1.5m dish; (3) repair service for the Sinclair flat-screen TV set. K. Dulay, 5 Llewellyn Road, Leamington Spa, CV31 2BJ.

Keen DXer requires help in sorting out a fault with the Teleton TA12DU v.h.f./u.h.f. receiver. Signals seem to be weak at the lower end of the v.h.f. band. S. Mildoon, 2 Sandringham Avenue, Broadway Estate, Willenhall, W. Midlands WV12 5SX.

Can anyone help with spares for a Grundig Super Colour Model 4632, or a complete set and remote control? T. Milverton, 121 Borrowdale Road, Northfield, Birmingham B31 5QL (021 477 2044).

Can anyone supply a circuit diagram and/or service manual for an Ultravision 2000 projection TV set? It was made in Mexico by the Zenith Corporation. K.C.H. Catlett, 119 Dormington Road, Kingstanding, Birmingham B44 9LE (021 360 8773).

Can anyone supply or suggest a source for the following? A LOPT (part no. TLF6024C) for the Panasonic Model TC481. A two-stick e.h.t. tray for the Thorn 1580 series chassis (10kV, BRC part no. 00D4-034). Roy Burchett, 12 Ormonde Road, Hythe. Kent (0303 267 969).

Can anyone supply any service information on a Kyoto Model TC21PS? It's a 21in. PAL/SECAM FST set sold in France but made in the UK. Mark Adams, 64 Maple Drive, Portinfer, Guernsey (0481 52417).

Can anyone supply a small quantity of new Thorn 1500 main smoothing blocks (150/150/100µF, 300V)? I can supply Thorn 1400 mains smoothing blocks new. R.E. Bailey, 51 Robin Gardens, Waterlooville, Hants PO8 9XF.

Can anyone supply two flaps for the Philips 17CT2619/05S? Sarah Burton, Circuit Services (Lincs), 31A High Street North, Ruskington, Sleaford, Lincs NG34 9DY (0526 833 023).

Can anyone supply a used, second-hand or redundant remote control handset for a JVC HR7700EK VCR? B.G. King, 25 Mere Oak Road, Perton, Wolverhampton WV6 7NB (0902 741 956).

Can anyone supply a TDA8150 chip for an Osaki CTV20T (circuit reference IC101)? Vic Rummery, Tele-Service, 28 Lower Bore Street, Bodmin, Cornwall PL31 2JY (0208 72011).

Does anyone have a scrap Sony TC-K96R or TC-K77R cassette deck? We require the right-hand cassette guide that attaches to the metal door frame. Sony part no. is 3-551-091-00. Contact Nigel J. Burton, Mays Hi-Fi, 27 Churchgate, Leicester LE1 3AL (0533 514 444).

next month in

TELEVISION

FREE CATALOGUE

The latest components/equipment catalogue from East Cornwall Components is included free with the August issue of *Television*.

● SERVICING THE FINLUX 3000 SERIES CHASSIS

This is an all-singing, all-dancing TV chassis with a digital data bus (I2C) to control operations – programme memory, tuning, signal and deflection waveform processing. Thus to carry out any setting up the service mode has to be entered. Despite all this many faults are the standard ones you get, with the power supply, in this case a fairly straightforward TDA4601 type chopper circuit, etc. Steve Cannon lists common problems and provides guidance on checking the digital control system.

● AD CONVERTER OPERATION

Analogue-to-digital signal converters (DACs) are now widely used in TV sets, video equipment, computers and test equipment. Little information on their operation has been published however, though an understanding of this can be helpful when fault finding. David Botto decided to investigate and found that he had to breadboard some circuitry in order to check and analyse its operation.

● SERVICING THE MICROVITEC CUB

The Microvitec Cub is one of the most commonly encountered computer monitors. It's UK built and caters for RGB or TTL inputs. Arthur Rumbelow, G3KKC, provides a guide to specific faults and their cures based on considerable workshop experience. The notes apply to Models 1431, 1441, 1442, 2031 and 2032.

● TEST REPORT: TESTLAB LOGIC PROBE

A logic probe is the digital equivalent of the old-style signal tracer and is almost essential for fault tracing in digital circuitry. Eugene Trundle tests the TestLab TL07, a typical example of a modern logic probe.

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VCR Clinic

Reports from Eugene Trundle, Brian Storm, Alfred Damp, Michael Dranfield, Nick Beer, Ronnie Boag, Gerald Smith and John Edwards

Sanyo VHR3300

We've had three of these machines with the same evil intermittent fault which snaps a tape completely in two – sometimes! This model apart, it's rare for any VCR to break a tape though it often occurs when efforts are made to remove a tangled tape. With the VHR3300 the disaster occurs at the beginning of tape threading, due to a reel brake problem. Look at the feed spool's hard brake arm. On its left there's a metal pin which is, or should be, pushed by an underdeck lever. The pin can work upwards in the plastic arm to the point where it rides over the lever. Its correct position is where it just clears the topmost surface of the underdeck plastic cam. Fix it in position with Superglue or, better, replace the arm assembly. **E.T.**

Tatung TVR6111

This model is similar to those in the Amstrad range of three or so years ago. A symptom that's becoming common is intermittent ejection of cassettes, either when one is inserted or at random during play. The cause is dry-joints at the tags of the three microswitches (start, in, out) on the horizontal PCB fixed to the right of the front-loading gantry. **E.T.**

Philips VR6462/Finlux 1010 etc

These machines use the early Philips VHS deck with conventional M loading of the tape. Many of them now suffer from insufficient reel torque in the fast transport modes – fast forward, rewind, cue and review. Typical symptoms are spillage with E180 or E240 tapes in the forward search mode and long rewind times. Some models benefit from the official modification – fit a 22Ω resistor across R3101/3103 in the reel motor drive circuit. Whether or not you do this, check for excessive friction between the reel idler wheel and the guide plate below it, and for gummy shafts on the spool turntables. To cure the latter problem, remove the turntables and thoroughly clean the holes in them, then clean and polish the shafts. Apply a tiny drop of light oil when reassembling. **E.T.**

JVC GRC11

This record-only camcorder promptly ejected a tape whenever one was inserted. With no cassette present the lid would open only when the power was removed and then restored. A check showed that pin 30 (eject) of the microcomputer chip was permanently low at about 1.1V. This was caused by an electrically leaky eject slide switch. A replacement had to be fitted. **E.T.**

Panasonic NVL25

A curious set of symptoms greeted me with this machine: no "power on" and the timer flashed zeros, but above these were the words "write" and "erase" – it was not something I'd ever seen before. The machine would accept a tape, but as the controls were inoperative it wouldn't return the tape. This suggested to me that the systems and servo chip IC2001 was probably all right. I'd also no good reason to suspect the timer chip IC7501. Voltage checks between these two chips showed that the serial data and serial clock lines were the source of the trouble. The serial data line was sitting at about

1V while the serial clock line, at around 4V, was closer to the normal condition for these lines.

Disconnecting IC7501's serial data pin removed the "write erase" from the display, but the line's voltage remained low. Disconnecting the other two chips connected to the serial data line, IC2001 and IC6801, also had no effect – the voltage remained low. The only other possibility was the 270pF capacitor C6012 which is connected between the line and chassis. When I eventually found it (it's a small, surface-mounted capacitor tucked away at the edge of the main board) it turned out to be leaky. A normal-sized replacement restored correct operation. **B.S.**

Panasonic NVG21

The playback sound gave a fair impression of a washing machine and a tumble drier working in unison, drowning the recorded sound with buzzing and spurious oscillation. Voltage checks around IC4001 in the sound section produced no clues except that the noises were reduced when the meter's probe touched the input pin. So attention was turned to the input circuitry, where R4021 (47Ω), a surface-mounted resistor connected to a filter network, was found to be open-circuit. **B.S.**

National NVG33

A dead power supply was the trouble with this foreign machine. Checks in the switch-mode power supply failed to reveal any shorts in either the primary or the secondary side, so attention was turned to the start-up circuit. We found that C1003 (1μF, 250V) was open-circuit. **B.S.**

Ferguson 3V44

For once the symptoms displayed agreed with the fault description on the job ticket. This said dirty heads. Cleaning them didn't help however and the reason for this was soon apparent: the drum motor was running backwards at full speed. D408, a 5.1V zener diode, was short-circuit. **A.D.**

Sony SL615

While this machine was still apart after being serviced we found that no functions could be obtained via the operation board though remote control operation was correct. The "fault" was eventually traced to the fact that there was no earth link to the operation board because the bottom case was open-circuit: normal operation was restored when the bottom case was refitted. **A.D.**

Amstrad VCR6000/6100

There was neither forward wind nor rewind as the reel brakes were on. They would come off if the brake plate, reference 261, or the brake actuator, reference 262, was operated manually before selecting a wind mode, but when a wind mode

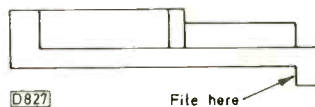


Fig. 1: Cure for Amstrad VCR6000/6100 fault.

was stopped then selected again the reel brakes once more remained on. The cause of the problem was that the brake actuator plate moved but the brake plate didn't. Careful observation showed that the lever trigger, reference 260, didn't return to its correct resting place, thus inhibiting movement of the brake plate. Filing at the point shown in Fig. 1 cured the fault. **A.D.**

Panasonic NV333

The capstan servo wasn't locked, the symptom being a noise bar that floated through the playback picture. This is typical of a no CTL pulse fault, but checks on the CTL section of the circuit showed that it was working correctly. Further checks revealed the fact that the 9V supply to the tracking control was missing. This is the "except Rec 9V" supply. It comes from the syscon panel where Q6003 was found to be open-circuit. **A.D.**

Panasonic NVG40

Fast forward and rewind were o.k. but the machine didn't play. When we checked the operation of the mechanism we found that the P5 unit arm didn't come across fully in the stop mode. This was because the "pull-out sector gear" was broken. We replaced the gear and also the mode switch as it's the most likely thing to have caused the gear to break. **R.B.**

Panasonic NVG12

There was a rather unusual symptom – no sound in any mode, including E-E. A sound signal was going from the TV demodulator PCB to the audio pack, where all the audio goes. It wasn't being switched out of the BA7752LS chip IC410 however. The supplies and the d.c. switching conditions were all correct so it seemed that the i.c. was faulty. A replacement restored the sound. **N.B.**

Panasonic NVG12

This machine would enter the record mode and proceed as if everything was o.k., but when you rewound the tape and replayed it the previous recording was still present. Although the machine entered the record mode it didn't produce the delayed record 12V supply. There was no 12V at the emitter of Q6005 as Q6006 was switched off because its base voltage was high. Q6006's base voltage should be pulled down by the record prevent switch line from the microcomputer chip IC6001. The voltage was correct at IC6001, the cause of the fault being a break in the print between the cathode of D6005 and R6041 as the print winds its way through the pins of the audio pack. **N.B.**

Ferguson FV52L

This machine had been installed only two days previously, yet here I was looking into why it lost about twenty minutes an hour. The cause was fairly simple – reference crystal 01 was dry-jointed on both legs. This was probably due to the fact that the PCB holes are much too large for the legs of this device. **N.B.**

Panasonic NVG45

Steve Beeching mentioned the sync separator modification for this model in his Camcorner feature last January. I reported on the problem a couple of years ago and pointed out that the modification could be improved by adding an

extra 47k Ω resistor across the components that Panasonic supply. I'd found this to be necessary because users complained about severe drum twitch and HSP running through the picture when recording from early Bush/Alba satellite TV receivers (the ones that used to drift off tune). I had heard that the video output from these units was suspect and that there was a modification for them. But customers who rented G40s and G45s from us preferred us to take action. **N.B.**

Samsung VI710

Playback was fine but there was no E-E sound or vision. Inputs from the line or tuner were missing. There was vision at pin 4 of the TA8605N chip IC303, but only hash at pin 10. The amplifier inside the chip had to be all right as it fed both the playback and E-E video through to pin 10. So the cause of the problem had to be in the switching. The chip was stuck in the playback mode as pin 13 remained high. But the PB 5V was switching correctly – so where was the 5V coming from? Not via the white-clip network but from within the chip itself. We proved this by disconnecting the pin and finding that the 5V was still present here. A new chip restored normal operation. **N.B.**

Panasonic NVM7

A common problem with these and other full-size camcorders is that the unit powers up and then, within a few seconds, shuts down again. The clue is that the mechanism doesn't shuffle as it should, the cause being a faulty M54543L loading motor driver chip. It's easy to check the i.c. If its supply is present and there are correct commands at its logic pins but no output is provided the chip is defective. Another clue is that the chip's supply falls when the load should be on. **N.B.**

Panasonic NVJ40

This machine drifted off tune on any channel above 59. The cause was a faulty tuner. **N.B.**

Salora SV6910

There were no functions and no clock display. FR2 in the power supply was open-circuit. **G.S.**

Akai VS33

This machine kept going to standby. The drum speed was found to be erratic and a check on the drum PG waveform showed that noise was present. Replacement of C6, which was leaky, on the drum motor PCB provided a complete cure. **G.S.**

Akai VS35

The playback picture was marred by numerous white dashes which were similar to the spots produced by e.h.t. arcing in a TV set. The cause of this interference was traced to the fact that the head preamplifier screening plate's chassis earthing screw was loose. Retightening it solved the problem. **J.E.**

Ferguson 3V55

The loading motor continued to run after the cassette had been ejected. As a result the loading belt squealed loudly. We found that the cause of the fault was the mode opto-switch assembly. It's available from CPC at a very reasonable price under part no. TNPU35632A3. **M.Dr.**

Filters for DX-TV Systems

Part 2

Keith Hamer and Gary Smith

In this concluding part we'll provide guidance on dealing with the various types of interference that can affect DX reception.

