JANUARY 1984

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TELEVISION

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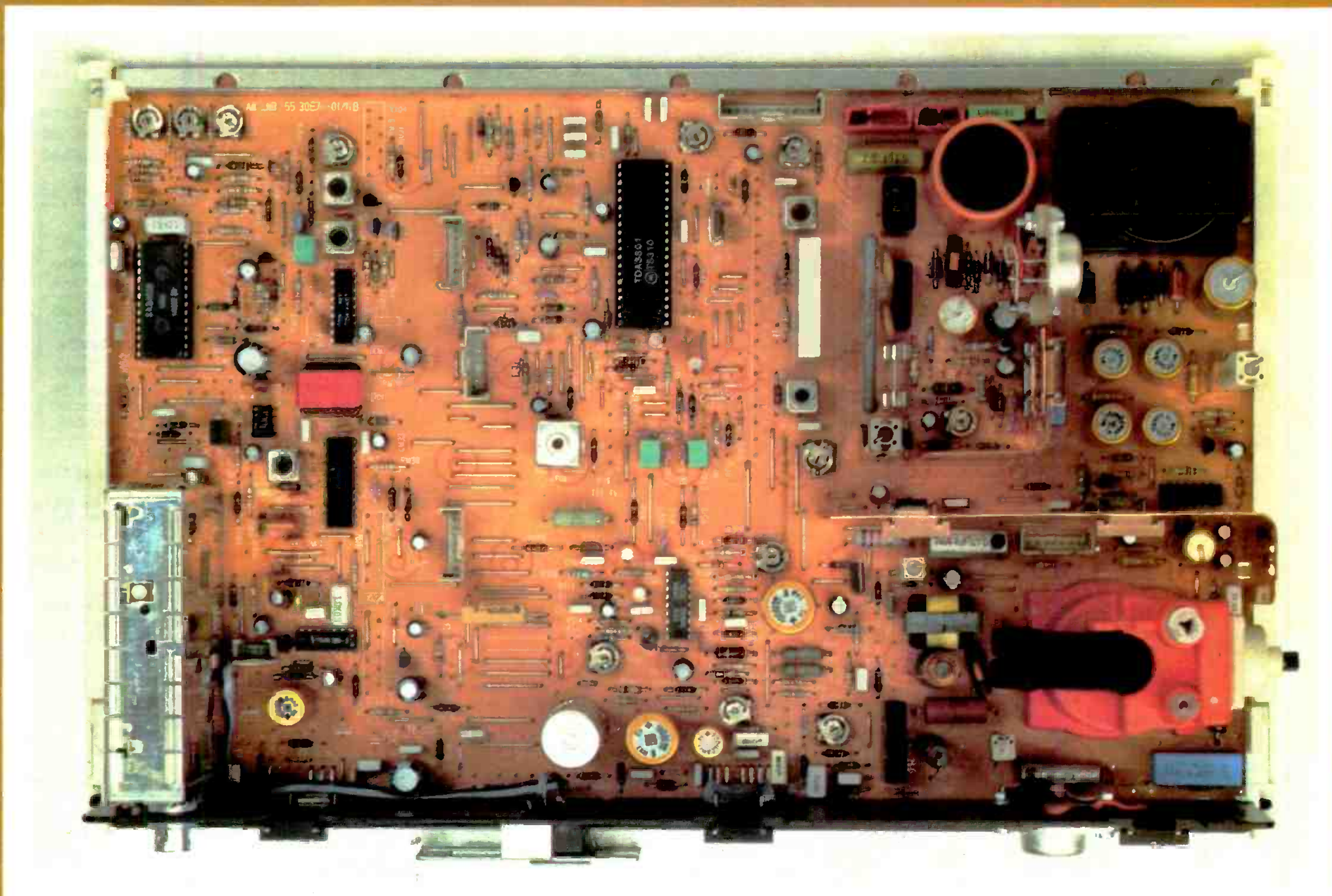

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TELEVISION

January 1984

Vol. 34, No. 3
Issue 399

CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", King's Reach Tower, Stamford Street, London SE1 9LS. Editorial correspondence should be addressed to "Television", IPC Magazines Ltd., King's Reach Tower, Stamford Street, London SE1 9LS.

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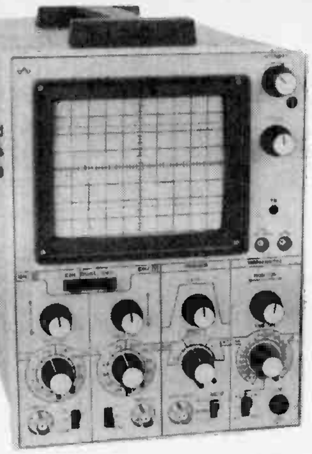
this month

OUR NEXT ISSUE DATED FEBRUARY WILL BE PUBLISHED ON JANUARY 18

DUAL TRACE 'SCOPES



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£2.50 incl. p/p & VAT.

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¼W pack 10 each value E12 – 10R to 1M 610 pieces	4.80
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VDRs. etc

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01/	0.28
02/	0.28
E298CD	
/A258	0.25
E298ED	
/A258	0.22
/A260	0.22
/A262	0.22
/A265	0.22
/P258	0.22
E298ZZ	
/05	0.25
/06	0.22
E299DD/P116-P354	all 0.23
E299DH	
/P230	0.72
VA1015	0.92
VA1026	0.79
VA1033/34/38/39/40/53	all 0.20
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VA1077	0.31
VA1091	0.29
VA1096/97/98	all 0.20
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VA1104	0.66
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4mm Banana Socket	0.15
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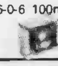

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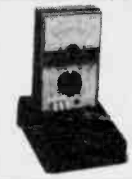
EM3	6V	200m/a	£1.00	80p	55p
EO9	6V	400m/a	£1.50	£1.25	85p

(Postage & Packing: 45p per adaptor or £1.60 per 10, £4.50 per 100)

MULTIMETER SPECIAL



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16 pin	0.11	1.00/10
18 pin	0.14	1.60/10
22 pin	0.21	1.95/10
24 pin	0.25	2.25/10
28 pin	0.30	2.75/10
40 pin	0.34	3.10/10
Dil to Quil		
14 pin	0.30	2.75/10
16 pin	0.32	2.90/10
18 pin	0.34	3.10/10
Quil to Quil		
14 pin	0.30	2.75/10
16 pin	0.34	3.10/10

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AC127	0.30
AC128	0.30
AC128K	0.34
AC132	0.55
AC141	0.26
AC141K	0.40
AC142	0.26
AC142K	0.48
AC151	0.45
AC152	0.45
AC176	0.28
AC176K	0.46
AC187	0.26
AC187K	0.40
AC188	0.28
AC188K	0.40
ACY40	0.88
AD142	1.10
AD143	1.10
AD149	0.96
AD161	0.42
AD162	0.42
AD161/AD162	0.98
AF106	0.48
AF114	2.10
AF115	2.10
AF116	2.10
AF117	2.10
AF118	0.85
AF121	0.62
AF124	0.48
AF125	0.48
AF126	0.48
AF127	0.48
AF139	0.68
AF178	0.68
AF239	0.68
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AL102	1.88
AL113	2.20
ASY80	1.75
AU110	1.40
AY102	4.32
BA102	0.34
BA110	0.67
BA121	0.40
BA129	0.38
BA148	0.16
BA154	0.08
BA155	0.10
BA156	0.08
BA157	0.28
BA164	0.14
BB104B	0.52
BB105B	0.30
BB105G	0.48
BB110B	0.42
BC107	0.10
A or B	0.12

Type	Price (£)
BC108	0.10
A,B or C	0.12
BC113	0.14
BC114	0.12
BC115	0.12
BC116	0.15
BC117	0.22
BC118	0.17
BC119	0.30
BC125	0.12
BC140	0.28
BC141	0.42
BC142	0.30
BC143	0.30
BC147	0.08
A or B	0.10
BC148	0.08
A or B	0.10
BC149	0.09
BC157	0.10
BC158	0.10
BC159	0.10
BC160	0.30
BC161	0.30
BC168B	0.12
BC169C	0.10
BC170	0.14
BC170B	0.12
BC171	0.10
BC171	0.10
A or B	0.08
BC172	0.08
A or B	0.12
BC177	0.20
BC178A	0.22
BC182	0.09
A,B or C	0.09
BC182L	0.09
A,B or C	0.09
BC183	0.09
A,B or C	0.10
BC183L	0.08
A,B or C	0.12
BC184L	0.10
A,B or C	0.10
BC207	0.15
BC208	0.16
BC212	0.09
A,B or C	0.10
BC212L	0.08
A,B or C	0.10
BC213	0.09
A or B	0.10
BC213L	0.10
A or B	0.10
BC237	0.11
BC238	0.12
BC239C	0.14
BC251	0.12
A,B or C	0.14
BC301	0.30

Type	Price (£)
BC302	0.32
BC303	0.32
BC307	0.10
BC308A	0.10
BC323	0.99
BC327	0.14
BC328	0.14
BC337	0.12
BC338	0.12
BC350	0.14
BC440	0.30
BC441	0.32
BC461	0.32
BC547	0.12
BC548	0.12
BC549	0.12
BC550	0.18
BC550C	0.18
BC557	0.12
BC558	0.12
BCX34	0.27
BCY70	0.15
BCY71	0.17
BCY72	0.18
BCZ10	1.68
BCZ11	1.45
BD124P	0.80
BC130Y	0.68
BD131	0.34
BD132	0.34
BD131/BD132	0.95
BD135	0.32
BD136	0.36
BD137	0.36
BD138	0.38
BD139	0.38
BD140	0.38
BD144	1.60
BD145	1.82
BD150A	0.51
BD159	0.65
BD160	1.65
BD165	0.45
BD175	0.60
BD182	1.00
BD183	1.10
BD184	1.20
BD201	0.72
BD202	0.87
BD204	0.80
BD222	0.80
BD225	0.86
BD232	0.45
BD233	0.60
BD234	0.62
BD235	0.63
BD236	0.63
BD237	0.65
BD238	0.56
BD241	0.60
BD243A	0.80

Type	Price (£)
BD244A	0.65
BD375	0.32
BD410	0.76
BD434	0.68
BD436	0.68
BD437	0.76
BD438	0.75
BD439	0.68
BD507	0.48
BD508	0.53
BD509	0.54
BD510	0.48
BD517	0.56
BD520	0.66
BD699	1.25
BD707	0.88
BDX18	2.35
BDX32	2.10
BF115	0.32
BF117	0.54
BF119	0.82
BF120	0.38
BF123	0.40
BF125	0.42
BF127	0.38
BF152	0.16
BF154	0.23
BF157	0.40
BF158	0.22
BF159	0.24
BF160	0.23
BF167	0.30
BF173	0.25
BF177	0.42
BF178	0.30
BF179	0.32
BF180	0.35
BF181	0.35
BF182	0.32
BF183	0.32
BF184	0.32
BF185	0.32
BF194	0.08
BF195	0.10
BF196	0.10
BF197	0.10
BF198	0.14
BF199	0.16
BF200	0.26
BF222	0.80
BF224	0.20
BF224J	0.16
BF240	0.20
BF241	0.20
BF244	0.26
BF244A	0.28
BF244C	0.24
BF245A	0.28
BF254	0.15
BF256	0.40
BF257	0.32

Type	Price (£)
BF258	0.30
BF259	0.32
BF262	0.30
BF263	0.30
BF270	0.30
BF271	0.26
BF273	0.18
BF274	0.32
BF323	0.92
BF336	0.26
BF337	0.26
BF338	0.26
BF355	0.42
BF363	0.82
BF367	0.24
BF371	0.27
BF422	0.38
BF450	0.38
BF457	0.33
BF458	0.36
BF459	0.44
BFR39	0.22
BFR40	0.22
BFR41	0.22
BFR51	0.30
BFR61	0.32
BFR62	0.28
BFR88	0.34
BFR90	1.72
BFT41	0.38
BFT43	0.38
BFW10	0.79
BFW44	0.76
BFX29	0.28
BFX30	0.30
BFX80	3.56
BFX84	0.24
BFX85	0.26
BFX86	0.26
BFX87	0.26
BFX89	0.65
BFY50	0.21
BFY51	0.21
BFY52	0.21
BFY57	0.40
BFY90	0.90
BFY90S	1.34
BR100	0.20
BR101	0.44
BR103	0.58
BRC4443	1.76
BRY39	0.36
BRY56	0.42
BRY61	0.86
BSS17	0.56
BSS27	0.92
BSX19	0.34
BSX20	0.34
BSX59	0.82
BSX76	0.29
BT100A/02	0.94