Interference from FM Radio

For Band II reception (the TV channels are just below the f.m. radio broadcast band) it's desirable to incorporate some form of filtering since in many areas the f.m. radio transmissions are very prone to penetrate this part of the band. F.M. radio transmissions also occasionally find their way into Bands I and III, with the result that "blank" or fuzzy-looking carriers appear at certain points. In Band III for example channels E5/6/7, i.e. at twice the f.m. carrier frequency, can be affected. You can use a scanner to confirm that the interference is caused by f.m. transmissions. Alternatively a D100 DX receiver can be used for the purpose simply by setting the sound spacing to zero and listening to the signal.

A length of coaxial cable approximately 75cm long can be connected in circuit to remove f.m. interference in Bands I/II, acting as a stub filter (see last month). Shorten the cable one centimetre at a time, using wire cutters, while observing the interference or listening to the carrier with a scanner or D100 receiver as described above. Find the cable length at which the interference falls to a minimum level. If you keep snipping, the interference will increase as the optimum stub length has been passed. The higher the frequency of the offending signal the shorter the coaxial stub will need to be. Don't short-circuit the free end of the stub as it will then have the opposite effect and the interference will rise to a maximum level.

A two-way aerial switch can be used, see Fig. 1, when a quarter-wave stub is employed to remove f.m. radio interference in Bands I/II. This enables the stub to be switched in or out of circuit quickly depending on whether a limited (for TV reception) or full (for f.m. listening) response is required. The switch also enables a variety of quarter-wave stubs to be connected quickly when experimenting. Modify the switch by

linking two of the switch connections as shown, thus providing a permanent path for the signal from the aerial.

Alternatively a variable acceptor circuit, see Fig. 2, can be used. Where f.m. radio interference is particularly bad it may be an advantage to use this circuit in addition to a stub. Connect it at the amplifier's input. Use a small trimmer to provide adjustment to reduce the f.m. signal level.

A coaxial stub filter can't be used to remove f.m. interference in Band III because it will also remove signals at multiples of the frequency to which it's cut, e.g. a stub cut to 100MHz will also have an effect at 200MHz. Instead, the Band III (high-pass) leg of a diplexer or triplexer can be used to remove the f.m. radio interference.

UHF Breakthrough at VHF

Where strong local u.h.f. signals cause interference by overloading a Band I or III mast-head amplifier additional filtering can be added at its input. For u.h.f. breakthrough in Band I try the low-pass (Band I) section of a diplexer. For breakthrough in Band III use a low-pass v.h.f. type which has a cut-off above Band III. Alternatively a simple u.h.f. acceptor circuit can be used, see Fig. 3. Operation is simple: adjust the trimmer just enough to remove the interference from the wanted channel.

UHF breakthrough at UHF

Where a high-level u.h.f. signal overloads a distribution amplifier the acceptor circuit can be added prior to its input and adjusted to reduce the level of the offending u.h.f. group while DX signals present in the other two groups are passed through. The filter can be inserted in-line where the mast-head amplifier is powered from the distribution amplifier since it passes d.c.

If a mast-head amplifier is being overloaded remove it from the mast and install it indoors with the variable filter connected to its input. In extreme cases the cross-modulation will affect the entire u.h.f. band: by adjusting the trimmer's screw to attenuate the local u.h.f. group the interference will be removed from the other groups.

The local group of u.h.f. channel signals can be attenuated simply by using the leg of a u.h.f. diplexer that doesn't allow for this group. U.H.F. diplexers are normally used to combine the outputs from two u.h.f. aerials of different groups. They are available in group A + BCD (sometimes known as A + E) or group AB + CD versions. There are variations with the latter type, with different response cut-off points between the upper and lower groups of channels. If a u.h.f. group diplexer is used to remove the local transmissions for the purposes of DX-TV reception it must be stressed that the method is suitable only for attenuating group A or CD transmissions: the group B channels cannot be attenuated without sacrificing one of the other two groups as well.

Band I Signals in Band III

During an intense Sporadic E opening you may occasionally find Band I channel signals in Band III. Before claiming exotic reception, disconnect the Band I aerial to ensure that the picture is not being produced as the result of some form



Broadcast weather chart showing an intense area of high pressure and an associated occluded front. The photograph, taken in 1974, also shows the line-pairing effect produced by interference.

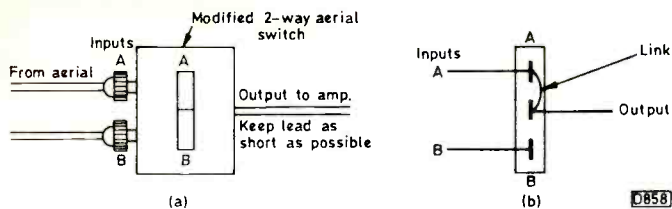


Fig. 1: Incorporating a switchable stub. (a) Basic arrangement; (b) slide switch modification.

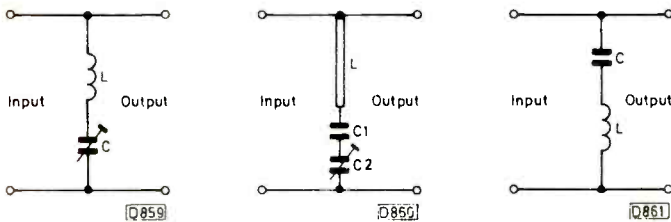


Fig. 2 (left): Variable acceptor circuit for f.m. band signals. Coil L consists of 4-5 turns of 0.25in. diameter 20 s.w.g. wire air-spaced over 3/8in.; C is 5-60pF.

Fig. 3 (centre): Acceptor circuit for u.h.f. signals. L is a 2.5 cm length of 20 s.w.g. wire; C1 is 6.8 pF; C2 2-10pF.

Fig. 4 (right): Simple acceptor circuit for 27MHz signals. C is 100pF; coil L consists of 15 turns of 24 s.w.g. enamelled wire, diameter 3/16in.

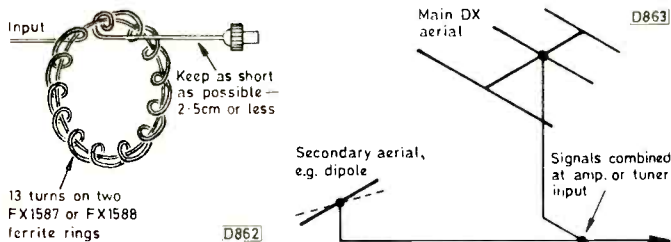


Fig. 5 (left): Ferrite ring filter.

Fig. 6 (right): Signal cancellation with a second aerial.

of cross-modulation – this is particularly likely where a distribution amplifier is used. When more than one receiver is in use a combination of tuner settings can sometimes produce an up-conversion effect. This has led to red faces and disappointment on more than one occasion in the past.

CB Breakthrough

CB interference usually occurs around channels IA/E3 in Band I, at twice the CB transmission frequency. If the cause is an overloaded mast-head amplifier a high-pass filter at its input should provide a remedy or at least a worthwhile reduction. As an alternative the simple acceptor circuit shown in Fig. 4 can be tried, connected across the amplifier's input.

In many cases unfortunately the CB installation will not be tuned correctly and will thus radiate harmonics at Band I frequencies. The use of a 27MHz filter at the input of an amplifier will not in this case provide a cure because the interference is at approximately 54-55MHz. CB harmonics at this frequency have been received at distances of over 500m.

Sometimes the 27MHz (or other h.f.) signals are picked up on the outer braid of the coaxial downlead and transferred to the tuner which can then be overloaded, especially if it uses bipolar transistors. In this case the use of a ferrite ring filter (see Fig. 5) will sometimes provide a cure.

Removing In-band Interference

Simple filtering usually won't help with in-band interference because it will also remove or seriously attenuate the wanted

signal. In the 405-line era however notch filters were commonly used by UK DXers to remove interfering BBC-1 vision or sound carriers. These are most effective when the interfering signal is at least 250kHz away from the wanted signal.

In recent years there has been a great growth in the use of cordless telephones and baby alarms operating at around 49.6MHz, which is uncomfortably close to the 49.75MHz channel R1 vision carrier frequency. It's unlikely that a notch filter would provide an effective remedy because of the closeness of the two frequencies. Use of the 6-metre band (around 50MHz) by radio amateurs also causes problems for DXers, particularly those who live close to a repeater or beacon.

Use of a reduced i.f. bandwidth helps a great deal provided the interference is not at exactly the same frequency as the wanted signal. Directional aerials may also help in reducing the interference, provided in this case that it doesn't come from the same direction as the wanted signal.

Interference at the same frequency as the wanted signal can be removed by using a process known as phase cancellation. In this case a second aerial picks up as much as possible of the offending interference, which is then mixed with the wanted DX signal. One hundred per cent cancellation can sometimes be achieved. The signal from the extra aerial must be 180° out of phase and of equal amplitude to the interference picked up by the main aerial when the two signals are combined. This may sound rather complicated, but bear with us.

When the 405-line system was in use in the UK the channel B2 and E2 vision carriers coincided at 48.25MHz. This meant that DXers within range of a channel B2 transmitter had great problems in resolving channel E2 vision successfully. Several enthusiasts tried a simple phasing system to provide a remedy. It's technically primitive but works. The output from a channel B2 dipole was connected to the amplifier's input in parallel with the channel E2 signal and was rotated, experimentally, through various angles. A position occurs where the channel B2 interference drops to virtually nil. In one case a position where cancellation occurred was found in the garden, at ground level, and the dipole was then carefully fixed in this position. Despite the mismatch that was present when the cables were joined the end results were startling. Thanks to the system weak signals from the channel E2 Kissi transmitter in Ghana were seen for the first time.

Rotating the main aerial alters the phase difference of course. So other fixed dipoles had to be used for different directions. One DXer discovered that his portable TV set's telescopic aerial was in circuit when the main DXing array was connected and that this enabled a similar cancellation effect to be achieved.

This approach also works at other frequencies, though much patience and experimentation are required. If this is of any consolation, the stronger the interference the easier it is to remove it. Phase cancellation doesn't work where more than one interfering carrier is present at a particular frequency.

A Band I electronic phaser unit was described by Roger Bunnay in the January 1981 issue of *Television*. It uses a fixed aerial with rotary controls for amplitude and phase adjustment. The D100 converter system can be supplied with a dual aerial-input socket for connecting a coaxial stub filter or a second aerial for phase cancellation purposes.

Fig. 6 shows the principle of phase cancellation using a second aerial.

HS Publications, 7 Epping Close, Derby DE3 4HR (0332 381 699) can supply the F1013 triplexer mentioned last month at £5.95 including UK postage and packing. The D100 converter system is also available from this source.

TV Fault Finding

*Reports from Philip Blundell, AMIEE,
Mick Dutton, Steve Cannon, Chris Avis,
Michael Dranfield, Roger Burchett and
Stephen Leatherbarrow*

Philips CP90 Chassis

This set was dead with a whistling noise coming from the power supply – the over-voltage crowbar thyristor was firing. By running the set with reduced mains input (via a variac) we discovered that the 95V from the power supply was rising to over 100V, pointing to a fault in the error amplifier stage. Checks here showed that transistor 7701 (BC548) was short-circuit base-to-emitter. **P.B.**

Philips K40 Chassis

There was no sound output from this set. Checks showed that the volume control voltage from the SAB3035 chip was being held down. To cut a very long story short, the cause of this was the on-off switch! Its momentary-make contacts were stuck together. One to watch out for. **P.B.**

Philips GR1-AX Chassis

I've had this fault a couple of times now. The symptoms are no colour and a vertical black bar across the screen. The cause is a crack in the print by the line output transformer, where the PCB fits into the back cover. Check the track that runs from pin 10 of the transformer. **P.B.**

Philips CP110 Chassis

For a "flashing" picture check whether R3415 (470k Ω) or R3412 (180 Ω) on the tube base panel is open-circuit. **P.B.**

Philips CP90 Chassis

This set came from another dealer because it kept blowing its BUT11AF line output transistor. A new transistor would last only a couple of days. The e.h.t. was normal, no dry-joints were visible and the transistor's base drive waveform was o.k. I then noticed that the set was a late model fitted with the A51AEL30X05 tube. This called for a few component changes, including the use of a BUT12A line output transistor. The correct transistor lasted long enough for line tearing to be seen before I managed to switch the set off. The line output transformer was faulty. **P.B.**

Philips GR2-1AX Chassis

This set would intermittently blank out the picture and mute the sound for a few seconds. Channel changing seemed to instigate the fault. We found that the /VD pulse to pin 27 of IC7708 disappeared in the fault condition. The source of the pulse was traced back to the TDA2579B/N1 timebase generator chip IC7470 where the field-rate part of the sandcastle pulse disappeared though the line-rate part was o.k. When the chip was tried in another set it took the fault with it. A replacement was ordered and when fitted provided a complete cure. **P.B.**

Sony KV2752 (PE3 Chassis)

This set led us a merry dance. It had recently had a new TDA3562 field output chip fitted but the complaint now was that the picture and sound would go off when the set had warmed up, leaving a horizontal white line across two-thirds

of the centre of the screen. We saw this happen in the customer's house and were able to establish that the 12V supply disappeared because rectifier diodes D659 and D653 both went open-circuit when warm. These were replaced and the set worked well for a couple of days.

The customer then said that the set had started to drift off tune. A new tuner seemed to put that right but two days later we were back again. This time the symptoms were tuning drift and the colour saturation in the top half of the picture being less than that in the bottom half. We took the set back to the workshop and put it on soak test. It ran for days without the fault showing. Then one day while cricket was on the grass became less green towards the top of the picture.

The most likely cause of the fault seemed to be some kind of hum modulation on one of the supplies. Scope checks showed that there was a 6V ripple on the 40V supply that feeds the 30V tuning voltage stabiliser. The 33 μ F reservoir capacitor C653 was o.k., but adding a 10 μ F capacitor across the 40V line removed the ripple and restored correct colour saturation. The cause of the problem was the 1.2 Ω surge limiter resistor R651 which had risen in value to 15 Ω . The excessive ripple was being developed here. **M.D.**

Hitachi G8Q Chassis

The complaint with this set was no tuning. It employs pulse-width modulated tuning, the relevant output from the SAA1293 chip being integrated to provide the tuning voltage. As there was no tuning voltage at the tuner we checked back to the source. The pulse-width modulated output from the chip was present at the base of Q1506 and its mark-space ratio altered as the tuning was varied. This transistor's collector voltage also varied, but only slightly – not enough to span the required tuning range. The path from the collector of this transistor to the tuner is via several resistors, first on the tuning panel, then on the control panel and finally on the main board. We eventually found that one of these resistors, R1534, had gone high in value, a replacement (39k Ω) restoring normal operation. **M.D.**

Sharp C1420

A point worth noting with these sets and models that use a similar chassis is that if R623 (1.2M Ω) goes high in value the result will be intermittent tripping, usually on bright scenes. Unfortunately the line output transformer is also a common cause of intermittent or permanent tripping. **M.D.**

Ferguson ICC5 Chassis

This set was in the shutdown state. When switched on it would trip three times then become lifeless. That's the usual trip sequence with this chassis. It can sometimes be a nightmarish situation as the fault can be almost anywhere – the protection circuits are very sensitive. As a start we disconnected pins 8 and 10 of the line output transformer, but the set still tripped. Next various secondary supplies from the chopper transformer were disconnected including, inadvertently, pins 17 and 18. A note was then made in the service manual warning never to do this or else the power supply will suffer impending doom. As a result of my miscalculation a new BU508 chopper transistor was next fitted. Back, ahem, to the original fault.

new BU508 chopper transistor was next fitted. Back, ahem, to the original fault.

A glimmer of light appeared at the end of the tunnel when pin 22 of the chopper transformer was disconnected – the set powered up with a raster. There was no sound though as pin 22 is the 36V supply to the stereo audio board. When the audio output chips IS40 and IS41 were checked the left-hand channel one was found to be low-resistance from its supply input to chassis. A new TDA2030A42 chip put matters right. S.C.

Salora J Chassis

The sound was o.k. but there was no picture – the screen was completely dark. A check on the drive waveforms from the colour decoder chip, at pins 13, 15 and 17, showed that they were missing. In addition the d.c. content was low. The brightness and contrast control voltages were present at the chip and altered appropriately depending on the function selected. The luminance input was also fine. Time to check the sandcastle pulses. These also looked fine. But wait a minute, something doesn't seem right. When the scope was set to the line frequency a perfect line blanking sandcastle waveform was seen, but at field frequency there was no blanking waveform present. We traced the pulses back to the point where the separate components are added together to give the distinctive waveform shape. The field component comes from the field output chip ICB400 via DB402 and TB400. ICB400 was delivering pulses but they were going AWOL at the base of TB400. The cause of this was that TB209 was short-circuit collector-to-emitter. When a new BC307 was fitted up came the picture. S.C.

Sony KV211XMTU

There was an intermittent fault on this set – the screen would light up bright green. The fault was heat related, so it was time for the hairdryer. We found that the cause of the fault was definitely on the video panel, which was a bit of a surprise as we've had a few faulty transistors on the tube base PCB in these sets. The fault could be made to appear by heating around the colour decoder chip. C302, the green sample-and-hold capacitor, was suspect but proved its innocence on being replaced. It didn't take long though to trace the source of the fault to the green on-screen display buffer transistor Q311. The original type is JC501, but the 2SC2785 is a direct, Sony official replacement. A new one cleared the trouble. S.C.

Osume CTV1484R

Amazing aliases abound with colour portables: this remote-controlled cash'n'carry weirdo turned out to be an Alba set in disguise. The trouble was loss of channel selection and uncontrollable, maximum sound when the set had been in operation for a few minutes. Heat and freeze probing suggested that a 455kHz crystal on the front remote control/tuning board was faulty. A suitable transplant was obtained from a defunct Sharp remote control panel. Fitting it restored normal operation. C.A.

Tatung 160 Chassis

A type of fault that's becoming more common is the dreaded "demolition syndrome", when one small failure starts a chain of destructive events. Our first discovery with this dead set was that the line output transistor was short-circuit. We removed it and temporarily connected a 60W bulb across its

emitter-collector connections. The power supply then worked but there was no line drive from the TDA4503 chip because its 11.5V supply was missing. Regulator transistor Q501 was non-conductive because one of its two 12kΩ base bias resistors was open-circuit. We replaced both resistors (R507/8) and fitted a new R4050 line output transistor. When we switched the set on it sprang to life – with a bright raster. The 10Ω filter resistor R201 in the feed to the RGB output transistors was open-circuit. Did a falling 11.5V supply distort the line drive, turn the RGB output transistors hard on, blow R201 then destroy the line output transistor? Send your answers to anyone but me! C.A.

Ferguson TX90 Chassis (20in version)

The field scan was stretched across the top and bottom but cramped across the middle. After a few minutes the fault would clear, but a squirt of freezer on the 68V zener diode D137 would bring it back. The diode had a 200kΩ leak when cold. C.A.

Ferguson TX90 Chassis

A rolling picture with horizontal ripples across the screen is a common fault with these sets. The usual cause is that R236 or R241 in the pulse feed to the TDA4500/S1 chip IC102 is high in value or open-circuit. This time however the identical symptoms were accompanied by a clatter when the set was turned over, caused by the ferrite core that had fallen out of the line driver transformer T103. Memories of the 3000 chassis! C.A.

Luxor B2 Chassis

The trouble with this portable was low output from the power supply at only some 90V instead of 129V. The set-h.t. control PN01 had no effect. As a first step we changed the BRY55 thyristor TN02, using an MCR101 as we didn't have the BRY type in stock. This produced some improvement. The set-h.t. control now worked, but we couldn't get an output above 110V. Assuming that the set would work correctly only with the correct thyristor we obtained and fitted one. All this did was to restore the original fault! Further checks showed that the 5.1V zener diode DN18 had only 1V at its cathode, and we then discovered that RN28 (560kΩ) was open-circuit. Replacing this resistor along with RN29 (330kΩ) for good measure restored the set to working order. All that was now needed was to reset the set-h.t. control for 129V at the cathode of DN13. M.Dr.

Amstrad TVR1

This machine came in dead. The mains supply was present up to the relay in the TV section but the relay didn't operate when the monitor button was pressed. In this model the standby power supply comes from the VCR section, so we started our investigation here. Fuse F604 (630mA) in the power supply had blown and a replacement blew at switch on. We disconnected plugs and found that the short-circuit was across the all 5V line. The output from the 5V regulator transistor Q603 goes to the syscon PCB, but extensive checks here failed to reveal the cause of the short-circuit. We then discovered that the fault disappeared when one of the inter-connecting plugs between the VCR and the TV sections was disconnected. This enabled us to establish that the short was on the tuning preset PCB. Desoldering various suspect components brought us to C1109 (100μF, 10V) which decouples pin 1 of IC1102. When this had been replaced the fuse held

and the TV and VCR were back in working order.

If you get one of these in with the complaint that the TV section won't switch on when the monitor button is pressed though the monitor on LED lights up, check whether the timer record button is pressed in. It will save you having to strip down the VCR. **M.Dr.**

Matsui 1455

There was no luminance and the on-screen display characters flared badly to the right, extending to the edge of the screen. A check on the luminance waveform at pin 23 of IC202 showed that all was well here, but the signal was missing at the emitter of the 2SA562 luminance amplifier transistor Q202 which turned out to be leaky. A replacement restored full luminance but the on-screen display fault was still present. The on-screen display signal is fed to the base of Q202 via a 1N4148 diode which also turned out to be leaky, but the fault was still present when a replacement had been fitted. Further checks brought us to the collector of the 2SC1815 buffer transistor Q408 where the voltage was 7V. The correct figure is 0.13V. The transistor tested o.k. when removed but a replacement cured the fault. **M.Dr.**

Philips K35 Chassis

The reported complaint was of picture flicker but when we switched the set on there was a small picture – about two inches was missing all round. As the h.t. was correct at 140V attention was turned to the line output stage where the tuning capacitor C567 was found to be badly dry-jointed. This was presumably the cause of the flickering mentioned on the fault ticket. The fault was still present when we resoldered the joints so C567 was removed. It was then obvious that severe heating had occurred, caused by the dry-joint, and the capacitor was visibly deformed. On test we found that its value had fallen from 8.2nF to 2nF. A replacement capacitor cured the fault but with the lower e.h.t. the picture was very disappointing. Amazingly the line output transistor had suffered no damage. **M.Dr.**

Matsui 2160

Sound but no picture was the complaint. There was h.t. at the collector of the line output transistor but no e.h.t. because the transistor's base drive was missing. R428 and R427 which provide the supply to the driver transistor Q401 were red hot but the transistor was o.k. A check at Q401's base showed that there was no input, only a d.c. voltage of 1V which turned the transistor on. The μ PC1420CA chip IC401 had the correct 12V at pin 38 and the voltage at the X-ray shutdown pin was correct at 0V. A d.c. reading of 3V was obtained at the line drive output pin 26 however. After disconnecting this pin the voltage rose to 12V. Clearly the chip was defective, a replacement curing the fault. **M.Dr.**

Fidelity CTV140R (ZX4010 Chassis)

The chopper and line output transistors were both short-circuit. The cause was not hard to see – the on-off switch had obviously been arcing for some considerable time and was now visibly burnt. **R.B.**

Network NWC1401

A new customer, obviously shopping around, asked if I would like to repair a dead Network colour portable. Being one of the more helpful types she said that it was actually a

Grundig set, or so the salesperson had claimed. Now some Network sets did have Grundig innards, but this was not one of them. On removing the back shell I was confronted with a suspiciously Toshiba-looking chassis. The 2SC2068 line driver transistor proved to be lazy, starting when warm but not when cold. The manual for the Bush BC7000/7100 (Rank T24 chassis) proved to be useful (Toshiba X53 chassis for those more used to the maker of the original chassis). **R.B.**

Crown 14CX25

This 14in. portable is fitted with a Sanyo chassis. Failure of the line output transistor can be caused by the 0.0022 μ F, 2kV line output stage tuning capacitors C709/710 being dry-jointed. I traced the cause of no colour to the 2SC65Y burst amplifier transistor Q311 being open-circuit base-to-emitter. A BF259 worked all right in this position. **R.B.**

Rediffusion Mk 3 Chassis

We get a lot of these sets ex-rental. No sound is usually caused by OR71 (820 Ω , 0.5W) overheating and going open-circuit. This is now a very common fault. Fit a 1W replacement. In the dual-standard versions (aerial/cable compatible i.f./s.f. boards) the component reference number is OR55.

If the set tries to start up but the blowing of 6FS1 (1.6AT) on the power panel puts a stop to the proceedings you need spare boards, a variac and patience. If a substitution check proves that the power supply panel is not responsible check the thyristors in the line output stage. On one occasion 5C4 (0.1 μ F, 1kV) was visibly bulged – a replacement restored normal operation. On two occasions recently the line output transformer has been the cause of the problem. If a variac is not available a neon tester held near the transformer will usually show "pulsing" if the transformer is o.k. and the cause of the fault lies elsewhere. Even with a heavy leak in the line scan thyristor the neon lit. **R.B.**

Fidelity ZX3000 Chassis

There was severe line tearing and stressful noises came from within the set. The cause of this situation was the 33 μ F, 250V h.t. reservoir capacitor C100 which was open-circuit. Interesting that the fault condition varied with different brightness levels. **S.L.**

Hinari CT5

An open-circuit resistor was the cause of field collapse. The offending item was R422, 10 Ω , off pin 5 of the line output transformer. It seems to supply Q310 with collector voltage/bias, though from our photocopied circuit it's sure hard to tell! **S.L.**

Binatone 01/9014 Colortron

These nice little sets are very common in our area. A recurrent problem we have is with the start-up circuit. There are two 180k Ω , 0.5W resistors here, R622 and R633, and one invariably succumbs. We fit more manly replacements. **S.L.**

Ferguson TX100 Chassis

The picture would occasionally turn a distinct shade of green. This usually showed up after a quarter of an hour or so. It was noticed that from switch on the green output took a shade longer to appear than did either red or blue. The culprit was C51 (0.47 μ F). **S.L.**

What a Life!

Donald Bullock

A bit of sun is always cheering. So I got up early the other day and raced Greeneyes to the bathroom. "Lets have my Healthybran and fruit" I cried, "and my sugar-free coffee. Let me get to the workshop. I want to get on and work."