Type	Price (£)
BT101/300	1.15
BT101/500	1.25
BT102/300	1.35
BT102/500	1.65
BT106	1.50
BT108	1.30
BT109	1.18
BT116	1.25
BT119	3.62
BT120	3.60
BT121	3.02
BT138/600	1.30
BT151/560R	0.90
BT151/300R	1.15
BTY79/400R	2.80
BU100A	2.30
BU104	2.00
BU105	1.20
BU105/02	1.56
BU108	1.80
BU124	1.75
BU126	1.25
BU133	1.80
BU204	1.36
BU205	1.30
BU206	1.70
BU208	1.55
BU208A	1.63
BU208/02	2.05
BU326S	1.75
BU407	1.65
BU407D	1.80
BUX80	3.70
BUY20	1.75
BUY69A	2.60
BUY69B	1.98
BY101	0.48
BY118	1.10
BY122	0.68
BY126	0.12
BY127	0.10
BY133	0.16
BY135	0.25
BY164	0.44
BY179	0.66
BY182	0.87
BY184	0.40
BY187	0.72
BY189	4.75
BY198	0.44
BY199	0.47
BY206	0.24
BY207	0.24
BY210/400	0.25
BY210/600	0.26
BY210/800	0.30
BY223	1.20
BY227	0.26
BY229	0.30
BY238	0.68
BYX10	0.24

Type	Price (£)
BYX36/150	0.22
BYX36/600	0.28
BYX48/300	0.72
BYX49/300	0.47
BYX55/350	0.29
BYX55/600	0.33
BYX71/600	1.18
BYZ12	0.42
C106D	0.80
E1222	0.40
E5024	0.30
GET872	0.48
ITT44	0.04
ITT2002	0.11
ME0402	0.20
ME0404/2	0.24
MEU21	0.60
MJ400	1.25
MJ2955	0.90
MJ3000	1.98
MJE240	0.60
MJE340	0.54
MJE370	0.88
MJE520	0.48
MJE2955	0.99
MJE3055	0.70
MPSLO1	0.28
OA47	0.10
OA90	0.08
OA91	0.09
OA95	0.18
OA200	0.06
OA202	0.15
OC25	2.10
OC26	1.70
OC28	1.50
OC29	2.47
OC35	1.76
OC36	1.76
OC42	0.72
OC42K	1.40
OC44	0.72
OC45	0.58
OC71	0.50
OC72	0.52
OC81	0.68
OC200	2.46
OC202	2.20
ORP12	0.85
R2008B	1.50
R2010B	1.52
SHG1.5	0.40
TAG1/100	1.40
TAG3/400	1.78
TIC44	0.40
TIC45	0.45
TIC46	0.48
TIC47	0.70
TIC106A	0.70
TIP30A	0.46
TIP31C	0.54

Type	Price (£)
TIP32	0.40
TIP32C	0.60
TIP33A	0.63
TIP34A	0.72
TIP41C	0.46
TIP42A	0.52
TIP47	0.60
TIP110	0.88
TIP2955	0.60
TIP3055	0.60
TIS43	0.32
TIS88	0.40
TIS90	0.25
TIS91	0.28
ZTX108	0.12
ZTX109	0.12
ZTX212	0.28
IN4001	0.05
IN4003	0.05
IN4004	0.06
IN4006	0.07
IN4007	0.07
IN4148	0.05
IN5400	0.12
IN5402	0.15
IN5405	0.16
IN5406	0.18
IN5408	0.20
IS920	0.08
2N697	0.55
2N706A	0.33
2N2904	0.28
2N2906	0.24
2N2926G	0.10
2N3053	0.22
2N3054	0.56
2N3055	0.45
2N3702	0.10
2N3704	0.10
2N3708	0.10
2N3772	1.90
2N3773	2.70
2N3904	0.16
2N3906	0.16
2N5294	0.48
2N6107	0.71
2N6126	0.68
2SB337	1.60
2SC1172Y	2.90
2SC1173Y	0.82
2SC1302	1.40
40251	0.95
40361	0.58
40362	0.50
40411	3.72
40530	0.80
40673	0.80
40964	1.54

VOLTAGE REGULATORS

Type	Price (£)
78L05	0.30
78L08	0.30
78L12	0.30
78L15n	0.30
78M05	0.50
78M08	0.50
78M12	0.50
78M15	0.50
78M24	0.50
7805	0.55
7808	0.55
7812	0.55
7815	0.55
7818	0.55
7824	0.55
7905	0.65
7912	0.65
7915	0.65
7918	0.65
7924	0.65
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723C	0.36
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10nF 500V AC	80p
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22nF 300V AC	32p
100nF 1000V DC 46p	
470nF1000V DC	60p

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1kV 1.5nF	18p
3kV 1.5nF	20p
8kV 10, 47, 82, 100, 120, 150, 180, 200, 220pF	30p
270, 300pF	39p
10kV 1nF	87p

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DY86/87	0.75
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ECC82	0.65
ECC83	0.75
ECC84	0.65
ECC85	0.90
ECC88	0.95
ECF80	0.95
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.98
EF80	0.65
EF86	1.60
EF183	0.75
EF184	0.75
EH90	0.94
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
[illegible]	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.95
PCF801	1.45
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.98
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	5.95
PY88	1.80
PY500A	2.40
U25	1.90
UCH81	0.90
UCL82	1.70
6J5GT	1.75
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Cable is here – well almost

Things are beginning to happen on the cable front, with the government's announcement of the first eleven successful applicants for the new multi-channel cable franchises. The whole thing seems to be going off rather half-heartedly however. Along with the announcement came a statement from the Home Secretary that there would be further discussions with the applicants for elaboration of certain matters before the granting of final approval. These matters seem to relate to the technical aspects, financial arrangements and the sorts of programme packages proposed. The approach seems to be one of caution, which is as well and is in marked contrast to the earlier ballyhoo. Does it mean that the consortia applying were not prepared to offer as good a service as had been hoped? That could be so, since the financial cost of providing quite a modest service is relatively high and the rewards uncertain. It's also perhaps significant that one franchise remained unallocated. Companies are clearly not rushing in droves to offer to sink vast funds into the provision of cable services, at least for the time being.

It's interesting that mixed consortia seem to have done rather better with their franchise applications than the major existing cable operators, also that there seems to have been a preference in the selection for applicants offering to instal switched-star networks, something that was perhaps to be expected in view of the greater flexibility of such systems and the hope that the services will be capable of expansion in the future.

The cost of providing a multi-channel cable service to an area with some 100,000 households has been put at around £30 million, a by no means negligible sum. Being one of the least brilliant of mathematicians, I work that out at £300 per household. Which is a lot if most of the households passed choose not to take the cable service. So you've sunk £30 million, then set about arranging programming to attract householders to connect up – more money. It means that some pretty effective salesmanship will be required to get things going. I wouldn't like to be one of those knocking on doors however. It seems that they'll have a rather curious, i.e. confusing, proposal to make. Not just a connect up for a fee then pay for a service proposition but a sort of multi-option offer. A basic service providing family entertainment, hobbyist and childrens programmes etc. for around £7-£10 a month, or a premium service offering a bit more for another £7, or a premium film service or a combined package which it seems should be offered at around £15 monthly. Being someone who hates confusing offers, I'd bid the salesman a quick good day thank you. But you can see the point. Premium films are going to be expensive, so you've got to devise some way of generating extra income to be able to run such a service.

At this early stage no one knows what the response will be. There are nevertheless some things we do already know. Like the now well established video habit, with cassette renting once you've bought/rented a VCR and joined the club. Nightly cassette rental is not all that cheap in the long run though the public appears to be happy enough with the present charges. The cable offer doesn't compare unfavourably with this. It's a question of whether people will switch over or maybe opt for both. Who knows? They certainly won't be short of choices, now that discs are here and satellite channels are on the horizon.

One is tempted to take a look at the cable situation across the Atlantic. After all, it was partly the explosion of cable activity in the USA in recent years that gave rise to the idea of a possible UK cable bonanza. In 1975 cable TV in the USA had fewer than ten million subscribers. The figure has since risen to over 31 million and is still growing quite fast. But installation costs have soared while the competitive climate has held revenues down – so much so that many operators have been running at substantial losses. That could be a temporary situation, and in any case conditions in the USA are rather different from the UK, but the lesson is nevertheless that cable TV is not a pot of gold.

Neither will satellite TV be such a thing. In fact the provision of satellite TV services in the UK is already being viewed with some concern. In this field at any rate there's realism from the start. An expensive bird, then the necessary sales/promotion effort, then the problem of providing programmes people will want and be prepared to pay for. What people seem to want is primarily feature films, yet it's been pointed out that Hollywood's output over more than thirty years was made available in cassette form in just three years. The public's appetite for films is likely to far outstrip the capabilities and resources of the programme makers. It costs £50,000 to £200,000 or more an hour to produce entertainment programmes, and if customers are offered ever wider choices the revenue to support the required production is going to be hard to find.

Are we going to end up with a choice of BBC/ITV soap opera, video soap opera, satellite soap opera or cable soap opera? If that's what people primarily want, it's what they'll have to be offered if the revenue required is to be generated. It's rather a far cry from the idea of a modern technology based communications explosion, with interactive services and a wide range of facilities, as envisaged in the heady days of Information Technology year (remember it, just two years ago?).

PRICE INCREASE

The price of *Television* will be increased to £1 from our next (February) issue. We regret the need for this, due to the inescapable cost increases we face. In order to offer readers better value however the February issue will contain eight extra pages: we plan to publish other bumper issues during next year.

FRONT COVER

Our thanks to Luxor (UK) Ltd. who provided the photograph of their new SX9 chassis on this month's cover.

Letters

PHILIPS KT3/K30 CHASSIS

John Bourne's article on the Philips KT3/K30 chassis in the November issue contained much useful information. It didn't however mention the most common cause of a dead set we've encountered, simply that the 4·7Ω surge limiter resistor R6291 has a tendency to go open-circuit. It's a wirewound resistor rated at 4W, but doesn't seem up to it. Fit a 5W vitreous wirewound resistor and all will be well.
Peter Gaymead-Fraser,
Gravesend, Kent.

BERRYVISION 510

The advice given in Service Bureau (November) to the reader requesting help with the touch tuner assembly used in the Berryvision 510 was rather limited. The tuning voltage is taken from the 200V h.t. rail via R19 (15kΩ, 2W) and an SN76550 30V regulator (IC4). These components are both at the bottom left hand of the R1A signals panel. R19 usually goes low in value, the increased voltage at IC4 making it go open-circuit. Replace R19 with a 3W wirewound resistor and IC4 with a TAA550. A voltage check between tag 5 (brown lead) under R19 on the panel and chassis should indicate 30-32V. The effect of R19 and IC4 being faulty is that more than one, probably all, the LEDs will conduct and light up.

On early versions of this set the earth tag is fixed to the front control panel by a "pop" rivet. An aluminium rivet was used, with the tag tinned and fitted to the copper print. If the rivet is the slightest bit loose and, after all this time, oxidation has occurred between the connections, problems appear. Remove the rivet and fit a screw and nut, with a shakeproof washer between the tag and print, then tighten the screw.
A.M. Lowson,
Houghton Regis, Beds.