The JVC HRD230

With breakfast over I strode to the workshop and put the first job on the bench. It was a JVC VCR – an HRD230. Rewind and fast forward were o.k. but it wouldn't record or play. The tape laced then unlaced and that was that. The head drum was still.

After checking the power circuits I decided to replace the STK5481 just to be sure. As I'd feared, this made no difference. So I carried out some voltage checks around IC601, the 64-leg M50965-628 chip in the mechacon circuit. As some of the voltages were wrong I replaced the chip then switched the machine on and tried it with a cassette. The drum now revolved and the tape loaded satisfactorily, but the take-up spool kept faltering to a stop and the tape spewed into the mechanism. Progress, but there was still something wrong.

Checks in the associated circuitry showed that the voltages around the M54644BL chip IC604 were haywire. Fitting a new one restored the machine to full working order.

Well, I'd had to work for results that time, but I'd won. Perhaps, for a change, I was going to have a good day.

Mrs Libber's Sanyo CBP2145

My next caller put an end to this hope. I wish Mrs. Libber had gone to Snoddies. They can take strident, mouthy women in their stride. She asked for a house call, which wasn't on, even though her set had only a "slight fault". So she sent her husband along with it. The set turned out to be a 22in. Sanyo CBP2145, which is fitted with the E2 chassis. Later that evening she phoned to ask whether it had been done. It hadn't.

Next day I put the set on the bench. There are two channel selector buttons, for up and down, at the front. The trouble was that they didn't work until the set had been on for about five minutes. After a spell with the freezer and hairdryer I decided to take out the front panel to apply a little contact cleaner and resolder the joints, which is faster to say than do. Operation of the set seemed to be better after doing this but it was still not good enough. So I set about obtaining a manual and meanwhile had a word with Sanyo. I was advised to change C398, a 100µF 16V electrolytic across one of the 5V lines. It made no difference, so I decided to wait for the manual.

Then the phone rang again and Mrs. Libber said she was getting impatient. She'd bought the set, at enormous expense, so that they could watch television. They couldn't because I had it. Why was it taking so long to fix such a slight fault? And she hoped it wouldn't cost much.

I should have given the set back to her then and there, but since I'd got involved I decided to press ahead. For the time being I had to work as well as I could without the manual. I changed one or two items in the supply, including the L78M05-RA 5V regulator IC395 and D395 which supplies it. Next day Mrs. Libber came on again and I suggested that she had the set back until I'd received the manual, studied it and

ordered any bits I suspected. In that way she'd have the use of the set until I was ready, hopefully, to have it back and cure the fault quickly.

Her husband, a rather sheepish fellow, came, shook my hand and offered to pay for my trouble so far. I told him that I wouldn't charge until the job was finished. Off he went with the set, smiling away, leaving me to reflect on why such shrews always seem to marry such decent chaps.

Then Greeneyes went to Spain for three weeks, with our eldest offspring, leaving me to look after the three youngest ones. I assured her that I could cope. In no time at all we were all down with flu and I was too ill to work. By the time I'd recovered the house was full of TVs and videos brought in for repair. I hardly knew which way to turn.

My first caller was Mrs. Libber. The set now changed channels perfectly she said. It must have been a bit of dust on the controls, so I needn't attend to that. But I'd obviously done something to the set because there was now sometimes a noise on the sound, accompanied by a faint chirp from within.

"I can't take it anywhere else" she said, perhaps sensing that I was a little less than fond of her, "because since you caused it you'll know at once how to put it right." Her husband brought the set, all apologetically, into the workshop and when he'd gone I put it on test. Within a couple of hours Mrs. Libber was on. "Have you got it right? I miss my television set."

The set behaved itself for hours, then I heard a slight "ccrr-ing" noise that seemed to come from the line output transformer. I placed a blanket over the set and it was soon chirping enough for me to be able to investigate. The noise definitely came from within the line output transformer, and now the brightness was affected as well.

I had an identical Fisher set awaiting a line output transformer. It arrived as I was working on the Sanyo set. The part numbers matched, so I fitted the new transformer, all £30 worth of it, in Mrs. Libber's set. As a cross-check I installed the chirping transformer in the Fisher set. After a while the Fisher began to chirp, and a few hours later the transformer suddenly warmed up and died. Meanwhile Mrs. Libber's set was behaving perfectly with the new transformer. Then suddenly she was back, with her husband.

"I'm not happy with the time you've taken on our set" she said. "You're still running your little advert, so you can't blame pressure of work. I know that you've been ill, but we can't help that. I came to you because I wanted service. We've been to the Weights and Measures about you."

I glanced at Mr. Libber. "Are you better, Mr. Bullock?" he began, smiling nervously. She glanced at him and his smile went.

The set seemed to be working all right with the new transformer, but I wanted to be sure. I ignored Mrs. Libber and addressed her husband. "If you telephone tomorrow I may have good news about your set." Off she strode, with her husband in tow.

The set continued to work well after being boxed up. So next day I asked him to collect it. While waiting for him I pondered on what to do about charging. I'd spent a lot of time on the set and fitted an expensive line output transformer that I now had to re-order. If I made a charge I'd be stuck with Mrs. Libber in the event of a further fault occurring. Or, come to that, if a passing aeroplane fluttered her picture or the programme went off the air.

When Mr. Libber called I told him that I wasn't happy about my dealings with his wife and didn't want to see or hear from her again, that fitting a new line output transformer had cured the latest trouble and that there wouldn't be a charge.

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Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81	Capstan Motor	VID 1005 £1.81
Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27	Capstan Motor	VID 1260 £24.27
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Channel 5 Reception Problems

Harold Peters

By this autumn we should know to whom the licence for the fifth, and last, terrestrial UK TV channel has been awarded. Whoever it is looks to be in for a tough time. The franchise holder must undertake to retune or modify any equipment with which the Channel 5 transmissions interfere. This is a job that's easier said than done. There are likely to be other problems, as outlined in various recent letters in the correspondence pages. The purpose of the present article is to pull together as much information as is currently available to help prepare readers for what lies ahead. After looking at coverage we'll go over the theory behind possible causes of interference for the benefit of those who are a bit rusty on this side of things or who, for a quarter of a century, have been able to take the current channel allocations for granted.

The Broadcasting Act

The Broadcasting Act, 1990 didn't help. It merely made provision for a fifth TV service using mainly channels 35-37. Apart from the retuning proviso, the rest of its text was devoted to specifying the programme requirements. The Independent Television Commission asked National Transcommunications Ltd. and others to assist it in working out how the extra service can be fitted into the gap between Bands IV and V and the extent of the obligation for the licensee to retune users' equipment. Potential bidders can see what they are in for by getting the ITC report - a snip at £587.50 a copy.

Some Comments

Last December's Teletopics column mentioned that the licensee will not be responsible for retuning VCRs etc. if the interference is caused after the viewer has installed equipment (aerials etc.) for Channel 5 reception: it will be down to the viewer to get this done when the installation is carried out. A letter from Gareth Foster in the same issue pointed out that the intention is to cross-polarise the Channel 5 signal with respect to the other four at many transmitting sites, i.e. use vertical instead of horizontal polarisation. He reported that one reason for this is to avoid interference to Irish and French stations that already use the relevant channel. Bill Wright, in the January issue, put the point of view of the signal provider dealing with more programmes than the basic four plus VCR and satellite TV, experiencing difficulty in

finding room for them all let alone any newcomers. There must be many more of you who are equally worried but didn't write about it. So let's start by looking at the current channel allocations to see how Channel 5 fits in, see Fig. 1.

Channel Allocations

Up to now TV networking has been in Bands IV (channels 21-34) and V (channels 39-68). The space in between, channels 35-38, was left as a no-man's land occupied by signals other than TV, some of which have only recently been cleared. For the last decade or so almost all the extra equipment connected to TV sets, i.e. VCRs, video games, computers and more recently satellite TV tuners, has used this gap to add its signal(s) to the incoming networked four. VCRs usually leave the factory tuned to channel 36, which is a great help to installers.

Channel 5 is to use this gap (channels 35-38), with the majority of the stations using channel 35 or 37 as these two channels have been the easiest to clear of other services. About half a dozen or so mostly low- or medium-power stations will use a channel outside the 35-38 group. Table 1 lists the carrier frequencies for channels 34 to 39.

Coverage

The coverage plan grew from a combined survey for a possible "city TV" provision carried out in 1987. It was found that by concentrating on the areas of greatest population density a fifth service could reach 60 per cent of the population. Further work improved this to 70 per cent, using twenty five transmitters. This scheme was in the process of getting international approval by the time that the Broadcasting act was passed. By using some channels outside 35-38 the coverage has been further increased to 75 per cent and, at the time of writing, the extra eight transmitters are hopefully getting international clearance, bringing the total up to 33.

The "city TV" idea was included in the network plan to enable the licensee to arrange for local "opt-outs". It shows up particularly in some of the "extra eight" stations. Initially Winter Hill would have served both Liverpool and Manchester: now Storeton gives Liverpool its own station, with Winter Hill providing Manchester's "city TV". Likewise the Nottingham station leaves Sutton Coldfield to serve Birmingham, Craigkelly serves Edinburgh so that Glasgow can

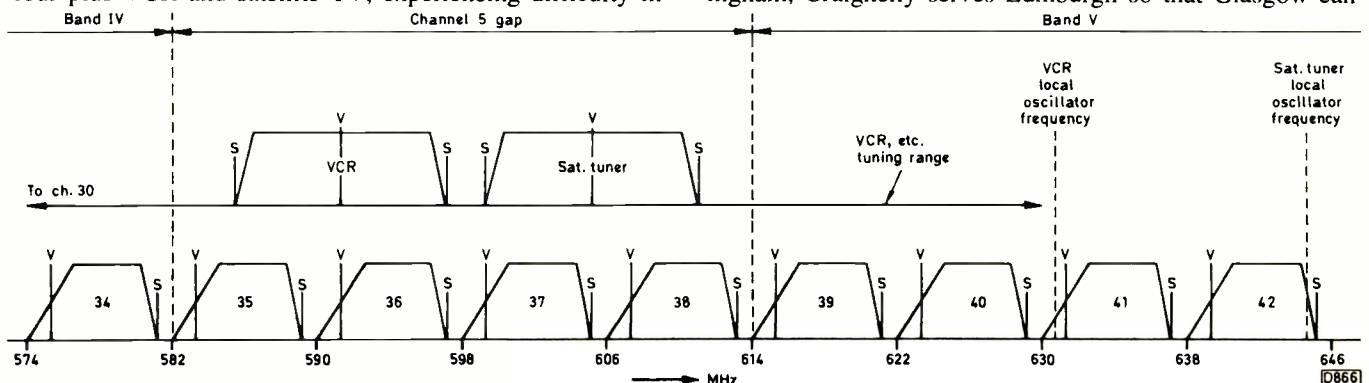


Fig. 1: The gap between Bands IV and V where most of the Channel 5 transmitters will operate. There are four broadcast channels but only two VCR/satellite tuner/video game etc. outputs can be accommodated as their modulators produce a double-sideband output that takes up to 12MHz.

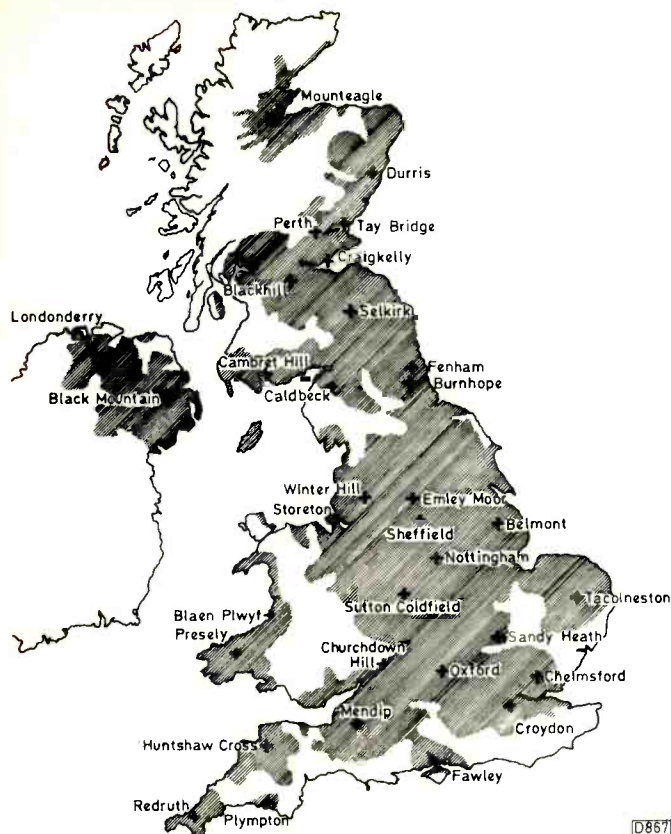


Fig. 2: Approximate predicted coverage of the Channel 5 service, using 33 transmitters.

have Black Hill, and Fenham serves Tyneside leaving Burnhope to cater for Teeside. Sheffield also has its own station so that Emley Moor can serve Leeds. The only area where a second station couldn't be arranged was the Bristol Channel, so Bristol shares Mendip with Cardiff. Other gaps in the frequency spectrum made it possible to have extra stations for Carlisle (Caldbeck), Cheltenham and Gloucester (Churchdown Hill) and Bedford (Sandy Heath). You've probably been checking this against the map (Fig. 2) and Table 2 and have already noticed that not all the transmitters are co-sited with existing main stations and that where they are the polarisation is usually different.