THAT REMOTE CONTROL TRANSMITTER

I was very interested to see the item on remote control trouble with the Philips K30 chassis (TV Fault Finding, December issue). I'd repaired one of these units only two weeks previously because of the same fault – transmitting continuously. I discovered that the trouble was due to a black staining that was building up around the PCB tracks inside the keyboard. By scratching this black stain away the unit stopped transmitting and normal operation was restored.
J.C. Baskett,
Totton, Southampton.

All Systems Stop

Les Lawry-Johns

A couple came in with this T20 just as we were about to shut up shop the other Saturday. Since we all know our Rank T20s like the backs of our hands I said I'd do it while they waited, so that their weekend entertainment wouldn't be affected.

The voltages were low and there was a smell of overheating. I unhooked the tripler, but things were much the same and the line output transformer's overwinding was hot. After whipping out the panel and unsoldering the transformer I gave them a choice – complete new transformer or replacement of the faulty winding. They opted for the winding and before you could say knife it was fitted and the panel restored. I switched on and was glad to see the tube's heaters glowing merrily. Unfortunately the picture was badly serrated with large vee indentations at each side, varying in size and number with the picture content.

Time was zipping by and it had been a long day. So I attacked my spare T20, relieving it of its line output panel. Fitted in the set on the bench it gave a good picture, and the customers went off happily. We were just about to lock the door when a worried face looked in. It was Eric, an old friend who has practised the art of servicing for many a long year.

"What's up Eric? You look right buggered."

"I am, too true I am. Been working on this rotten T20 for a week. It's used up all my BU208s and is breaking my heart. If I leave it with you, would you take a look at it during the week? It's not wanted until next Friday."

His ravaged face told me that he'd been having a hard time, and I knew just how he felt. So we took it in and he departed, looking so happy now that his nightmare had been shifted. "Cheers Les, see you next week."

Tuner Transplant

Sunday morning dawned bright and cold. Having taken Ben for his walk I looked at the T20 Eric had brought in and decided to put it off till Monday. Instead I busied myself trying to repair a tuner in a small Sharp portable. The mixer transistor had failed – one of those tiny ones no bigger than a full stop. Putting another one in was not easy but was done. The tuner still didn't work. The fact that the circuit diagram was wrongly drawn didn't help – it showed the transistor's emitter with a lone capacitor in series, which I thought rather quaint. In the tuner the capacitor was across the emitter resistor, as it should be. I didn't have the correct tuner, but as there was room at the rear I fitted a U321 (G11) tuner. This produced a picture, but it was very grainy.

The set belonged to a friend who frequents the "Call Girl", so I was not inclined to give up easily. I checked the a.g.c. line and found that it couldn't be reduced much below 4V. So I hung a preset on the line, to chassis, to determine the right voltage. A good picture was produced with the a.g.c. reduced to almost nothing. Being a coward I left it at that and told Tony what I'd done and where the preset was. After all he's a much better electronics man than I.

The T20 Saga

Monday dawned, bright and cold. After clearing up a few odds and ends it was time to tackle Eric's monster. The BU208 was short-circuit, so I checked this, that and the other on the line output panel and found that nearly everything that could have been suspect had been replaced – there was a new line output transformer, new tripler, new EW modulator diodes, new tuning capacitors, new driver transistor etc., so what was I to do?

I fitted a new BU208 and unhooked the tripler, just in case. At switch on there was a brrrump and then silence, except for the twittering of the power unit. Fearing the worst I checked the voltage at the collector of the BU208. Full h.t. The voltage at the collector of the driver transistor was also high, suggesting that the TBA950 line oscillator wasn't working. In fact there was no 12V supply, due to 4R16 (910Ω) in the 12V regulator circuit being open-circuit. A 1kΩ resistor was fitted and the set tried again. The timebase was now fully operative, with the tube heaters glowing. So far so good, but I knew Eric would have checked 4R16 and that something was still likely to be amiss. After reconnecting the tripler the set produced a raster, showing that all was normal. Fancy that I thought.

I plugged in an aerial and the set sort of coughed and lapsed into silence. Again the voltage at the collector of the line driver transistor remained high, so I slapped a 10kΩ resistor across 4C19 to provide the line oscillator with a start-up supply. The set came to life and remained on for eight seconds. It then shut down. I took the 10kΩ resistor out and put it back again. The set came on for four seconds. So I removed the 10kΩ resistor altogether and tried the on-off switch. Each time the set was switched on it came to life for a few seconds – longer if it was left off for a time. "We have a heat-sensitive component" I diagnosed. So next time I sprayed everything with freezer. It still went off.

Something then dawned on me. It had stayed on longer when the tripler was disconnected. I unhooked the tripler and the set stayed on. I looked at the tripler. Brand new. So I removed it and fitter another. Still the same. I connected a meter from the tripler's clipper diode connection to chassis. There was a positive reading for a few seconds, then a negative swing as the set went off, returning to positive although the set remained off. I disconnected the diode lead from the panel and the set stayed on. So I accused the first anode supply reservoir capacitor 5C16 of being intermittently open-circuit. A replacement proved that this was not the case.

Look at the transformer. The yoke was the original, so only the overwinding had been replaced. I then accused the third harmonic tuning coil 5L3 (on the transformer) of causing the trouble. Remembering the scan panel I'd removed from a T20 on Saturday, I took the transformer off this and tried it in Eric's set. The picture appeared, with serrated edges, then the set went off as before. I put my head in my hands and hoped that the muddle would clear.

The new winding I'd fitted on Saturday was in fact faulty. So I took Eric's transformer and fitted it to the Saturday panel. Lovely. The picture remained, proving that 5L3 wasn't at fault, also that the fault was still on Eric's panel. More urgent work then came in, so the T20 was put to one side.

Touch Tune

Thankfully I turned to something else. A touch-tune GEC colour set – C2113 type. The complaint was that the end neon (no. 6) was alight and couldn't be changed. Cleaning the touch pad thoroughly made no difference so I pondered on whether to attack the touch panel first or change the ETTR6016 channel selector i.c. With bleary eyes I pulled out the drawer containing ETT6016s. The one in the set was of the quil type but this didn't ring a bell in my muddled mind. I took it out and fitted a quil-to-dil holder to facilitate any further change that might be necessary (fool). In went the replacement. The neons fluttered but channels one and three could be selected and tuned. Channel two could be tuned but the neon didn't light. The other three would give only one channel which couldn't be altered and I then noticed that the channel six tuning potentiometer was missing. I wondered how position six could produce a channel without a tuning potentiometer being fitted and became even more confused. What right had a moron like I to undertake the repair of such complicated equipment? But I don't ask for it. I don't advertise at all, keeping as quiet as I can hoping that no one will ask me to do anything. Lazy I suppose. But very muddled and getting more so as time goes by. Someone said my brain cells are dying at the rate of knots, and I think that's right.

I've tried yoga, but every time I got into a thinking position someone would come in and ask me to do something for them. Yes now, where was I? Funny neons. I tried another chip in the holder and this did different things. I did earth myself before handling them, honest. So I took out the touch panel and found a spring missing from position six. I wondered about this, and took out the other number six spring to see if it made any difference. Neon two was black, so I replaced this and then put the lot back in. Neons four and five fluttered all the time but channels one, two and three could be selected. Positions four and five gave channel one and couldn't be altered.

A couple more sets came in and were done and taken away in minutes. But I had the GEC and the T20 nagging away at the back of my mind all the time. I was getting more fed up by the minute. Then the phone rang.

"Hallo Les, have you a pnp transistor rated at 100V or more at 10A – ring us back if you can find one on your untidy shelves." I found one and rang back. "Found what you want. Do you happen to have a spare T20 line output panel you can lend me?"

"Certainly Les" was the surprising answer. And it was there in minutes. They must have needed that transistor real bad. Not true – they always help. I returned to the GEC set. Looked at the circuit hard. Looked at the i.c. ETTR . . . I'd been trying ETTs. I looked here and there and eventually found an ETTR, but its legs had seen solder before and they were quil of course.

They were dil in seconds. This produced number one neon lighting but nothing else. A bell rang and I knew I'd put a suspect on the shelf instead of dumping it. At this point the owner returned. I explained what had been happening and to my surprise he didn't turn a hair.

"Oh yes. Knew about the front panel. Had it out the other night. Don't worry about the ETTR, I can soon stick another of those in. As long as you've confirmed what I thought. I'll put it right, don't worry."

I put the back on so quickly the displaced air nearly knocked him over. "Cheers. Goodbye. Have a good day." I'd spent a lot of time and worry, mainly of my own making. Send in the clowns . . . don't bother, they're here.

Back to T20s

Back to the T20, and I couldn't remember how far I'd got. Oh yes, I now had Eric's panel with a fault on it I couldn't fathom out, my panel which only needed a new line output transformer, and a spare panel which had been brought in a couple of hours previously. I put the spare panel in Eric's set and it worked splendidly. I phoned Eric and told him to come and get it, feeling a bit sorry that his panel with the new transformer and tripler etc. wasn't in it. I then fitted Eric's transformer to my panel, which worked beautifully. So my T20 was back in action. I looked at the panel I had left over and put it on one side for now... Why have a nervous breakdown if you don't have to?

There followed a brief encounter with yet another T20. This time with a queer power supply fault that was overcome only by replacing the chopper transistor, the 8·2Ω resistor in the crowbar circuit, the two thyristors and a zener diode – plus fuses of course. I don't like this job....

Long-distance Television

Roger Bunney

October was another active month for Sporadic E and tropospheric propagation. Unusually, there was a very good SpE opening towards the end of the month, with smaller openings throughout the rest of the month. Prolonged high pressure gave greatly enhanced tropospheric reception during the third and fourth weeks, from Band I through to u.h.f. The SpE log, compiled from reports from different parts of the UK, is as follows:

7/10/83	RAI (Italy) ch. IA. Zimbabwe (ZTV) ch. E2 was received via TE at sunset: the same opening in the reverse direction gave Spain (RTVE) in S. Africa.
11/10/83	TVP (Poland) R1.
13/10/83	NRK (Norway) E2; TVP R1.
14/10/83	RTVE E2, 3, 4; RTP (Portugal) E2, 3; CST (Czechoslovakia) R1; RAI IA, B. ZTV ch. E2 via TE.
15/10/83	CST R1; TSS (USSR) R1; RTVE E2.
17/10/83	NRK E2 (via Aurora); JRT (Yugoslavia) E3, 4.
18/10/83	RAI IA, B; NRK E2; JRT E3, 4; RTVE E2; ZTV E2 via TE.
19/10/83	RTVE E2, 3.
21/10/83	MTV (Hungary) R1.
22/10/83	NRK E2.
24/10/83	RTVE E2, 3, 4; RTP E2, 3; RAI IA, B; CST R1.
28/10/83	A good SpE opening with TVR (Rumania) R2; MTV R1, 2; TVP R1, 2; CST R1, 2; TSS R1, 2; ARD (West Germany) E2; RAI IA, B; JRT E3; ORF (Austria) E2a, 3, 4; +PTT/SRG (Switzerland) E2, 3.
29/10/83	CST R1; RAI IA, B.
30/10/83	TSS R1; RTVE E2, 3.
31/10/83	ORF E2a; RTVE E3; RAI IA, B.
2/11/83	RAI IA, B; JRT E3; RTVE E3, 4; MTV R1. Unidentified ch. R1 and 2 programmes during the morning.

Auroral activity was noted on the 14th and 17th. A high-pressure system started to form around the 16/17th, resulting in improved tropospheric reception on the 18/19th, mainly from the west (RTE-Eire), extending to W./E. Germany from the 19th on. Cyril Willis received BR Grunten (S.W. Germany) ch. E2 during the afternoon of the 18th, a most unusual catch. There appeared to be two main phases to this lift, during the 19th-23rd and the 25-27th. The former gave reception over a N.W./S.E. path to start with, gradually changing to include the south by the 21st. W./E. Germany, Denmark, Belgium and Holland were received in the southern UK, at v.h.f. and u.h.f. The bands were not jammed however, giving time to seek signals on particular channels.

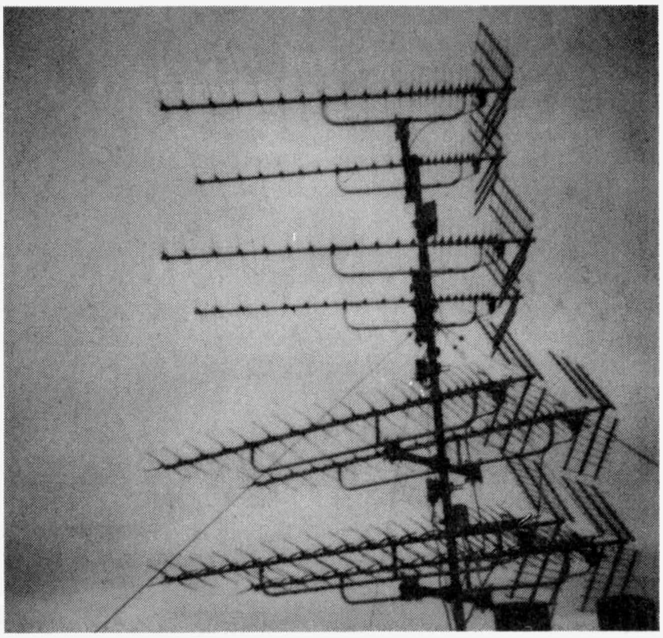
Simon Hamer (Powys) did very well, in particular with DFF (GDR) ch. E34 and Liége (Belgium) ch. E3 on the 22nd. Many enthusiasts reported reception of E. Germany and Denmark (Band III). The French ch. 9 (formerly ch. 6) was seen over a wide area, with Antiope and test signals, but more interesting was a signal at the l.f. end of Band III (just h.f. of ch. E6) with scrambled TDF/TF1 programme material from the direction of Paris. The picture locks solidly enough but the lines are shifted with respect to each other by several microseconds, giving the impression of a line sync fault. There are also two white bars from right to left and other cogging effects – not a pretty sight. A photograph shows the test card received at Romsey. The scrambling tests are presumably in preparation for the Canal Plus service.

October 23rd produced many Polish transmitters during 0600-0830 GMT in Holland. RTL (Luxembourg) was seen using dual-sound transmissions on ch. E7 – the sound signals were either French/German or German stereo TV sound.

Another slight lift on November 1st gave Robin Crossley (Potters Bar) Switzerland ch. E22 (Chasseral, 12kW e.r.p.).

The above openings gave many enthusiasts their first sightings of ATV transmissions. Simon Hamer logged G4IMO (Nick Harrold, Essex) at strength P4 (almost noise free).

My thanks to the following for their reports: Simon Hamer (Powys), Hugh Cocks (E. Sussex), Cyril Willis (Ely), Iain Menzies (Aberdeen), Robin Crossley (Potters Bar), D. Moller (Eastbourne), Tim Anderson (Stroud),



Michael Raher's aerial installation at Tramore, Waterford, Eire. The upper quad stack of group B Triax aerials is for reception from Presley, Wales, the lower group A stack for reception from Caradon Hill. For much of the time reception is good using a 25dB gain, 1·4dB noise figure amplifier.

Nick Brown (Rugby), James Burton-Stewart (Milton Keynes), Ian Johnson (Bromsgrove), John Tellick (Surbiton), P. Heaney (Norwich), Gosta van der Linden (Holland) and Jim Maden (S. Africa).

Gorizont at Last!

After many trials and tribulations I've at last received the Gorizont 3·675GHz satellite transmissions. The dish tried some months back turned out to be faulty – it was spherically instead of parabolically spun. After further delays I decided to obtain a 4ft petal dish from Premier Pattern at Leicester. This arrived, with stand, some eight days after being ordered, and within five minutes of connecting the 4GHz head unit described in the November 1982 issue signals were received. The unit doesn't include an LNA (three stages at least are normally used) which is rather a disadvantage, but at least weak signals could be resolved.

Interference Goes!

Another personal note – the interference from faultily designed VDUs at the nearby brewery office has at last gone, with the installation of new units, this time from IBM. Previously high-level shash was radiated over a distance of some 100 yards and the VDU manufacturer refused to take any action to remove the problem. As a result, extraordinary measures, with filters, anti-phase aerials etc., had to be adopted to combat the problem. I've now been able to rerig the aerial system, but missed the recent tropospheric opening as the upper mast had been stripped of v.h.f./u.h.f. arrays. Typical!

News Items

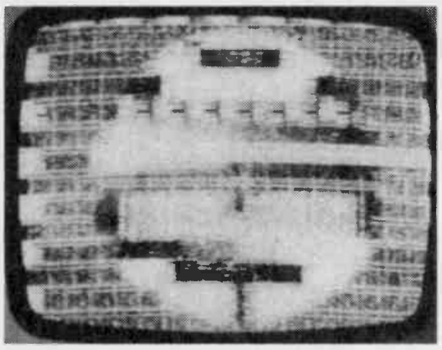
Japan: Experiments have been carried out to relay sound in teletext form, with the score transmitted in the form of teletext characters. At the receiver, a microcomputer uses the data from the teletext decoder to control oscillators and filters that provide the sound. Applications envisaged include background music, music for commercial messages, etc.

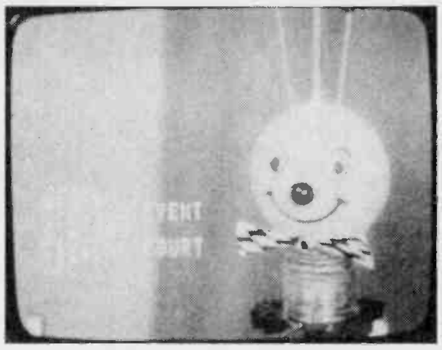
Singapore: A teletext service is in operation for 16 hours daily, over the SBC network, with 200 pages.

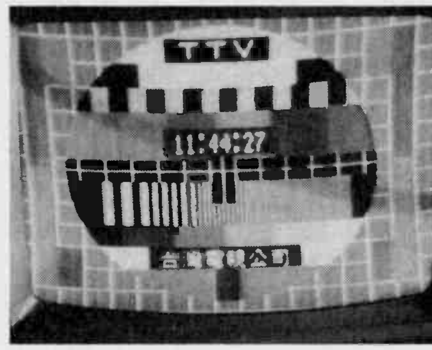
In brief: A three-channel TV service is to be introduced during the next five years in the Beijing area of China .... Egyptian TV is to be extended to the Sudan via a satellite transponder ... A TV service has been started in Boputhatswana, S. Africa ... Though officially closed, the Helpterberg (GDR) E3 transmitter has been seen on air, mainly with test transmissions – the plan is to sell it to an African country ... NTV Sokoto (Nigeria) was received in Holland in colour on June 11th via SpE, at 1245-1345 GMT ... Syria uses colour bars and picture slides rather than a test pattern: programmes are at 1445-2400 on Fridays, 1700-2400 on other days.

VHF Allocations

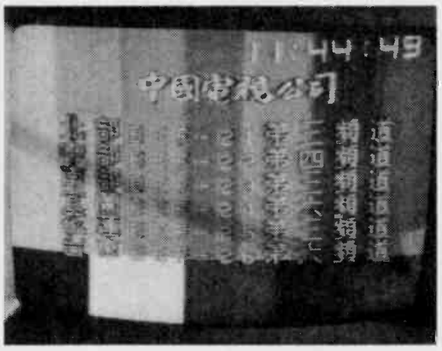
Information on the possible future uses of the present v.h.f. TV bands is slowly leaking out. The gas/electricity allocations in Band III are likely to remain in their present slot until later in the decade in order to make use of current equipment. Other users such as message/data handlers and repeaters are to use this Band. Fire services are likely to be moved to 65-70MHz and the police to between the 144MHz amateur band and the lower end of the marine band, with a.m. Typical base outputs 0·2kW with mobiles generally 25W.

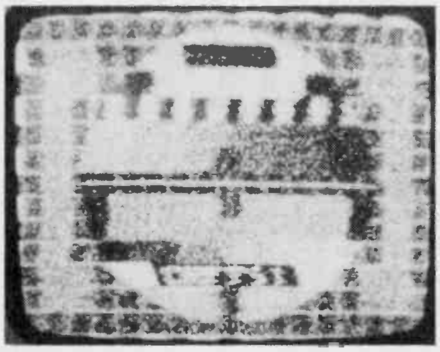


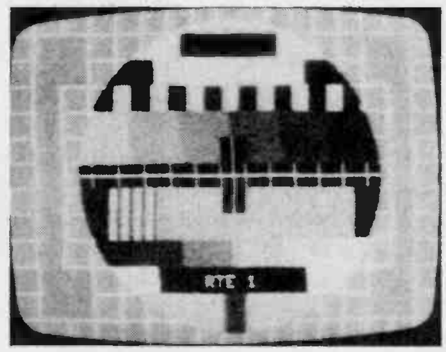




Left: Scrambled test transmission received from the Paris direction in Band III. Centre: IBA Crawley Court ATV Club special commemorative caption marking ten years of independent radio in the UK. The normal caption is G6IBA, with 100W to a 16-element Yagi array N.W. of Winchester. Right: Test pattern used by Taiwan Television, Taipei.







Left: CTV (China Television) received at Taipei, Taiwan. Centre: ORF-1 Austria Bruck ch. E9 received at Romsey during the tropospheric opening on September 26th, a distance of some 835 miles. Transmitter power 20kW e.r.p. Right: RTE (Eire) ch. IH Dublin received by Tim Anderson at Stroud.

Rumours suggest that France is considering f.m. transmissions in the 105-8MHz spectrum with megawatt output transmitters. There's likely to be a permanent 50MHz amateur band, probably for class A licence holders only. At present about 40 amateurs are licenced to operate in this band experimentally, after TV hours – though I've a report of one operator noted during programme times in the area of a recently closed ch. B2 transmitter.

New EBU Listings

France: Strasbourg TF1 ch. E62, 300kW e.r.p., horizontal. The following transmitters have been closed down: Boulogne F4, Strasbourg F5, Metz/Luttange F6, Lille F8a, Mulhouse F8, Brest F8, Amiens F11, Epinal F12 – all these were 819-line transmitters.
Lebanon: Beit Mery TL (Tele Liban) ch. E2 1kW e.r.p. French language programmes (system B/SECAM). This transmitter was received here at Romsey during the 1983 SpE season.
Egypt: Dumyat EBT-1 and EBT-2 on chs. E4 and E2 respectively. 900W e.r.p.

Commercial Corner

The use of fibreglass aerial support booms was mentioned recently. Two sources have been found. Bantex Ltd., Abbey Road, Park Royal, London NW1 can supply lengths up to 6ft at £3·50 a foot. Jaybeam Ltd., Kettering Road North, Northampton NN3 1EZ also stock this tubing, at much the same price – contact Mr. M. E. Ward.

Lowe Electronics Ltd., Chesterfield Road, Matlock, Derbyshire DE4 5LE have introduced a scanner with continuous coverage over 25-550MHz. Features include narrow f.m. (±7·5kHz), wide f.m. (±50kHz) and a.m., with sensitivities of 0·3, 1 and 0·5μV respectively, and image frequency response at least 50dB down. The AR2001's specification seems quite remarkable, despite its price tag of around £300.

From our Correspondents . . .

W.M. Geary has moved from Taipai, Taiwan to Kuala Lumpur, Malaysia where he intends to start DXing. He's sent us some interesting photos of Taiwanese test patterns. Most transmissions are at v.h.f., with 525 lines and NTSC colour, though there are test transmissions at u.h.f. Programme hours are normally 1200-2400, with Mandarin Chinese sound. Much of the content seems to be Chinese opera and documentaries.

John Tellick has recently returned from the Canary Islands. He took a small portable TV set with him to Lanzerote and reports that RTVE-Canarias transmits programmes from approximately 1200 daily, with the local test pattern prior to programme start (it has Canarias-1 or Canarias-2 where Cadena usually is in the mainland test pattern). "TVE-Canarias" appears at the top right-hand corner with the announcer between programmes. He also received RTM (Morocco) in SECAM and on several nights noted unidentified multiple-image TE signals.