Co-channel Interference

The use of only channels 35 and 37 to cover the UK is asking for co-channel interference – we get enough of it with the present networks. Because of this, many of the present stations are offset from the nominal channel carrier frequency by plus or minus five-thirds of the line frequency (26.0416rec.kHz), which has been found to give the least

Table 1: Ch. 34-39 carrier frequencies.

Channel	Vision, MHz	Sound, MHz
34	575.25	581.25
35	583.25	589.25
36	591.25	597.25
37	599.25	605.25
38	607.25	613.25
39	615.25	621.25

Plus or minus offsets for co-channel operation. For Nicam sound add 5.52kHz to the sound carrier.

objectionable patterning. Even so with a transmitter stability of plus or minus 200Hz the degree of impairment can vary from downright annoying to being barely perceptible. To permit Channel 5 powers as high as they are planned, a precision of plus or minus 1Hz is required. This calls for reference via satellite to an atomic clock or something similar. In many cases the e.r.p. is similar to that of the existing four main-station channels. This would result in interference without the previously mentioned use of cross-polarisation. Seven of the proposed Channel 5 transmitters use horizontal polarisation, the rest being vertically polarised. Only at ten locations will the new service be co-polarised with the existing transmissions, Emley Moor being the best example. An extra aerial will almost certainly be required for Channel 5 anywhere else.

To keep Europe happy there's not a single main Channel 5 station along the entire south coast while the power at Tacolneston, Croydon and Redruth is substantially less than that for the present services.

Just to be helpful, a Home Office ruling barred the BBC from providing transmission services for Channel 5. This is the reason for most of the stations being on NTL landlord sites, including old 405-line masts like Croydon, Burnhope, Black Mountain etc. The exception here is Sutton Coldfield. Birmingham's Channel 5 station could have used the Lichfield mast, but BBC-1 from Sutton Coldfield would be on the "second channel" (channel 46) and a lot nearer to the city. The problem is solved by co-siting Channel 5 at Sutton Coldfield, cross-polarised. This is a typical n + 9 interference problem (see later).

West London has a problem of its own. Heathrow uses channel 36 for aircraft, Channel 5 is on ch. 37 and BBC-2 has been on ch. 33 for some thirty years. So viewers with a VCR and a satellite TV receiver won't have a lot of room in which to manoeuvre.

Aerials

Just to recap, the present receiving aerial groups are as follows:

A	chs. 21-34	colour code red
B	chs. 39-53	colour code yellow
C/D	chs. 48-68	colour code green
E	chs. 39-68	colour code brown
W	chs. 21-68	colour code black

The majority of existing aerials will not be suitable for Channel 5 reception. The areas where it might be possible, because the signals are co-polarised, are Perth, Caldbeck (Carlisle), Londonderry, Belfast, Newcastle, Leeds, Liverpool, Sheffield, Nottingham and Bedford. In these areas group A or B aerials are required for the present services: they should be able to pick up chs. 35-37 reasonably well.

Receiving aerials are tuned to have a flat response over most of their intended bandwidth. The elements are cut to a length that corresponds with half a wavelength of the wanted frequency. The folded dipole, which is the signal collector, is cut to the nominal centre frequency dimension. To achieve a wide bandwidth response the directors are cut shorter and the reflector elements are longer. It follows from this that if a high-band aerial (i.e. group C) is asked to pick up a lower channel there comes a point where the reflector is less than a quarter wavelength and acts as a director, effectively turning the array round to point the other way. Similarly if a low-band array is asked to pick up a higher channel there comes a point where its directors act as reflectors and it, too, points the other way. As a rule of thumb, the more ele-

Table 2: Channel 5 transmitters.

Transmitter	Ch.	E.R.P.	PO	Co-sited services	
		kW		E.R.P., kW	Aerials
Belmont	35V	500	-	500	A H
Black Hill	37V	500	0	500	B H
Black Mountain	35V	500	-	0.025	B V
Blaen Plwyf	35V	100	-	100	A H
Burnhope	35V	500	-	Radio	
Caldbeck	56H	10	0	500	A H
Cambret Hill	37V	20	-	16	B H
Chelmsford	35H	1	-	None	
Churchdown Hill	48H	1		Radio	
Craigkelly	48V	4		100	A H
Croydon	37V	250	+	LBC radio	
Durris	35V	500	+	500	A H
Emley Moor	37H	870	+	1000	B H
Fawley	35V	2	0	None	
Fenham	37V	2		2	A V
Huntshaw Cross	35V	100	0	100	C/D H
Londonderry	37V	10	0	10	B V
Mendip	37V	126	-	500	C/D H
Mounteagle	35V	100	0	Radio	
Nottingham	34V	2	+	2	A V
Oxford	35V	200	+	500	C/D H
Perth	35V	2	-	2	B V
Plympton	35H	2.5	-	2	C/D V
Presely	37V	100	+	100	B H
Redruth	37V	3	-	100	B H
Sandy Heath	39H	10	-	1000	A H
Selkirk	35V	50	0	50	C/D H
Sheffield	67V	2.5		5	A V
Storeton	39V	2.8	0	2.8	A V
Sutton Coldfield	37V	1000	0	1000	B H
Tacolneston	37V	30	-	250	C/D H
Tay Bridge	37H	2	-	0.5	B V
Winter Hill	35V	500	+	500	C/D H

V = vertical polarisation, H = horizontal polarisation, PO = precision offset.

ments an array has the more abrupt is the transition. So in general it looks like installing another array where Channel 5 is required.

Vestigial Sideband Transmission

As with the present services, Channel 5 will use vestigial sideband transmission. This is something you've probably taken for granted for the last thirty or so years, so a recap won't be amiss.

To save spectrum space the vision modulation, in the form of a.m. sidebands, is radiated at only frequencies higher than the carrier - or at least they would be were it not necessary to attenuate the carrier itself to keep the signal proportions right. As you can see from Fig. 3, this is done by a slow roll-off of the sidebands below +1.25MHz, reaching zero at -1.25MHz (with respect to the carrier). The f.m. sound is 6MHz above the vision carrier while the Nicam sound is at +6.552MHz. The vision carriers are spaced 8MHz apart, so between the end of Band IV (ch. 34) and the beginning of Band V (ch. 39) there is 32MHz of space into which four more vestigial sideband channels can be fitted.

This is fine for broadcasters. But your VCR, satellite

receiver etc. has a simple modulator without sideband shaping, also a sound carrier that pops up at each side of the double-sideband signal (refer back to Fig. 1). This incidentally explains why you can so often get two tuning peaks when tuning a TV set to a VCR that's playing a tape or in the E-E mode. It's better by far to bring up the "bars" using the switch at the back. In this mode there's no sound carrier to fox the TV set's a.f.c. system, but we digress.

Thus the output from a VCR/satellite etc. modulator occupies a full 12MHz, so you can get only two "channels" into the no-man's land between Bands IV and V. Because such modulators are tunable five channels either side of ch. 36 they can be shifted well away from any potential Channel 5 signal, but this is where the fun starts, because it's not only the frequencies between chs. 34 and 39 that can produce patterning interference.

Patterning

All VCRs, TV sets etc. use the superhet principle, with the local oscillator on the high side. The vision i.f., which is the difference between the local oscillator frequency and the frequency of the carrier being received, is 39.5MHz (or maybe

the Euro 38.9MHz). One result of the frequency conversion process is that the sound and vision carriers change place. Thus the sound i.f. is low at 33.5MHz (Euro 32.9MHz). It's normally suppressed in favour of the intercarrier sound (6MHz) and gives no problems, which is as well since the vision carrier gives us plenty to contend with.

Consider ch. 36, whose vision carrier frequency is 591.25MHz. The local oscillator frequency of a VCR with an i.f. of 39.5MHz will be 630.75MHz, pushing into ch. 41 with which it will interfere. Another source of patterning occurs at twice the i.f. (79MHz), in this case 670.25MHz, the equipment's "second channel". This comes around chs. 45 and 46.

We thus have the likelihood of herringbone patterning in channels 41 and 45/6 caused by a working VCR or satellite TV tuner. Because of the channel spacing from the original carrier this is known as $n + 5$ and $n + 9$ interference. These are the most common and most difficult to shift forms of interference. Vision i.f. harmonics continue to appear at intervals of 39.5MHz right up the band as far as the region of ch. 60 and can cause trouble especially when the incoming u.h.f. signal is weak in comparison.

An interfering signal at -26dB (voltage) is still perceptible enough to be irritating, which means that with a wanted signal at just below the threshold of comfort, say 500 μ V, a mere 25 μ V of interference can irk mightily. It's viewers whose main station uses Band V frequencies that will be most likely to suffer from the start up of Channel 5. It's a simple enough matter to detune the VCR etc. away from the new Channel 5 station, but you must ensure that in doing so you are free from interference on the higher in the band stations required. If you have more than one item of auxiliary gear (VCR, satellite TV tuner etc.) have them all up and running while you, or your friendly local Channel 5 representative, is doing the retuning.

If Band IV signals are being received, tuning the VCR etc. to a channel higher than the Channel 5 one should be all that's needed, but with more than one item the modulators may run out of range before you can clear the channel. Most in-built modulators will tune five channels either side of ch. 35 but, as mentioned earlier in the case of West London, this leaves little room in which to move about when Channel 5 has been allocated ch. 37, Heathrow is still using ch. 36 and BBC-2 has been using ch. 33 since u.h.f. broadcasting began.

Cross-modulation

Cross-modulation is most likely to be a problem with non-co-sited transmitters where reception of a weaker Channel 5 signal from some distance away is required close to a strong local station. The TV set will display both the wanted and unwanted pictures - amongst other things.

Cross-modulation occurs when the r.f. amplifier transistor in the tuner is overloaded. It then behaves as a non-linear

amplifier (call it a detector if you prefer). As a result, mixing takes place between the incoming signals. If all the incoming signals are of equal strength, cross-modulation can be overcome by applying a.g.c. to the r.f. amplifier transistor to reduce its gain so that it behaves as a simple linear amplifier.

To avoid mixer noise putting snow on the picture, the start of the r.f. a.g.c. action is normally delayed until the input rises above 3mV: the a.g.c. crossover control sets this delay. With an input of less than 3mV a.g.c. is applied to the i.f. amplifier. If the wanted signal is say 1mV and an unwanted one 10mV, the a.g.c. output from the detector, being based on the wanted signal, will not be large enough to switch control to the r.f. amplifier, which as a result will overload. As long as the difference in signal level is not too great, careful adjustment of the a.g.c. crossover potentiometer to start r.f. control earlier will help. Economics assist here: if the signals are strong a simple aerial is used, keeping the input levels down. Unfortunately, being flatly tuned the r.f. amplifier tends to act on the sum of all the signals it receives. Thus with 10mV each of VCR and satellite TV receiver output on top of all the other inputs it's driven towards the overload point.

Retuning

Whilst on economics, let's end the theory part by looking at how Channel 5 will be expected to tackle the retuning. Retuning is the collective word used by the ITC to cover all forms of interference removal, including the fitting of filters etc. Potential Channel 5 licencees expressed so much concern about this that the ITC issued additional guidance last January in question and answer form. This goes as follows.

Who will do the retuning? This is up to the licencee: whoever he recruits or trains must satisfy the ITC's definition of competence to do the job in a "proper manner".

Can viewers do their own tuning? Certainly. But help can still be obtained if this is unsuccessful.

Will there be delays? It's hoped that much of the retuning will be done before the start of transmissions, using test transmissions which will be kept as short as possible to avoid troubling unconverted equipment. Requests for retuning should be honoured within 21 days, or seven days once the service begins.

What if the trouble recurs? If a second Channel 5 transmitter comes into operation nearby for example and further help is required this remains the broadcaster's responsibility and expense.

How will viewers know what's causing the interference? The licencee is expected to publicise the start-up date for the Channel 5 service in each area and to encourage requests for retuning.

What about fiddles and malpractice? This one is still being worked on.

In Conclusion

It looks as if we're in for an interesting time. A lot could change before the start of the service, but it would be a pity if the "city TV" concept was watered down. That's my view anyway, and while being personal I must thank the ITC's Engineering Information staff for keeping me up to date and for permission to reprint their coverage map.

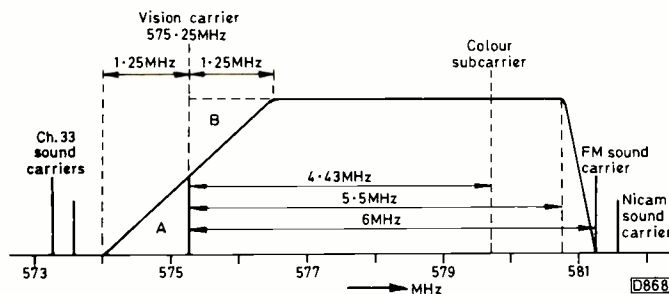


Fig. 3: The frequency spectrum of ch.34 showing the vestigial sideband arrangement. The roll-off begins at +1.25 MHz with respect to the vision carrier: sideband area A compensates for the missing area B.

Long-distance Television

Roger Bunney

Now that the summer is here F2 layer propagation has lessened considerably and we can hope for a dramatic increase in Sporadic E (SpE) propagation. We are however still high up on the descending slope of Solar Cycle 22: my experience gained over the past thirty years suggests that as a result the 1992 SpE season will be little better than last year's indifferent one. Hopefully I'll be proved wrong!

There were in fact a couple of good days for SpE reception during April. Tropospheric enhancement also occurred on several days, with widespread reception on the 6-10th across much of the UK. The 6-8th were the best days. On the 6-7th there was extensive reception of v.h.f./u.h.f. signals from Scandinavia and also reception from Germany and Luxembourg. Of particular note were certain of the new Swedish TV4 transmitters (chs. E46 and 50). There were fewer Scandinavian signals on the 8th, but the "usual" Benelux Band III/u.h.f. stations were present instead. A German relay station was noted transmitting the SAT 1 service - check ch. E52 during the next opening. The 9th was similar to the 8th: on the 10th reception was more from the south, with Spanish u.h.f. transmitters being received in the south west - Canal Plus Espagne was seen using the PM5544 test pattern.

The only F2 reception during April consisted of midday sightings of Iran and Dubai ch. E2 on the 12th.

The SpE log is as follows:

11/4/92	TVE (Spain) chs. E2, 3.
17/4/92	TVE E3; DR (Denmark) E3; TVR (Rumania) R2.
20/4/92	DR E3; HTV (Yugoslavia) E3.
21/4/92	+PTT (Switzerland) E2, 3; DR E3.
22/4/92	+PTT E2; TVE E2, 3; SVT (Sweden) E3; NRK (Norway) E4; CST (Czechoslovakia) R1, 2.
23/4/92	+PTT E2; NRK E2; SVT E2.
24/4/92	+PTT E3; DR E4; JRT/HTV E3; RTP (Portugal) E2; DR E4; ARD (Germany) E2; MTV-1 (Hungary) R1; TVE-2 E2.
26/4/92	NRK E2; TVE E2, 3.
3/5/92	RAI (Italy) IA; DR E3; ARD E2; NRK E2, 3.

Our thanks to Brian Williams (Penarth), Roger Fussell (Torpoint), Simon Hamer (Powys), David Glenday (Arbroath) and Peter Schubert (Rainham) for sending in reception reports.

Exiting news from Garry Smith (Derby). Comparison of Gulf War pictures in a BBC-2 documentary and his own shots of F2 layer reception has confirmed that he received the Egyptian ch. E2 second network transmitter at Dumyat - power is only 900W e.r.p. Other photographs of clocks and logos confirm Egyptian reception. The signal strength was very high and, by F2 standards, the single signal hop was short. Our congratulations to Garry on this excellent reception. In view of the number of other mystery F2 loggings on ch. E2 we need perhaps to reconsider the transmitters in Egypt and the Lebanon.

Aerial Techniques has just published its latest (and larger) catalogue, which is packed with TV reception and satellite TV goodies for both conventional and DX reception. It's

available at just £1 including UK postage from Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH (0202 738 3232).

News Items

Sri Lanka: Various new services have either started or are due on-air shortly. The Teleshan company is to start a service using chs. E3, 4 and 21 (some reports suggest E2 and 3). Maharaja Television is now in operation, run by Singapore interests. Sunflower Systems Ltd. is setting up a local service based in Colombo, with the transmitter at Nuwara Eliya.

Cyprus: A pay-TV service called Lumiere Television (LTV) has started in Nicosia and is to be extended to Limassol and Larnaca. The Irdeto system, similar to M Net, is used for scrambling. Transmissions are from 1700-2400.

France: The La Sept channel operators are discussing with Arte Deutschland TV GmbH, a subsidiary of ARD and ZDF, a new service that will take over the La Cinq transmission facilities and channels.

Malaysia: Kuala Lumpur is likely to have two new services by next January, SNS (Subscriber News Service) and TV4.

Singapore: There are plans to start three Pay-TV services using u.h.f. channels.

Portugal: SIC (Independent Media Co.) and TVI (Independent Television) are to set up services. SIC hopes to be in operation this winter, using RTP transmitter facilities; TVI will establish its own transmitter network.

Andorra: The ORTA service has been suspended following the cessation of funding by the government.

Zimbabwe: A second TV network is to be established.

Czechoslovakia: The OK3 network in Bohemia and Moravia is to continue until the end of the year. Czech TV is now operating from a new ch. R41, 100kW e.r.p. transmitter at Domazlice/Vrani. Zlin-TV is carrying out tests from the old OK3 Zlin ch. R51 transmitter.

The 50MHz Amateur Band: Amateurs are now active in this band in Lithuania, Estonia and Latvia: there are also two amateur transmitters in Greenland. Transmissions are prohibited in Monaco, where Tele Monte Carlo holds the rights to the old 819-line ch. F2 that covers the 50MHz spectrum. Though it hasn't used the channel for many years TMC refuses to relinquish the allocation. This is also preventing French amateurs in the Alpes-Maritime region from using the band.

New DX Tuner

HS Publications, 7 Epping Close, Mackworth Estate, Derby DE3 4HR has introduced a new DX tuner, Model D400, that covers Bands I/II/III and part of the u.h.f. spectrum. The i.f. bandwidth can be varied and the output is at u.h.f. for feeding to a domestic TV set. Price is around £50. We propose to include a review of this simple to use tuner next month. Meanwhile further details can be obtained by sending an s.a.e. to the above address.

New TV Networks

The BDXC has supplied details of the Norwegian TV2 network that's due to come into operation in early September. The u.h.f. channels will be as follows: Odderoya/Kristiansand E30; Mandal E24; Kvinesdal E40; Arendal E25; Lillesand E22; Fevik E30 and E54; Mandvikheia E47; Vennesla (Krist. N) E53; Sogne (Krist. W) E32; Grimstad E42; Tvedestraand E27. Oslo and Bergen will probably use ch. E12.

The Finnish government has granted nine licences to operate experimental local TV services in thirteen regions. They

last until June 1997. Transmitter locations are: Savolinna, Rauma, Kouvola, Lammi, Narpio, Savitaipale, Ylivieska, Kristiinankaupunki and Korppoo. These are all small towns: applications to run services in Helsinki were rejected. Our thanks to Perti Salonen (Vaajakoski) for this information.

Satellite News

We paid a visit to the Cable and Satellite 92 Show at Olympia during the month. To us it was less interesting than last year as there were fewer small traders offering "bits and pieces" and essential components at bargain prices. This is partly due to the demise of the black-box industry that kept many small dealers in business offering low-price Filmnet decoders. Many new receivers were on display. Echo-sphere's manual SR50 receiver continues to be popular despite it being "all knobs". The company launched its new ultra-low threshold weak-signal LT530 receiver which is intended for the African/Middle East market. It looks like a promising development and we hope to review it shortly.

Several companies had long Yagi aerials in stacked formation for either S Band Arabsat or C Band (4GHz) reception. Space and Scientific (Reading) showed a massive C Band quad-stack Yagi with a claimed gain approaching that of a 2.4m dish – around 36dBi. The boom length is over 2m. This company has had considerable success with an S band version and produced the C band array as a high-gain, low-profile system that avoids the visual impact of a large dish. The Bentley Walker Group (Hayling Island) also showed various S Band Yagi systems along with specialised equipment intended for use in the Middle East.

CNN International is now using transponder 28 (11.62GHz vertical) at the 19°E Astra slot in addition to the feed via Intelsat VI F1 at 27.5°W – the latter feed is to be transferred to Band C. Unfortunately the Astra feed is to be scrambled at a later date. Astra is apparently being used because of the greater coverage, extending to Spain and the Canaries. Incidentally CNN International is also to provide a 24-hour DTH service via the Japanese Superbird B satellite.

September is likely to see the start of a BBC/Thames Television channel via Astra, initially clear but with Videocrypt encryption starting next spring.

Television New Zealand is seeking funds for a satellite channel with a footprint covering Asia via the Palapa craft. ABC Australia is also considering a satellite channel with Asian coverage.

German broadcaster Deutsche Welle is to start an equivalent of BBC World Service TV from Eutelsat II F1 at 13°E, initially starting with four hours of transmissions a day. The satellite already carries DW's external radio service. It also carries a daily news exchange between Capital Studios in Israel and Visnews, London.

Intelsat has signed an agreement with China Great Wall Industry Co. to use a Long March rocket to launch a future Intelsat bird. Discount terms have been introduced by Intelsat for broadcasters seeking to use transponders with digital sound carriers that give CD quality audio with only 25 per cent of the bandwidth required for traditional modulation.

The TV Plus 11.67GHz (horizontal) channel via Eutelsat II F3 at 16° E has been carrying 16:9 format transmissions from time to time since last February, with Matsushita Satbox encryption on occasions. Der Kabelkanal (11.09GHz hor.) via Eutelsat II F1 at 13°E is to adopt scrambling shortly.

Finally some decisions from WARC '92 relating to satellite transmissions. The Broadcast Satellite Service – Sound (BSSS) band has been agreed as follows. Worldwide 1.452-1.492GHz using Digital Audio Broadcasting (DAB) only, but on a secondary user basis in Europe until the year 2007. An

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Aerial Techniques

additional BSSS band for exclusive US use is 2.310-2.360GHz, and a secondary band 2.400-2.450GHz. A further BSSS band, 2.535-2.655GHz, will be used in parts of Asia. A new worldwide primary band has been allocated from 2007 for HD-TV: in the Americas this will be 17.3-17.8GHz, elsewhere 21.4-22.0GHz.

Cable Losses

The feeder is often overlooked when the merits of an aerial system are being considered. Yet the cable is perhaps more important than the aerial itself, since the few precious microvolts of a rare DX signal can easily be lost when inferior cable is used. Unfortunately the quality of coaxial cable has deteriorated over the past decade, due in part to the rising price of copper. The conductive braid often resembles fragile tinsel wire, the result being inferior screening. When you are considering the purchase of cable, pay attention to its electrical and physical construction as well as the claimed attenuation figures. If in doubt, the now readily available satellite

Table 1: Cable attenuation figures (Volaxial range) in dB/100m.

Frequency	RF60	RF75	RF100	RF125
50MHz	7.86	6.81	5.10	4.59
100MHz	11.22	9.72	7.29	6.57
200MHz	16.05	13.89	10.45	9.42
500MHz	25.85	22.36	16.93	15.30
650MHz	29.65	25.67	19.47	17.61
850MHz	34.15	29.57	22.48	20.36

TV coaxial cable can be used: this has the conventional 75Ω impedance and in addition has a plaited screen and an over-laying copper tape.

Attenuation figures are revealing. If a considerable run is required the best quality cable available within your overall budget should be used. As an example, Table 1 gives the attenuation figures in dB per 100 metres for the Volaxial range, which consists of four types. The RF60 is mainly intended for short runs with low v.h.f. applications while the top of the range RF125 is primarily for u.h.f. use. Remember that a 6dB voltage drop represents a fifty per cent fall. The overall thickness of RF60 cable is 4.7mm, which compares with 7.61mm for the RF125 type.

When installing cable avoid tight bends, do not hammer staples on to the cable tightly and beware of braid whiskers

that can short to the inner conductor at the aerial terminals or coaxial plug.

A remarkable new type of feeder, called Cavo-flex, was recently reported in *Six News*. It actually provides gain! Because of its design, which features a 3/8in. diameter internal vacuum cavity, the 0.75in. solid feeder increases signal power by up to 3dB per 100ft. The vacuum cavity has nil signal resistance, resembling the characteristics of free-space propagation. Before you all rush out to Maplins however Cavo-flex is not available in the UK. Its price would be very high, and because of its method of construction it's far less flexible than conventional coaxial cable. It cannot be bent and will be unhappy being wound around an aerial rotor. An aerial feeder with gain does sound rather like an April 1st press release!

CD Player Casebook

Reports from Mike Leach
and P.J. Roberts

Denon DCD910

This player suffered from the all too common fault of skipping and jumping. In the past I've had one or two problems with the worm gear sticking in these machines, but in this case the laser assembly was the cause of the fault. It's the Sony KSS150A type, which was replaced by the KSS210A. The laser unit in these machines is nice and easy to change, not requiring a complete strip down. Just take off the bottom cover and move the plastic bar that holds the gear in place to one side: the laser unit will then come out from the top. Reverse this procedure when fitting the replacement. M.L.

JVC XLE3

This machine was fitted with a new laser unit as it wouldn't read the TOC. The manual said it was fitted with an Optima 2 but the ticket inside the machine said Optima 3. Anyway we fitted an Optima 2 and all seemed to be o.k. Then the trouble started.

First the machine came back with the complaint of skipping and jumping. As we couldn't find anything wrong we set it up and it seemed to be o.k. Three weeks later it came back again because of no sound, but no one told me that this was the same machine that had had the new laser unit fitted and was still under guarantee. We found that the cause of this new fault was the YM3815 digital decoder chip, so the machine was sent back to the customer as an uneconomical repair. Suffice it to say that the machine reappeared along with its rather unhappy owner. Apologies were made and a new YM3815 chip was fitted.

Hopefully the customer is now happy, but the story does highlight one of the problems we face in this trade. If your garage fits a new clutch and three weeks later the battery goes flat you buy a new one and have done with it. It's not as straightforward in the consumer electronics field: how do you try to explain to a customer who has just spent a lot of money on an item such as a laser unit that the player now wants say another forty pounds being spent on it within the repair guarantee period? It's not an easy one. I think it's best just to put such things down to experience. M.L.