Bindu Padaki (Madras, India) reports poor DX-TV conditions in recent months, with only Dubai ch. E2, Bangkok ch. A2 and Bahrein. The 714MHz Ekran satellite now transmits Moscow-1 from 2400-1530 GMT – the closedown is extended when there are special programmes or events. Bindu is getting good results using a twin stack of cross-polarised Yagi arrays spaced at 2λ.

Gosta van der Linden reports that TVR (Rumania) has started colour transmissions using PAL system D. A new E. European test pattern has been seen – like an electronic blockboard with the identification "BHN-2 BK". Has anyone else seen this?

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Degause VDR E299D/HP230 3000/8000	25p
Casters Set of 4	1.90
Double Fuse Holder on Small Pax Board 20mm type	10p
Single Fuse Holder on Small Pax Board 20mm type	5p
Direct Panel Mounting 20mm Fuse Clips	(pair) 15p
Single Fuse Holder on Small Pax Board. As per early 3000 mains input	6p
EHT Cable	Metre 25p
13A Plugs	12 for 4.80
TX9 Tube Base and Panel	65p
3K PSU PL22 edge connector. + Lum to PSU (New)	40p
3K5 Complete Lum with all Plugs (New)	2.00
LM340 T12 on Heatsink	25p
T9051V on Heatsink	60p
BF259 with Heatsink	14p
TIP110 with Heatsink	40p
L129/130/131 Coil	10p
6MHz Ceramic Filter	25p
DL700 (Philips) Chroma Delay Line	1.00
DL50 Chroma Delay Line	1.00
T9006A Lum Delay Line	1.00
8K5/9K Lum. Delay Line	65p
Plastic Cover for 3K5 SP8385	5p
TX9 Back Ground Control 10K	15p
TX9 Gain Control 100R	15p
1500 Metal Chassis Supports Pair	40p
Thorn 8K5 Focus Pot	2.40
Thorn 4000 Focus Pot	2.75
Thorn 18Ω 9W (3K5) R752	30p

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Ambersil Freezer	12oz	1.99
Ambersil Amberlube	6oz	1.89
Ambersil Ambertron	16oz	1.95
Ambersil Anti-Static Screen Cleaner	7oz	1.95
Ambersil 40+ Protective Lubricant	14.1oz	2.15
Ambersil Amberclens Foaming Cleaner	13oz	1.26
Ambersil Circuit Lacquer	14oz	2.15

FUSES

20mm		1¼"	
50MA	10 for 70p	250MA	10 for 65p
315MA A/S	10 for 50p	750MA	10 for 65p
500MA	10 for 50p	7A	10 for 50p
1A	10 for 50p	10A	10 for 50p
2.5A	10 for 1.00	20A	10 for 50p
3.15A	10 for 1.00	50A	10 for 50p

THICK FILM RESISTOR UNITS

3500 Thorn (5 Pin Connection) video	1.70
4000 Thorn (4 Pin Connection)	1.90

Thorn Mains TX 3000/3500	7.50
Thorn Mains TX 8000/8500	10.00
Thorn S.O.P.T 8000/8500	3.50
Thorn Scan TX 3000/3500	6.00
Thorn EHT TX 3000/3500	6.00
Thorn LOPT 9600	12.00
Thorn LOPT 1615	7.25
Thorn LOPT 1590/91	7.25
Thorn LOPT 1690/91	7.25
Thorn LOPT 8000	9.80
Thorn LOPT 8500	9.80
Thorn LOPT TX9	9.85
Thorn LOPT 9800	17.00
Pye LOPT 713	10.00
Pye LOPT 725	9.85
GEC LOPT 3113	7.40
Diode Split LOPT AT2076/35	14.75
Sanyo LOPT AM-WM-21	6.75
Sanyo LOPT AM-WM-4	7.30
Philips LOPT G8	7.80
Sanyo LOPT (CW21) 4-2751-44700	5.00
ITT LOPT CVC5-9	9.60
ITT LOPT CVC45	9.75
Baird 8750	10.25
Baird 8752	10.25
Korting AZ9100	10.25
Korting B92-170	10.25
Korting AZ2101	10.25
Korting AZ2103	10.25
Korting ZTR1001	10.25
Siemens V1155	11.75
Siemens V1823	11.75
Zanussi BS2222	10.25
Zanussi BS2223	10.25
Salora FR0057	10.25
Salora FR0029	10.25

300 Mixed Resistors	1.50
300 Mixed Capacitors	1.50
150 Mixed Electrolytics	2.00
100 W/W Resistors	1.00
20 Mixed Conv Pots	1.00
40 Mixed Pots	1.50
20 Mixed Sliders	1.00
40 Mixed Presets	60p
20 Mixed VDR & Thermistors	1.00
20 Mixed Ferrite Cores	50p
100 Mixed Ceramic Discs	1.00
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10–16 pin Quil IC Socket	90p
20 Assorted TV Knobs	1.00
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300 Mixed Resistors & Capacitors	1.50
10–16 pin Dil to Dil IC Socket	1.00
50 Electrolytics & 50 Capacitors	1.00
50 Mixed Poly Capacitors	1.00
30 Mixed Neons & Bulbs	1.00

AC128	39	BC171	9	BC558	10
AC131	40	BC172	9	BC559	8
AC138	40	BC174B	23	BC595	8
AC141K	39	BC177	24	BCX33	22
AC142K	38	BC182LB	12	BCX34	11
AC153	39	BC183L	12	BD115	49
AC176	33	BC184L	13	BD131	30
AC176K/ AC128K	93	BC187	24	BD132	46
		BC204	15	BD133	59
AC188	38	BC208	9	BD139	36
AD142	1.18	BC212L	9	BD140	38
AD143	1.08	BC213L	12	BD144	1.70
AD149	98	BC237	12	BD163	98
AD161	32	BC238B	8	BD201	74
AD162	32	BC238L	8	BD203	78
AD263	1.05	BC250A	15	BD204	99
AF127	45	BC251	8	BD222	48
AF139	38	BC252A	20	BD225	52
AF239	41	BC294	37	BD232	50
AU113	2.10	BC301	32	BD233	60
BC107	15	BC303	31	BD234	60
BC108	15	BC307	10	BD237	55
BC109	15	BC308	8	BD238	65
BC115	16	BC309	14	BD241	59
BC117	21	BC327	18	BD244	85
BC125	26	BC328	18	BD278A	81
BC126	23	BC337	17	BD386	68
BC139	27	BC338	17	BD433	71
BC141	34	BC347	8	BD437	83
BC142	30	BC394	8	BD592	1.20
BC143	31	BC454	8	BD589	1.20
BC147	12	BC455	8	BD677G	1.35
BC148	12	BC456	10	BD707	95
BC149	12	BC460	40	BD708	95
BC153	16	BC463	22	BDX10	93
BC154OR	16	BC546	8	BDY20	1.09
BC154YL	16	BC547	12	BDY82	99
BC157	12	BC548	12	BF137	20
BC158	12	BC549	8	BF153	20
BC159	15	BC557	10	BF154	25

BF167	24	BFR62	28	NKT276	20
BF173	29	BFR81	29	NKT453	1.65
BF179	32	BFR87	25	OT112	1.92
BF180	33	BFR90	1.74	OT121	2.08
BF181	30	BFR91	2.08	R1038	80
BF184	30	BFT42	30	R1039	80
BF185	30	BFT43	30	R2008B	1.40
BF194	16	BFX38	40	R2010B	1.10
BF195	16	BFY50	30	R2030	70
BF196	16	BFY51	34	R2265	1.30
BF197	15	BFY52	34	R2305	80
BF198	19	BRC116	1.50	R2322	50
BF199	15	BRC1693	1.43	R2443	25
BF223	18	BU105	1.00	RCA16446	30
BF224	19	BU126	1.10	RCA16599	1.25
BF238	20	BU207	1.05	RCA16600	1.40
BF240	9	BU208	1.15	RCA16799	1.13
BF241	21	BU208A	1.15	RCA16800	1.42
BF255	10	BU326A	1.30	RCA16802	1.38
BF256S	20	BU407	1.70	S1299	2.25
BF257	28	BU408	2.76	S28000	1.25
BF259	28	BU500	2.30	S6080A/B	3.50
BF271	25	BU526	2.46	T6050V	1.30
BF274	11	BU807	2.94	T6052V	1.30
BF337	25	C1129	9	T9003V	1.25
BF338	34	C1172B	9	T9010V	1.45
BF355	40	E5386	54	T9053V	1.30
BF362	50	E9003	28	T9054V	1.00
BF391	21	E9005	25	T9039V	1.10
BF394	16	ME0404	10	TIC45X	50
BF422	47	ME0412	10	TIC46	48
BF423	53	ME6002	10	TIC106C	40
BF450	43	MJ2501	2.36	TIP29	42
BF453	53	MJ3001	2.21	TIP30	42
BF458	37	MJE182	47	TIP31	35
BF459	40	MJE340	50	TIP32	43
BF461	59	MJE520	50	TIP33	61
BF556B	35	MJE2955	1.40	TIP41	42
BF596	15	MJE3055	1.50	TIP42	45
BF694	16	NKT241W	8	TIP110	61
BF757	62	NKT241G	8	TIS91	25
BFR52	31	NKT241Y	8	ZTX550	30

INTEGRATED CIRCUITS

BRC1330	1.40	SN76013ND	1.80	TBA500	2.65	TDA2522	2.10
BRC3064	1.00	SN76023N	1.80	TBA510	1.90	TDA2530	2.61
BRC/M/200	1.00	SN76033N	2.00	TBA530	1.26	TDA2540	3.50
BRC/M/300	1.00	SN76115	2.00	TBA540	1.00	TDA2560	3.50
CA3060	1.58	SN76131N	1.58	TBA550Q	1.82	TDA2581	3.00
LM1303P	1.48	SN76226N	1.25	TBA560C	1.50	TDA2591	1.96
ML231B	2.20	SN76227N	1.00	TBA641	2.05	TDA2571A	2.00
ML237B	2.00	SN76530P	1.30	TBA651	2.50	TDA2640	2.90
ML239B	2.86	SN76545	1.40	TBA720A	2.49	TDA2690A	1.50
MC1327AP	1.25	SN76622N	1.00	TBA800	1.62	TDA3560	6.00
MC1358P	1.30	SN76660N	80p	TBA920	2.08	TDA9503	2.90
MC1455P	18p	SN76666N	75p	TBA950	1.95	TCEP100	3.48
MC14516BCP	60p	SN76744	1.92	TBA1440	1.92	TEA1009	1.95
SAA1025	7.20	TA7117P	1.00	TCA270SA	1.05	MC14426P	4.80
SAA1124	4.50	TA7109AP	2.80	TCA270C	1.05	MC14429P	4.50
SAA5010	6.00	TAA611	1.40	TCA270CQ	1.05	MC14514	5.00
SL432A	1.80	TBA120B	1.20	TDA1004A	2.97	UA758PC	2.50
SL1430	2.50	TBA120C	1.20	TDA1035T	3.50	UA1008A	2.66
SN15846N	60p	TBA120CQ	70p	TDA1037	2.72	ULN2165	1.30
SN74123N	65p	TBA120S	70p	TDA1170S	1.50	ULN2216A	1.25
SN74154N	1.40	TBA120U	1.00	TDA1200	2.42	UPC1365C	5.75
SN76001N	1.40	TBA395	1.00	TDA1270	2.76	SC9488P	1.40
SN76110N	1.14	TBA480Q	1.40	TDA1327	2.53	SC9511P	1.40
				TDA2002	2.80	SW153	2.50