Philips CD371

This player wouldn't spin the disc or read the TOC. On further investigation I found that in addition the laser didn't light. A quick check on the supply lines established that all

was in order here. I didn't suspect the laser at this stage and decided to look around the a.p.c. circuit. If you look at the circuit diagram you'll see that the laser is supplied from the 9V rail via R3532, transistor 6527 and R3533. Time for the meter again. A check around this circuit showed that transistor 6527 had 9V at its collector, so R3532 was o.k. Its base was at 0V however, so either R3530 was open-circuit or C2546 was short-circuit. Cold checks with the power disconnected showed that C2546 was indeed short-circuit. With a new 10μF capacitor installed the player found focus, read the TOC and played the test disc without difficulty. P.J.R.

Jamo DS50

This CD multiplayer/tuner/amplifier certainly gave me a run for my money. It all started with a simple CD player fault. The unit wouldn't read the TOC or play, nor would the disc spin up. On dismantling the unit I found that, due to hard grease on the sled worm gear, the pick-up was stuck half way along the slide rails. The worm gear was cleaned but the pick-up still refused to move. The trouble was that the sled motor driver transistors Q104 (2SB892S) and Q105 (2SD1207S) both had collector-emitter leakage and had destroyed their 2.2Ω feed resistors R147/8. They had probably been damaged by the jammed pick-up.

With new transistors and resistors installed the pick-up returned to its rest position, the lens moved and the laser lit. But focus wasn't found when a disc was loaded, so the disc wouldn't spin up. This time the cause of the trouble was the CXA1081M r.f. preamplifier chip. This was replaced and the focus offset adjustment was carried out. A disc was then loaded and play was selected. Focus was found and the disc spun up, but the tracking servo didn't lock.

At this point I noticed a couple of other burnt 2.2Ω resistors, R142/3. These are the feed resistors for the tracking driver transistors Q108 (2SB892S) and Q109 (2SD1207S) which were also leaky. The pick-up's tracking coil was checked and found to be o.k., so replacement transistors and resistors were installed. The E-F balance was adjusted and the focus offset and PLL adjustments were checked.

After all this I wondered whether anything else would be wrong. Taking my heart in my hand I loaded a disc and pressed play. Focus was found, the disc spun up, the tracking servo locked and sound came from the speakers. Also the test disc played all right. I reassembled the player and gave it a short soak test before returning to the customer. P.J.R.

Satellite Notebook

Nick Beer

A mixed bag of technical tales from the satellite department this month.

Interfaces

Last month I mentioned the Global interface which enables receivers designed for use with Marconi-type head units to be used with an electromagnetic polariser (there's also one that works the other way round). I found that it wouldn't work with a FUBA/Nokia polariser but had heard that it was o.k. with Racal units. I used it successfully with a Panasonic kit.

Having heard of my tests our sales department arranged to rent a Pace 9200 IRD to a customer who had purchased a top-of-the-range Panasonic TV set. The customer had said that he already had a dish and required only the receiver, so our salesman said we'd connect the two together.

The customer was some distance away in west Somerset and I went to do the job with little information on the installation. On arrival I found that the set was to be installed on the top floor of a large hotel, with access via a real warren of passages and tight stairways. The owner had installed the dish himself – the story as to how he came by a dish but no receiver was confused but seemed to relate to a house that had burnt down... He had fitted the dish right outside a fire exit, in a position where anyone intending to make a quick departure via the fire escape would have knocked himself silly immediately after going through the door.

The head unit was a Tatung Early Bird type with an electromagnetic polariser. A check with the meter showed that the dish had been aligned surprisingly well – it wasn't inclined quite enough. I set up the new TV set and tuner (lifting out a G11!) and found that use of one of the Global interfaces gave perfect results – alignment was far easier than with any other polariser I've tried.

The hotel owner's wife was rather on the friendly side and, judging by the collection of video tapes proudly displayed on shelves behind the set, she was an avid watcher of certain late-night German channels. The hotel's distribution system was arranged so that the output from a VCR or a satellite TV receiver could be fed to all rooms from the owner's flat. Mrs. hotel owner insisted that I showed her how to disconnect this should she want to watch something "privately"...

Tandy Receiver

I was recently asked to connect a Videocrypt decoder to a Tandy satellite TV receiver. It was a tiny affair, about six inches wide, that worked with a Marconi-type LNB. I'd not come across one before. Unfortunately there's no video output, so a decoder can't be connected. The customer didn't seem too surprised when he was told about this and willingly bought a new IRD from us. Thanks Tandy!

Local Interference

We've been getting a lot of calls recently to see satellite receivers and VCRs in the local, town area because of complaints of no vision or patterning. The cause of the trouble is that we have a new relay TV transmitter that uses channels

30, 40, 43 and 46. For customers who have a satellite TV receiver and possibly two VCRs the ch. 30-40 spectrum is getting busy and some careful tuning is required (can't wait for Channel 5, which in this area will be on ch. 35 from Huntshaw Cross!).

Despite being a local relay it's quite high powered – the BBC and NTL have been playing with the power since the station opened but there's still an imbalance between Channel 4 and the others (it's much higher). Good reception from the mast is possible many miles outside the intended service area, which means that its transmissions are being picked up on Huntshaw Cross aerials even though these are oppositely polarised and facing the wrong way. It's for this reason that the number of calls because of interference is far greater than might have been expected. When we explain to under-guaranteee satellite receiver owners that the problem is due to a new terrestrial transmitter some miles away they either think we're taking the Mick or say "I read about that trouble in *What Satellite?*", referring to the Eutelsat II F3/Astra 1B problem.

Beosat LM at 12GHz

We decided that it might be worth experimenting to see what we could get with our motorised system allied to the B and O LM in the 12/12.5GHz bands. So I fitted a Sharp multiband LNB with a noise figure of 1.3dB nominal in place of the 0.9dB, 11GHz LNB. This Sharp LNB is switched between the 11GHz and 12GHz bands by altering the LNB supply voltage from 12V to 18V. The Beosat LM has provision for this (LNB and LNB+ in the SETUP menu). You also have to type in the local oscillator frequency for the upper band, in this case 11.470GHz. We could get nothing at all however.

I checked that the switching worked and confirmed the local-oscillator frequency with Eurosat then phoned B and O who confirmed that the system wouldn't work unless the LM was equipped with version 3.0 or higher of the software. This did indeed get us some signals – more on this another time.

SMATV

There is, understandably, a lot of interest at present in SMATV systems: with higher than ever interest in the Astra transmissions there's a large potential market for communal systems. In terms of distribution frequency there's more than one way of going about an installation. I've recently encountered a couple of communal systems where the i.f. signal from the LNB is converted to a lower part of the u.h.f. spectrum and fed to viewers via the terrestrial u.h.f. distribution system. In one case each house has a single coaxial outlet plate whose output is split and fed to the TV set and a translator for the satellite i.f. The way these items were configured gave little thought to the likely life of the outlets!

One resident came to our shop and rented a TV set, a VCR and a satellite receiver, saying only that he was connected to a communal system and therefore didn't need a dish. When our installer arrived and found no satellite feed he concluded that a translator was required and asked the customer whether he had one or had arranged to have one provided via the Housing Association. The customer told him not to be so silly – the satellite receiver simply plugged into the TV outlet, into which he had, incidentally, already plugged a Y splitter to facilitate feeding a set in the kitchen. He wouldn't believe our installer until the two of them visited a neighbour who confirmed that he had "a box which cost £40". Our customer then complained about it all being a con. I became involved and suggested to him that £40 plus 22p a week was far cheaper than the £8 or so a month rental plus

£79.50 installation for a dish he probably wouldn't be allowed to erect anyway, but he didn't seem to want to see it this way – he then suggested that he would go to Radio Rentals for a dish!

Remote Control Interaction

We've discovered that the remote control unit used with the Finlux SR5100 IRD, a Cambridge made unit, interacts with the Ferguson Model 51P7 CTV receiver (TX98 chassis). Selection of certain functions will result in the TV set entering the AV or tuning mode, which is most inconvenient. This is something to bear in mind before concluding a sale or rental.

Corrections

Reference was made in the May Notebook to "the Bang and Olufsen product development manager". This was due to an editorial misunderstanding. The reference should have been to my own firm's Bang and Olufsen business development manager. The editor apologises for any embarrassment caused. Bang and Olufsen markets its own motorised satellite TV system, which is quite different from the system we devised and have been supplying.

While on the subject of corrections, the AV expander unit in the B and O Link article (January) is Model AVX-1, not aux-1.

TEST CASE 355

Time was when we collected AV equipment from schools and colleges for service and repair and took it back afterwards. In these hard times, with educational budgets as tight as everyone else's, to save money the equipment is brought to us – if the geography master or the caretaker can't fix it! Neither of them could fix this Hitachi VT410, so the headmaster dropped it in on his way home and asked us to ring him with an estimate before doing any work.

The pupils at Easthurst School for young gentlemen hadn't been very gentle with this machine! The loading cradle was bent and the cassette flap had been wrecked. Apart from these two items, a deck service and head clean were required. As always in this trade we had to do most of the work before an estimate could be made: unless the machine is operational, how do you know what problems there are? Our final check before giving a quote for the cost of the repair was to carry out a recording test. And here we ran into a snag. Although playback of a good tape was fine, when the machine's own recording was played back there was a flickering picture that was overlaid with spots and blobs – the classic symptoms of a blocked head.

We cleaned the heads and made another recording, but the results were exactly the same. When one of the machine's recordings was played back via another machine the same spotty, flickering pictures appeared. We hooked up an oscilloscope to check the off-tape f.m. signal waveform: the shape of the envelope clearly showed that one head wasn't recording anything on the tape while the other head was working

normally. The heads were cleaned once more and were this time examined closely with a watchmaker's eyeglass magnifier. They appeared to be perfectly all right, as did the connections to the head drum at the plug and socket on the bottom of the preamplifier PCB.

This machine doesn't have a luminance recording current preset, but we reasoned that if there was anything wrong with the writing current both heads would be affected equally. Nevertheless we made a check at pin 2 of the head connector – this is the common record feed to both heads. The waveform here was good. Could one of the heads be faulty? If so, what sort of fault would completely remove the head's ability to record while leaving its reading ability intact? Could something strange have happened to the rotary transformer? The preamplifiers and heads were disconnected, at accessible points, and the continuity of all the windings was checked. Both transformers were o.k.

The REC 9V supply switches the heads into the record mode. It enters the head preamplifier PCB at pin 9 of CN6. A check showed that 9.2V was present here in the record mode. At this point we decided to change the head drum. Another VT410 that had been refurbished for rental provided a drum for the purpose. For a test like this there's no need to go through the complete alignment procedure. We soon had the substitute head installed and spinning. Once again playback of the workshop test tape was entirely satisfactory but only alternate fields could be recorded: the same spotty, flickering playback picture greeted our disappointed gaze.

The cause of the trouble was eventually found. It was a tiny component which we didn't even have to draw from the stores – there was a spare unused one in the machine itself! What was it? For the answer and another diagnostic puzzle, see next month's issue.

ANSWER TO TEST CASE 354 – page 588 last month –

The Tatung TRX1801 satellite TV tuner that was the subject of last month's test case had to be fitted with three new 12V regulator chips before it was truly repaired. The replacements would go open-circuit within a few days of being fitted, to the exasperation of the tuner's user, Mr. Tate, and the chagrin of the service department – especially poor Philbert who had to do the fetching and carrying.

During our tests in the workshop the tuner worked perfectly signalwise and the output from the regulator chip IC802 remained steady at 12V, monitored by a meter hooked up for the purpose. In fact without its case the tuner might have gone on working indefinitely, for the basic cause of the problem was overheating in the little regulator chip despite its heatsink. It got very warm indeed, too hot to touch for long. A check with another tuner of the same type showed that the current being drawn from the regulator was correct: but the other tuner's regulator didn't run nearly so warmly – and neither did its mains transformer!

This was the key to the diagnosis. In the faulty set the voltage applied to the 12V regulator (and indeed to the others, but they were not so distressed by it) was excessive because the mains transformer was defective – perhaps with a few shorting turns, or perhaps just out of specification. A replacement transformer solved the problem by reducing the dissipation of the third regulator we had to fit in the IC802 position. It's still in there and working.

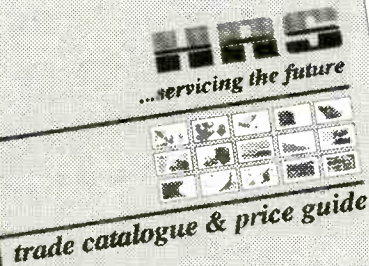
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TRANSISTORS Cont.

Table of transistor part numbers and prices, including models like 2SD1391, SDC1397, etc.

TD8180 ORIGINAL

Table of transistor part numbers and prices under the TD8180 ORIGINAL heading.

DIODES AND THYRISTORS

Table of diode and thyristor part numbers and prices, including models like BA157, BR100, etc.

ASK FOR SEMICONDUCTORS NOT LISTED

VIDEO HEADS

Table of video head part numbers and prices, including brands like AMSTRAD, FERGUSON, HITACHI, and PANASONIC.

VIDEO HEADS Continued

Table of video head part numbers and prices, including models like 3HSSU3N-NV430, 3HSS3N-NV777, etc.

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The above heads are new.

BELT KITS

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LINE OUTPUT TRANSFORMERS

Table of line output transformer part numbers and prices, including models like LOPT Hitachi CPT1476, LOPT Hitachi CPT2276, etc.

Other ITT transformers available

Table of ITT transformer part numbers and prices, including models like Fidelity all models up to 20" ZX3000, Fidelity Panel for ZX2000, etc.