Thorn 8/8K5 ex equip panels untested

PSU	2.88
FTB	3.75
Decoder	4.00

Thorn 9K ex equip panels untested

PSU	12.00
Decoder	5.00

Thorn 9K6 ex equip panel untested

Decoder	5.75

Thorn TX9 main panel

Complete (no tuner) ex-factory	11.00

Thorn 3/3K5 ex equip panels untested

PSU	3.75
LTB	3.75
Video	2.50
Chroma	2.00
FTB	2.75
IF	1.75
Conv. 3K	3.00
Conv. 3K5	3.75
Autovox Decoder FG/01 new boxed	5.00
Autovox IF & tuner panel A/01 new boxed	7.50
Thorn 4000 Convergence panel ex-factory	3.75

Thorn 4000 PSU panel ex-factory	2.50
Thorn 3K5 beam limiter board new	1.75
Thorn 3K5 PSU bottom board PC206 new	2.75
Thorn 3K5 IF panel new	3.00
Thorn 3/3K5. EHT & scan TX + R2008B on alum chassis ex-equip	1.80
Thorn 8/8K5 damaged FTB for spares	1.25
Thorn 8/8K5 damaged decoder for spares	2.25

UHF TV Aerial for portable	50p
Indoor Aerial Parabolic Type Reflector to Help Combat Ghosting Problems	2.50
Line Connectors	38p
Coax Plugs	10 for 1.65
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Flush Mounting TV/FM Diplexer	1.00
Switched Flush Fitting Aerial Outlet	1.00

Pye 78+161	50p
Pye 147+260	50p
Thorn 56+1K+47+12	1.24
Thorn 50+40+1K5	60p
Thorn 128+16+1K7+116+462+126	50p
Thorn 120+72+300	50p
RBM 250+14+58 (TV161)	63p
Pye 3R5+15+45 (713)	90p
Philips 2R2+682	90p
Philips 47R	52p
Thorn 350+20+148+1K5+317	1.40
Thorn 6+1+100	92p
Thorn 3000 Metal	1.45
Thorn 8/8500 Plastic	1.45

EHT TRAYS

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Thorn 8000	3.50
Thorn 8500	6.00
Thorn 9000	7.90
Thorn 9600	6.00
Thorn 900/950	1.50
Thorn 1500 3 stick	1.80
Pye 713 4 lead	5.83
Pye 713 5 lead	5.97
Pye 725	6.35
Decca Bradford	5.00
Baird 8750	7.10
Korting AZ9100	7.10
Philips G8 (520)	6.50
Philips G8 (550)	6.50

MULTISECTION CAPACITORS

100+150+150	350V	50p	200+200+100	350V	55p
220+47	350V	65p	200+200+75+25	350V	60p
200+150+50	350V	60p	16+16	500V	45p
200+200+100	325V	54p	50+50+8	300V	55p
32+32+16	275V	52p	100+50+100	350V	55p
200+200+100+32	350V	70p	16+16	350V	45p
100+50+150	350V	58p	100+150+50	350V	55p
400+400	200V	72p	2500+2500 (Thorn 8K)	63V	1.20
32+32+16	350V	52p	150+150+100	300V	1.80
200+32+300+100	350V	70p	200+47	250V	65p
225+25	350V	50p	500+500 175V Thorn TX9		1.00
200+200+100	350V	70p	175+100+100 350V Thorn 3K5		2.25
200+100	325V	65p	400 400V Thorn 9K		2.50
16+16	450V	45p	470 250V Philips G11		1.50
200+100+100+50	350V	60p			

CAN TYPES

0.2MF 250V	50p	1250MF 40V	50p
2MF 250V	50p	1250MF 50V	50p
22MF 275V	50p	1500MF 70V Thorn 3K	1.00
50MF 275V	50p		
100MF 150V	65p	1500MF 100V	1.05
100MF 250V	70p	2000MF 30V	50p
100MF 450V	75p	2200MF 40V Thorn 4K	95p
220MF 400V Thorn 9K	1.30	2500MF 35V	65p
220MF 450V Thorn 4K	1.30	2500MF 40V	65p
		3000MF 30V	65p
400MF 350V Thorn 8K	1.00	3300MF 16V	50p
		3300MF 25V	60p
800MF 250V Print type	80p	4700MF 16V	72p
800MF 250V	70p	4700MF 40V	75p

AM-LS-200 Mono Scancoils Sanyo	1.00
M-LS 145 Mono Scancoils Sanyo	1.00
4-2761-44570 Scancoils Sanyo	1.00
Thorn 4000 Coil L401	40p
Thorn 4000 Coil L701/2/3	12p
Pye 713 Coil L831/832	65p
Philips G8 Coil L482 Late Type	65p
Philips G9 Luma Delay Line	90p
Pye 713 Luma Delay Line	90p
Convergence Yoke Assy AT1023/05	5.90

ITT CVC8 On/Off Switch	65p
Thorn 3500 6 P/B Assy + Leads	1.75
ITT CVC9 On/Off Switch + Relay	90p
Philips G8 On/Off Switch	65p
Thorn 3/3500 A1 Switch	50p
Thorn 4000 A1 Switch	50p
Korting Shift Pot 50Ω	65p
2·5A Push to make on/off switch	15p

DIODES

AA112	8p	IN4006	5p
AA119	8p	IN4007	6p
AA143	8p	IN4742A	8p
BA115	8p	IN5254B	8p
BA154	8p	IN5349	14p
BB103	8p	IS025	8p
BR303	46p	IS131	8p
BT106	1.50	IS1658	8p
BT116	1.00	MR854	35p
BY127	12p	SKE1/02	20p
BY204	26p	MCR406	35p
BY298	22p	2N4444	1.50
BYX22/400	30p	Y827	80p
IN60	8p	ZX150	12p
IN2070	8p	OA91	5p
IN4001	4p	MCR106/7	1.00
IN4002	4p	MCR106/8	1.50
IN4003	4p	TD3F800H	2.80
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The Luxor SX9 Chassis

Luke Theodossiou

Most TV manufacturers appear to be heading towards a common goal when it comes to designing a new chassis for future production. The idea which makes the most sense is to design a single chassis which will drive a variety of tube sizes, is easily adapted to suit different broadcasting standards (this makes exporting that much easier) and is capable of add-ons, e.g. teletext facilities.

This approach reduces manufacturing costs by having a single production line for one p.c.b. containing all the common items. The production sequence then "forks" to allow for the different versions of the chassis, e.g. different components are required for 90° and 110° c.r.t.s. This type of design tends to suit smaller manufacturers.

The Swedish company Luxor recently introduced their "unified" chassis design, the SX9. Luxor's total output is relatively modest and they identified their main market as being at the luxury end. It made sense therefore to develop a single chassis with as much built-in flexibility as possible.

Chassis Outline

The SX9 is essentially a single-board design (the p.c.b. measures 14in. by 9in.) which of course is designed to facilitate automatic insertion of components, and incorporates frequency synthesis tuning as standard. A block diagram of the receiver is shown in Fig. 1.

Starting with the power supply, this is a self-oscillating switch-mode type based on the Siemens design but incorporating the Siemens TDA4600 i.c. providing base current control to a BU208 transistor. The circuit is also used in a very similar form in the Decca 120/130 series and was described in some detail in the January 1982 issue. The most important difference is that the Luxor SX9 uses a mains isolated version.

There are two versions of the line output stage: one suitable for 90° c.r.t.s and another for 110°. The 90° type uses a diode-split transformer which provides 24kV of e.h.t. The 110° type uses a conventional transformer/tripler combination and provides 25kV e.h.t. The most interesting aspect is the use of a 110° deflection tube with a pincushion-distortion free yoke. This is the first time that we have seen this type of tube in use. It obviates the need for the usual diode modulator, and width control is provided by a simple adjustable coil in series with the line scan coils as in the 90° version.

Vertical deflection is taken care of by an SGS-Ates i.c. type TDA1670. This is a development of the well-known TDA1170 but housed in a higher power vertically-mounted pack, and offers greater output stage current capability with thermal shutdown protection and an extended blanking pulse generator which effectively suppresses all non-active lines, including the teletext lines.

The sync generator/line oscillator uses a TDA2594 which is a later generation TDA2593 with the exception that it offers sound mute when the oscillator is not locked by incoming sync (e.g. when the receiver is not tuned to a station). This feature is a legal requirement for new receivers in some countries, W. Germany for example, and we are going to encounter it frequently from now on.

Turning to the signals side, the chassis uses a combined v.h.f./u.h.f. tuner as standard. The tuner has an integral ÷256 prescaler i.c. which provides the necessary local oscillator signal for the frequency synthesis tuning section. The i.f. output from the tuner is amplified by a Plessey SL1431 i.c. which provides an a.g.c. signal for the tuner without the need for the usual a.g.c. takeover point preset. This i.c. provides a balanced output which drives a Surface Acoustic Wave Filter. The filter is unusual in that it has two balanced outputs whose bandpass characteristics are different. The vision carrier output has the sound carrier suppressed more than usual, resulting in fewer unwanted interference effects, e.g. sound-chroma beats. This is fed to a TDA4427 i.c. which performs similar functions to the better known TDA2540, i.e. vision i.f. amplification and detection and a.f.c. detection. It differs from the TDA2540 in that it offers two video output signals of opposite polarity.

The sound carrier output from the SAWF is passed to a TDA4282 i.c. for processing. A block diagram is shown in Fig. 2. The i.c. has two basic sections. The first is similar to a standard vision i.f. amplifier and detector. The i.f. amplifier incorporates a.g.c. control; the detector uses a standard *LC* tuned circuit and produces an output very similar to a standard composite video signal. This is brought out of the i.c. and the 6MHz sound i.f. signal is extracted by the usual 6MHz ceramic filter. This signal is fed back into the second section of the i.c. which comprises an i.f. amplifier and detector, the latter using a ceramic discriminator and therefore not requiring any adjustment. The recovered audio signal is routed through a "VCR" switching block inside the i.c. This enables either the off-air signal to pass to the output buffer amplifier or, by applying a switching voltage to the i.c., it blocks the off-air signal and allows an external audio signal to be connected to the buffer. In order to minimise the number of pins on the i.c. and to reduce the switching complexity, a single pin is used to provide an off-air audio output signal via the SCART socket to, say, a VCR in the record mode. When the switching voltage to the i.c. is applied, this same pin reverts to an input pin which will accept an external audio signal (e.g. from a VCR in the playback mode) and route it via the buffer stage to the TV set's audio amplifier. The audio output from the i.c. proceeds to a TDA4290 i.c. which provides d.c. operated control of volume, bass and treble. The output from this i.c. is fed to a TDA2008 a.f. amplifier and then to a speaker and earphone socket. In its standard form the chassis offers only mono reproduction: it's easy to convert for stereo by substituting the audio control/output section for one containing an additional TDA4290 and a twin a.f. amplifier i.c.

Meanwhile, back at the composite video output from the TDA4427, this is passed through a 6MHz ceramic trap (again, no adjustment) to remove any residual intercarrier sound signal present on the video signal and then, after some switching to enable video out/video in, the selected video signal is processed by a Motorola TDA3301 single-chip colour decoder. This is virtually identical to the TDA3300 which has been described in previous issues. There is nothing particularly exceptional about the i.c. (except the extraordinary degree of integration) – it offers the usual RGB inputs with fast picture blanking, making an easy interface with the optional teletext decoder module. One nice feature of this i.c. is the facility of automatic black level control. It does this by monitoring beam current during flyback blanking. The value of the beam current under these conditions should of course be zero (i.e. the tube be cut off or else you don't have blanking!). If the i.c. senses some beam current on any one of the three guns, then it adjusts the d.c. pedestal of the appropriate colour output until there is zero beam current. Not only does this process result in "perfect" grey scale but it retains this throughout the life of the tube (as tubes age the black level for any of the three guns can change causing a deterioration of grey scale). It also compensates for component value changes in the video output stages due to age.

The video output stages themselves are of the class AB type and, as is usual nowadays, mounted on the tube base board to avoid the extra capacitance offered by the RGB connecting cable required with mounting on the main p.c.b. An extra *pnp* transistor connected between each video output stage and the c.r.t. cathode senses the beam current and feeds the information back to the colour decoder i.c. as explained above.

Digital Control

So much then for the basic outline of the receiver. We now turn our attention to the digital section which contains the frequency synthesis tuning system.

The SX9's control system is based on a Philips/Mullard development which offers: (i) user controls – either by remote plus local or local only; (ii) tuning; (iii) teletext acquisition and display (optional); and (iv) signal processing control. It is a very versatile and sophisticated system, and the high degree of integration means that few peripheral components are needed.

The system is illustrated in Fig. 3. It is based on five i.c.s: MAB8440 microcomputer; SAA3004 remote control transmitter; TDA3048 infra-red preamplifier; PCD8571 CMOS memory; and SAB3035 tuning i.c.

Remote Control

The remote control transmitter is very straightforward. The keypad is the usual matrix type. The i.c. is capable of a maximum of 7 sets of 64 commands although of course not all are used in the SX9. Instead of the usual expensive crystal, the SAA3004 uses a 455kHz ceramic resonator to produce its internal clock. In order to conserve battery power, the oscillator is not active until a button is depressed. In this standby condition the i.c. consumes a mere 2μA. The output from the i.c. is amplified by a single transistor and the output from this is used to drive an i.r. diode. Very few peripheral components are used.

The remote control commands are pulse-position coded, with modulated pulses. The spacing between the frequency bursts determines whether the signal is a "0" or a "1". Frequency bursts allow the use of a narrow band receiver circuit which makes the system less sensitive to interference. A complete command consists of a reference bit, a toggle bit, 3 address bits and 6 bits for the command itself. Incidentally, if a command button is pressed for sufficiently long to enable the transmitter to start sending the information, but happens to be released before the process is completed, the transmitter will ensure that the complete command is sent before returning to its standby mode. The reference bit is used by the receiver as a time reference – it is always a "1" and lasts for 7·59ms. The toggle bit changes state each time a new command is sent. The address bits are selected by the manufacturer to suit each application. Their selection determines which one out of the possible 7 sets of commands is to be used. In the SX9, the address bits are all "0". The six command bits are dependent on the command itself and of course allow one of 64 commands to be sent.

At the receiver end, the TDA3048 infra-red receiver i.c. consists of a controlled r.f. amplifier, demodulator, a.g.c. generator, limiter, pulse shaper and output stage. A filter at the input of the i.c. limits the bandwidth of the applied signal, thus ensuring minimum interference. A "Q-killer" circuit automatically reduces the Q of the input tuned circuit in order to limit strong signals reaching the amplifier. This can happen if the transmitter is operated too close to the receiver, in which case the signal can exceed the a.g.c. range.

Microcomputer Control System

The heart of the system is the microcomputer. Most of its functions are already programmed, but the customer (TV manufacturer) has a number of options he can specify. It is therefore best described as a dedicated microcomputer (designed specifically for this sort of application) whose parameters can be altered by software control. Its tasks are to decode the remote control commands, offer local customer "front panel" control, generate data for a seven segment display, control the tuning i.c. and communicate with other devices connected to the serial bus (i.e. memory, text, etc.).

The modulated pulse train from the infra-red receiver module is connected to the microcomputer where it is decoded. This function is performed by a block known as the control/timing block. It incorporates the microcomputer's on-chip oscillator which runs at 4MHz.

In order to store data when the set is switched off, a 1k memory powered by a rechargeable NiCad 1·2V battery is used. The PCD8571 is a 1024 bit CMOS memory organised as 128 × 8 bits. It is connected to the microcomputer via the serial bus. The memory stores channel number; frequency offset from "correct" channel frequency; TV standards (for use in multistandard sets); long/short time constant; on-off satellite; on-off video; on-off a.f.c.; on-off NTSC; preferred teletext pages; seven personal preference adjustments (e.g. volume, brightness, etc.). The above render the memory virtually full. The memory is powered from the +5V rail via a diode when the set is switched on. At the same time, the battery is charged via a current limiting resistor. When the +5V collapses (i.e. when the set is switched off), the diode is reversed biased, therefore preventing the battery from being discharged by other circuitry connected to the +5V rail.

The last i.c. in the system is the tuning i.c., type SAB3035. This provides synthesised tuning with a.f.c.; band switching; reception switching (e.g. satellite and VCR); analogue control of up to 8 functions. It receives its information from the microcomputer via the serial bus and has an internal reference clock running at 4MHz using an external crystal. The tuning voltage generator is fed from the stabilised +33V rail and a linear amplifier acts as

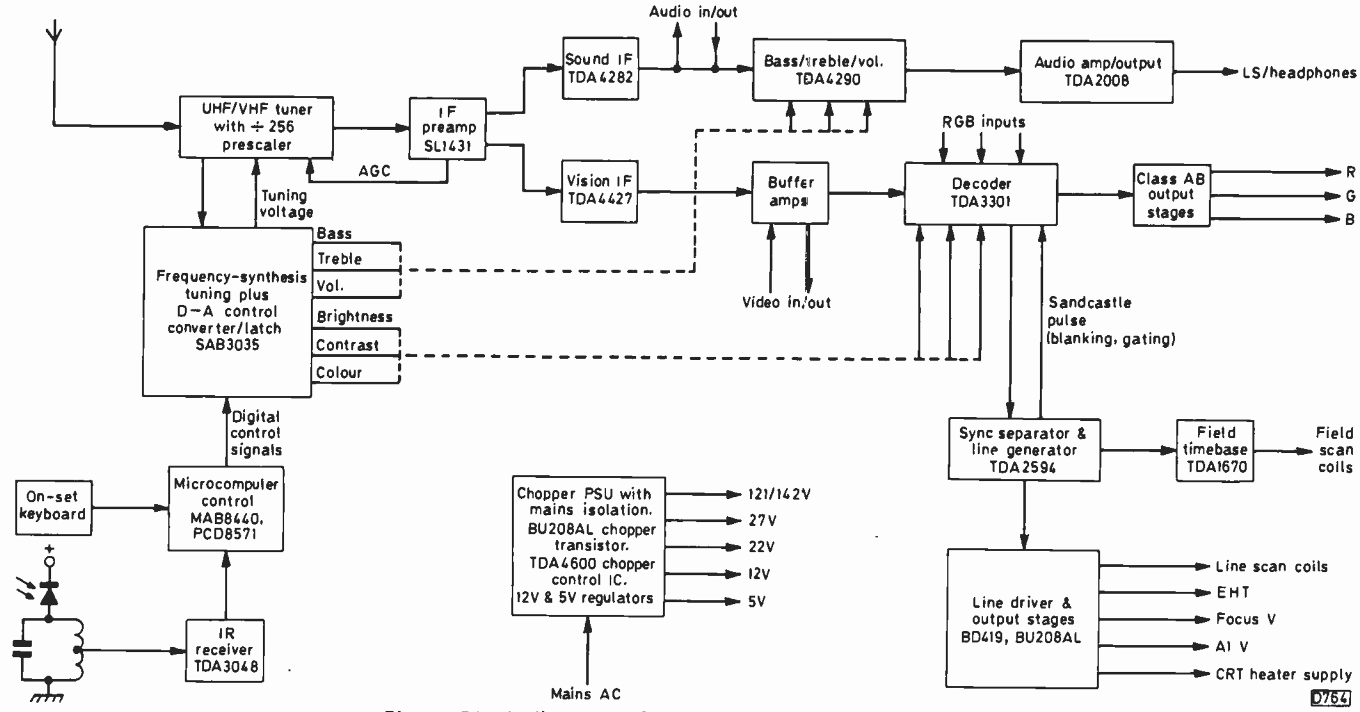


Fig. 1: Block diagram of the Luxor SX9 chassis.

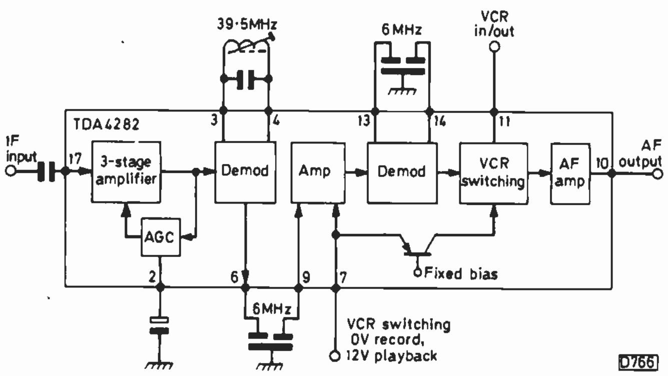


Fig. 2: Block diagram of the sound i.f. i.c., which receives its input direct from the SAWF.

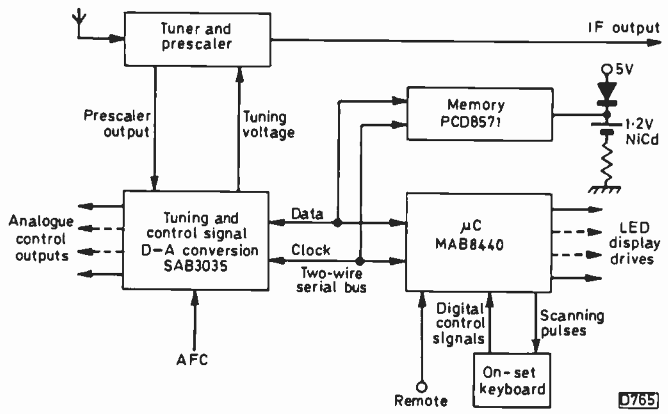


Fig. 3: Block diagram of the digital control system.

a series pass element under the control of the information received on the bus, producing an output voltage from around 0·3V to +33V. The analogue controls each produce 64 voltage "step" levels from 0·5V to 10·5V and these are used to control volume, bass, treble, balance (when used), brightness, colour saturation, contrast, and loudness (the last function is used as a switching function to introduce a loudness contour on the frequency response). This is a function of the TDA4290 a.f. processor i.c.

The digital control system briefly described is one with a considerable amount of built-in flexibility, thanks to its ability to be programmed. No doubt we shall see it being used elsewhere in the near future.

Miscellaneous Features

Other points of interest on the SX9 chassis are an optional SECAM transcoder based on the Motorola TDA3030 i.c. which is used in conjunction with the TDA3301. The latter is also capable of NTSC operation and this can be catered for in the SX9 chassis.

There is, of course, an optional teletext module, which is based on the Philips/Mullard set of teletext i.c.s. The one difference is the use of the MAB8410 which is another in the microcomputer series. Its essential function is to transcode the bus information into the format required by the teletext i.c.s. Luxor offer the additional facility of either the transmitted teletext colours or their complements, achieved with the use of an XOR gate i.c. type 74LS136. Another feature when in the teletext mode prevents the usual interlace flicker. This is achieved by feedback from the field timebase to the sync generator circuit of the teletext decoder to effectively stop the interlace. It appears to be a feature which is becoming more popular and is usually found on Prestel equipment as an option but is now finding favour amongst TV manufacturers.

Another feature included on the SX9 is the SCART socket. This is simply a socket which allows the TV set to be connected to external equipment. It was a standard agreed by a French committee and seems to have gained favour throughout Europe. SCART stands for Syndicat des Constructeurs d'Appareils Radio Recepteurs et Televiseurs. This is the name of the French originating committee and, even if your French is as non-existent as mine, translation is obvious. Philips have decided to call their SCART socket the "Euroconnector", which is perhaps a more easily remembered title, but the important thing is that it's identical. Yet another name for it is the

PERI-connector (peripheral) but this is not much used.

The connector on the TV set is a 21 pin socket, arranged in two rows with alternating pin numbering, starting on the left hand side of the longest row (see Fig. 4). Before giving the pin functions, it's worthwhile summarising some of the advantages.