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IDLER ASSEMBLIES

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PHILIPS

Table of Philips part numbers and prices, including models like VR6460 6920 Idler Arm (Original), DV464, 6462, 6463, 650 etc. Idler Kit, etc.

PANASONIC (All Original)

Table of Panasonic part numbers and prices, including models like NV370 Idler Arm Unit VXP0521 Gen, NV8600 8610 Play Idler VXP0243, etc.

SANYO

Table of Sanyo part numbers and prices, including models like Idler VHR1100, 1300, 1500, Idler VHR1200, 2300, 2500, 2700, etc.

AMSTRAD

Table of Amstrad part numbers and prices, including models like 4500, 4600 MOD KIT INCLUDES PINCH ROLLER AND IDLER CLUTCH, Limiter Post Assembly, etc.

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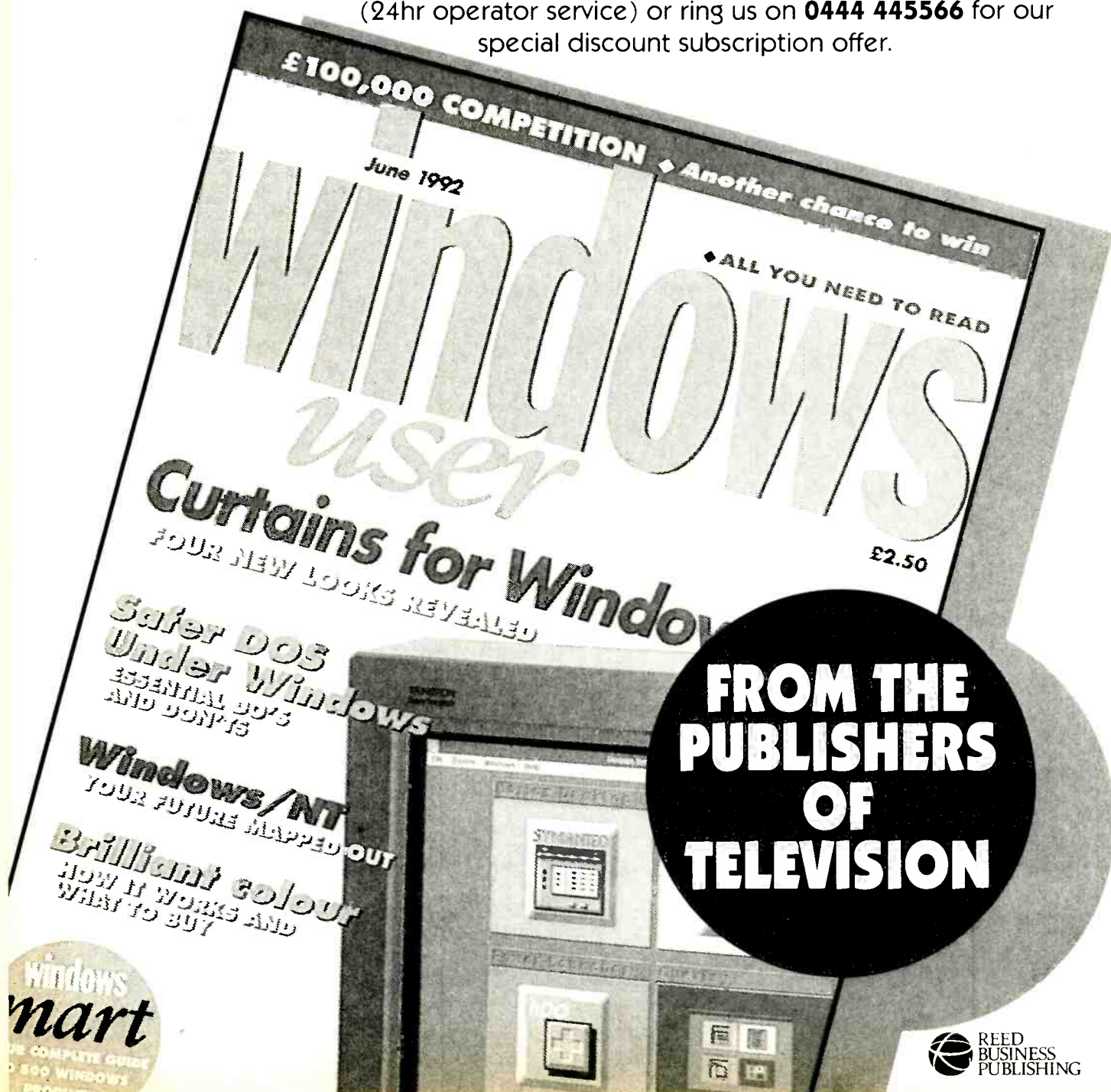
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VIDEO HEADS



Table listing various video heads from brands like AKAI, JVC, Matsui, and others, including model numbers and prices.

Table listing cassette tapes from brands like JVC, Matsui, Philips, and others, including model numbers and prices.

Table listing various motor components from brands like JVC, Matsui, Philips, and others, including model numbers and prices.

Table listing various belt kits from brands like NEC, Nikkai, and others, including model numbers and prices.

Table listing various rediffusion components from brands like Samsung, Sharp, and others, including model numbers and prices.

Table listing various idler components from brands like Hinari, JVC, Matsui, and others, including model numbers and prices.

Table listing various idler components from brands like Philips, Grundig, and others, including model numbers and prices.

REEL MOTORS



Table listing various reel motor components from brands like Amstrad, Ferguson, and others, including model numbers and prices.

CAPSTAN MOTORS



Table listing various capstan motor components from brands like Amstrad, Ferguson, and others, including model numbers and prices.

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Table listing various cassette housing components from brands like Amstrad, Ferguson, and others, including model numbers and prices.

BELT KITS



Table listing various belt kit components from brands like Akai, Matsui, and others, including model numbers and prices.

IDLERS/ Take Up Wheel



Table listing various idler and take-up wheel components from brands like Amstrad, Philips, and others, including model numbers and prices.

IDLERS Cont.

Continuation of idler components from brands like Hinari, JVC, Matsui, and others, including model numbers and prices.

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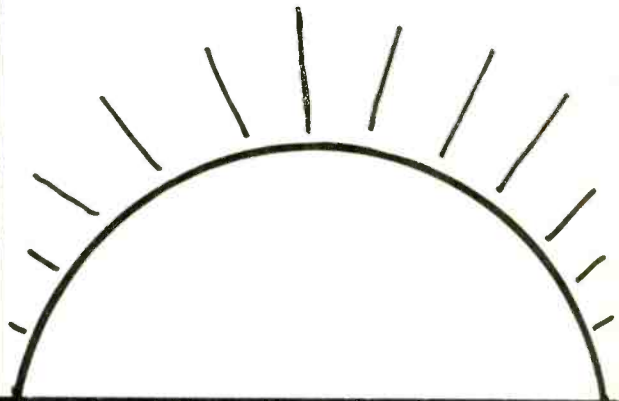
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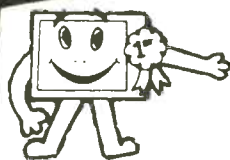
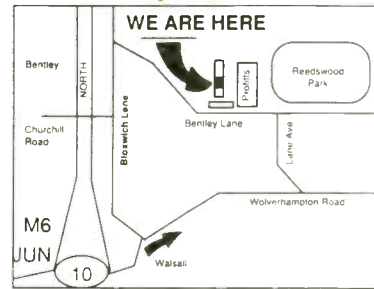
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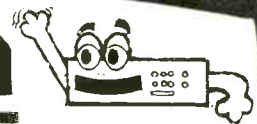
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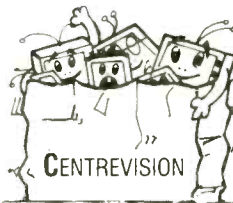
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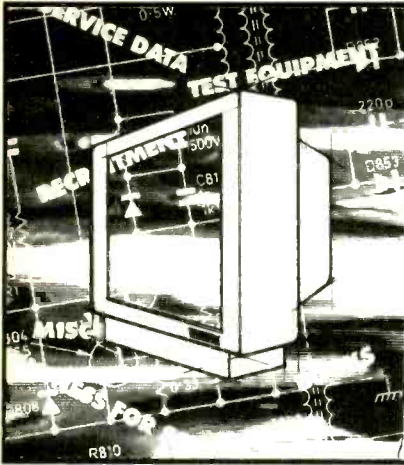
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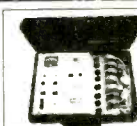
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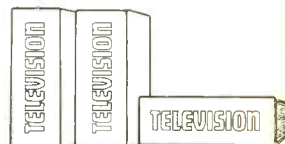
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JUST SPRAY AND IT IS CLEAN. PHILIPS' NEW VIDEO HEAD SPRAY CLEANER: £2.10 OR 10 FOR £1.50 EACH		60cm SATELLITE DISH £35 Postage £5.00		REPLACES 90% of Philips Handsets Philips Video R1/V Handset AV5661 with LCD AV5659 display £6	
SMALL SATELLITE TUNERS (950 to 1750 MHz). L.F. frequency 400MHz.....£9.00 each VHF/UHF S.BAND TUNER.....£3.00 NEW PLASTIC CASE 32 C.H. SAT-RECEIVER (no hand set).....£35 (Post £5) NEW METAL CASE SAT-RECEIVER, 32 C.H. WITH DOLBY B & CHANNEL C (no hand set).....£35 (Post £5) DAM MAINS CHASSIS AMSTRAD MONITOR C.....£10 UNIVERSAL TRIPLER, NEW TYPE.....£4.00 VIDEO LEADS.....80p AMSTRAD Line O.P. Transistors with Diode 2SD/453.....£1.00 BU208A.....£1.00 VIDEO LAMPS, Long Lead.....24p HITCHHIK & GEC FRAME, Thick Film.....£6.00 FIDELITY SPLIT DIODE FCC2215AE.....£20 FCC2015BE.....£10 FCC2215BE.....£10 K30 FRONT PANEL TEL. TEX TYPE.....£5.00 NEW G11 LINE OP PANEL.....£8.00		CAMCORDER SANYO NP22 6v 1300mah Rechargeable Battery Pack £6.00		PH500 Panic and Button Transmitter 180MHz.....£1.00 G11 CAP 250V, 470M.....£1.35 NEW PROFESSIONAL SATELLITE RECEIVER WITH HAND SET, METAL CASE WITH METER, DOLBY CHANNEL C WITH POLARIZER SUPPLY £50 £5 post SEND FOR DATA AND PHOTO	
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2433752 £20 2432984 2432971 2432301 2435016 2433952 2434393 2432211 T9048A 18T185B243 T90309D K4 L.O.P.T. K35 L.O.P.T. K40 2433452 2432984		SPLIT-DIODE 2433752 £20 TX100 Green Spot £15.00 TX100 Yellow Spot L.O.P.T. £10.00 TX91 White Spot L.O.P.T. £15.00 Split Diode 110P £12.50 Orion 65-3M G11 C85-9793-6 DST 81N243 TFB4023AD £10.00 MSHIFPT131 £12.00 MSHIFB27 £10.00 DST186N243 £10.00 36362 36482 36761 36831 36832 36833 3692179 3692279 L.O.P.T. SPLIT-DIODE PHILIPS £10 EACH		TRANSFORMERS 2435701 £10 2435012 £10 FERGUSON 47003481 £10 AT206600 AT2048/11 AT2095 AT2076/35 AT2076/38 AT2076/51 CVC 820 CVC 800 AT2076/55 AT2076/71T AT2084/15 RCU51 £13325 OT2041 FR165KA Orion 2076/51 2432401 2433451 SHARP MSHIFCP709 £10 EACH FTT MOST SETS New Thorn Hand Set Type u/v (£10) BRIDGE RECTIFIERS 10 FOR £1.00 4 Amp for Video Power Supply VIDEO MOTOR for V185 type VCO/D28.....£8.00 AMP TUNER IF for V1568 Hitachi & GEC.....£9.00	
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DST 884243 £10.00 each DST 884243	ICCS Remote I.C. CCUF RG07 £3.00 CCUF RG09 £5.00	Ferguson L.A.T.R Hand Set ICCS Mod £8.00	K13/K30 ITT Text £12.50 K13/K30 Full remote £15.00 K13 Power supply £4.00 GEC Infrared 2236-2026 £4.00 GEC 8 button full remote £14.00 GEC push pad handset button blips 10p each	Pyc & Philips handset K13-K30 chassis No. RC (5150-RC5176-RC5071-RC5177) Special Price £13.00 RC 4001 K13 and Teletex £14.00 IT CVC 32 handset repaired £15.00 CVC 32 Hand Set £15.00 CVC 45 3 and 2 Pin £12.50 TX10 Hand Set Text £12.50 TX9 with Text £2.00 TX10 Focus Pots £5.50	ITT TV & Video Processor, 1200 Type C10.00	PHILIPS UNIVERSAL HANDSET £12.00 RC5 K13 - K45 We have all parts for Philips Handsets	RC5353 £15.00 RC5301 £12.00 Philips RC5 £15.00	TEXT-TYPE Replace Hand Set for Philips K13-K30, K4 etc £12.50	THORN HANDSETS 9000 - 9600 - TX9 - TX10 - TX100 Text and Non-Text £10.00	PHILIPS RC5171 £12.00	K35-K4 HAND SET Repaired for £5.00
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