For a start, it can turn the set into a (fairly) good monitor, capable of accepting either a 1V pk-pk composite colour video signal (multistandard if the set is so designed) or separate RGB plus composite sync. The former can be used with VCRs, video cameras, most games consoles and some personal computers. The latter, which produces even better results by bypassing the set's decoder, can be used with most personal computers and most small business computers (watch out though – a 14in. TV tube is not really capable of resolving a line of text with more than 40 characters. Most business machines use 80 characters, as do some programmes written for personal computers, such as word processing). It is also possible to connect the TV sound to external hi-fi equipment with considerable quality improvement. It also makes for simpler source switching if one is equipped with all the gadgets – computer, video disc, VCR etc. Other, less obvious and possibly with less potential, uses include monitoring and controlling home appliances (e.g. central heating) via the set; bilingual operation by using the left and right sound channels when stereo broadcasting arrives; cheaper teletext decoder add-ons by using the composite video output to feed the decoder and the RGB connector inputs to display the information.

There are still one or two "loose" parameters which have not been finalised, although it is fairly certain that changes, if any, will be minor. The pinning, then, is as follows:

1:	Audio out – right	500mV/1k
2:	Audio in – right	500mV/1k
3:	Audio out – left	500mV/1k
4:	Audio earth	—
5:	Blue earth	—
6:	Audio in – left	500mV/1k
7:	Blue in	0·7V/75Ω
8:	Source switching	0-2V/10-12V/10k
9:	Green earth	—
10:	Intercommunication line (data bus)	
11:	Green in	0·7V/75Ω
12:	Intercommunication line (data bus)	
13:	Red earth	—
14:	Data bus earth	—
15:	Red in	0·7V/75Ω
16:	Status RGB (fast blanking)	0-0·4V/1-3V
17:	Composite video earth	—
18:	RGB blanking earth	—
19:	Composite video out	1V/75Ω
20:	Composite video in	1V/75Ω
21:	Socket earth	—

Not all the pins need be used of course. Some ready made cables to suit particular applications are becoming available but are expensive. A much cheaper alternative is to make up your own, ensuring that you use 75Ω cable where indicated and that the impedances and levels of the peripheral equipment inputs/outputs are correct.

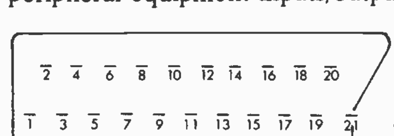


Fig. 4: The SCART socket, viewed from the wiring side.

Quick Checks Q and A

Part 4

S. Simon

The Thorn 8000 Series

It's essential to differentiate between the 8000/8000A and the 8500 chassis, though they share many features in common. The presence of a power resistor assembly (dropper) mounted vertically at the extreme left-hand side as viewed from the rear immediately identifies the 8000/8000A, but even here there are differences. In the original 8000 chassis the two lower sections of the assembly form the 12Ω surge limiter, a single 47Ω section at the top being used as the h.t. smoothing resistor. The assembly used in the 8000A chassis has two extra sections of 56Ω and 1kΩ, in the feeds to the line output and line driver stages respectively. These are at the top and replace wirewound resistors on the power supply board in the 8000 chassis. A more robust assembly with three sections is used in the 8500 chassis, mounted horizontally inboard of the main frame: the tube, e.h.t. and focus units are also quite different. But of course you knew all that. Now for some questions.

An 8000 has no sound or raster but the tube's heaters are glowing. What's the first check?

Check the continuity of the two lower sections of the left-side dropper. These form the surge limiter in the a.c. feed to the thyristor mains rectifier. One of these 6Ω sections is likely to be open-circuit. Whilst it's permissible to connect a 5Ω or 6Ω wirewound across the defective section, it's not permissible to short it out and leave only 6Ω in circuit.

Since the result of the surge limiter being open-circuit is loss of h.t. and the tuner is a mechanical one, why the loss of sound?

Because the single MJE340 audio output transistor is fed from the h.t. line.

What are the weak links in the 8000 series?

The BU105/02 line output transistor used in earlier sets is vulnerable. A different type of line output transistor is used in later models. As a general rule, if a BU type is fitted and is faulty, replace it with a BU208. If the set uses a BDX32 or 2SC1172B, the same type must be used for replacement purposes.

Most sets have a BY127 diode in series with the thyristor. This diode tends to disintegrate and is often the cause of no h.t. when the dropper is intact.

The e.h.t. rectifier is also suspect, be it the little U-shaped unit used in early models or the longer, more complex unit (with focus flylead) used in later sets.

The focus preset in early models is of the same type as used for the first anode voltages. It's at the top right-hand corner of the tube base assembly. The reason for this is that the tube used in the 8000/8000A chassis requires a low focus voltage. The 8500 chassis has a more conventional tube that requires a focus supply of 4-5kV: this is derived from the e.h.t. rectifier, the focus unit being at the lower right-hand side of the main frame. This latter unit is prone to breakdown due to poor wiper contact, open-circuit tracks and leakage to the main frame to which it's bolted.

The right-hand side timebase panel is inclined to suffer from dry-joints, and the front lower line driver section is not free from this. The line driver transistor is an MJE340 and, like the audio output MJE340, is subject to breakdown. In the event of an inoperative line output stage, the line driver transistor and its associated components, including the line driver transformer, should receive close attention.

If the complaint is no colour, why should the timebase panel receive attention?

Because R404 lives at the rear corner. This 33kΩ resistor is in the burst gate pulse feed and tends to change value. In the event of loss of colour, check R404 first.

There is sound and e.h.t. but no raster. What's the likely cause?

The first anode supply reservoir capacitor C401, which is in the same area on the timebase panel. It tends to short, robbing the tube of its first anode voltages and burning up R402 (3·3kΩ) which feeds the BY184 rectifier. The rectifier can also be damaged.

If an 8500 (or 8800) develops poor focus, is the focus unit the primary suspect?

No. Whilst it could well be the cause, it's more likely that the e.h.t. unit is at fault. This unit contains a 150MΩ resistor which supplies the focus unit. Also suspect is the 100kΩ feed resistor R609 (if fitted) on the tube base panel. The drill is to check R609 (convenient if present), then the e.h.t. unit, and finally if necessary the focus control.

There's no raster. The e.h.t. and first anode supplies are present and the tube's cathode voltages are correct. There's a heavy negative voltage at the grids however. What would account for this?

Beam limiting is applied to the tube's grids. The action should be backed off by a feed from the h.t. line to the beam limiter diodes via R615 (180kΩ). This resistor, which is on the c.r.t. base panel, is inclined to go high in value, as a result of which the c.r.t.'s grids are biased negatively.

The Thorn 9000 Chassis

What's the chief weakness of the 9000 design?

The fact that the tripler unit is bolted to the upper metal main frame. The insulation tends to break down, with obvious arcing present. This may or may not cause the syclops circuit to trip. It's prudent therefore to disconnect the tripler from the line output transformer to see whether this restores normal conditions.

Which item is frequently overlooked when the cause of tripping is being investigated?

R710 which is in series with the syclops transistor, from its emitter to chassis. Its value should be 0·47Ω but it sometimes goes high (not a lot). As a result, the voltage across it rises and the trip operates.

Where do you start when the set is apparently dead except for a high d.c. voltage at the collector of the R2540 syclops *transistor VT701?*

At the transistor itself. Poor contact between the holder and the base/emitter legs is often responsible, or the transistor itself could well be at fault. It pays to dwell here a little. In fact most of the faults that occur on the 9000 chassis seem to centre on VT701, W702 (SKE5F3) which is in series with it and is bolted to the syclops heatsink, the OVP-B thick-film unit and the tripler as far as components are concerned, and dry-joints that tend to affect the connections to the scan coils.

The Thorn 9600 Series

What is by far the most common failing with these sets?

Dry-joints under the centre section. These mainly relate to the scan coils' socket and the EW modulator circuitry.

Which components are most likely to be at fault?

The diodes in the EW correction circuit. Whilst W810 tends to decompose, causing bowed edges, lack of width, etc., W818 tends to go short-circuit, leading to complete shut down of the power supply.

If there's no input to the bridge rectifier on the right-hand side power panel, where does one look for the mains fuse?

At the bottom left-hand side, in a holder. If it has failed, note the manner of its failure. If it is blackened, view the bridge rectifier W525 with suspicion, also the mains filter capacitor C531. Also check the h.t. reservoir capacitor C515 for shorts.

Where are the three l.t. fuses?

At the rear lower part of the right-hand side power supply panel. The top one is 800mA and supplies the field timebase. The middle one is 500mA and supplies the 24V regulator. The bottom one is also 500mA: it supplies the audio panel.

Where and what are TSA and TSB?

These are diagnostic test sockets, the pins of which should carry specified voltages. These readings are a great help in speeding up fault diagnosis. TSA is at the rear centre of the horizontal timebase panel. TSB is at the top of the right-hand side power supply panel.

Teletopics

JAP-EEC 1984 VCR AGREEMENT

Agreement has been reached between Japan and the EEC over the arrangements for the second year (1984) of the Japanese-EEC VCR export restraint accord. This was originally to last for three years, with the terms to be revised annually. For 1983 the limit was set at 4·55 million VCRs, to include those exported in kit form for assembly in Europe. In the event this worked out at 3·95 million complete VCRs and 600,000 kits. For 1984 the limit has been set at 3·95 million complete VCRs with the export of kits "basically free" (a figure of around 1·1 has been suggested as likely). The EEC's Commissioner for Industry, Viscount Davignon, commented that the withdrawal of limits on kit exports is on the understanding that VCRs of Japanese origin assembled in Europe will incorporate a minimum amount of value added, and that this amount will be steadily increased. A third section of the agreement envisages the production and sale of some 1·3 million purely European, i.e. V2000 standard, machines in 1984.

The whole point of the accord was to provide a breathing space to enable the V2000 system to establish itself. The envisaged production of V2000 machines during 1983 was to be 1·2 million, a figure that does not appear to have been reached. The agreement has been a considerable disadvantage to kit assemblers, making investment decisions and optimum plant loading difficult — not to mention job creation.

Philips have predictably criticised the revised agreement, suggesting that the new quota for complete Japanese VCRs is a million too high. Both Philips and Grundig are to start production of VHS machines in Europe later this year however, alongside their V2000 assembly lines. It's expected that Philips, having obtained VHS technology licensing from Matsushita, will become suppliers of VHS components as well. Philips' VHS machines will initially be sold in the Americas, Australasia and Asia, not Europe "in the first instance".

The production target is for 300,000 VHS machines in 1984 (last year Philips sold 500,000 VHS machines in non-European markets). The UK is regarded as a likely market for such machines at a later date since the V2000 system has a lower proportion of the market here than elsewhere in Europe.

TOSHIBA'S UK VCR PRODUCTION

Toshiba are to start producing VCRs at their Plymouth plant, at an initial rate of 10,000 a month starting in April. The long-awaited announcement brings with it a surprise — the machines will be to the VHS standard. Clearly Toshiba have been watching the development of the European VCR market. Toshiba comment that their VHS machines will be sold in the UK initially and elsewhere in Europe from 1985. Betamax Toshiba VCRs will continue to be supplied from Japan.

With Sanyo, Toshiba, Philips and Grundig either producing or about to start producing VHS machines, the only major VCR manufacturer with no announced plans for VHS production is Sony.

NEW TV CHASSIS

Decca/Tatung's successor to the 120 series chassis is the 140 series, which is designed to drive pincushion-distortion free 90° tube/yoke assemblies in sizes 14-22in. The 140-144 have eight-button channel selection and the 145-149 full remote control with a 16-channel voltage-synthesis tuning system. The main changes compared to the 120 are as follows: the decoder i.c. is type TDA3561A; a diode-split line output transformer is used; no EW correction is required; the sync processor is a TDA2578A, which differs from the previous TDA2576A in incorporating the field generator, as a result of which a TDA3651 is used as the field driver/output device. The same Siemens TDA4600 type chopper power supply, and tube base mounted cascode RGB output stage arrangement, are used. Most sets employ the up-rated TDA3541 i.f. chip. Power consumption is 58W for tube sizes 14/16in. and 60W for 20/22in. sets, plus 8W for teletext versions. The line driver transistor is a ZTX651 and the line output transistor a BU508A.

The latest version of Thorn's TX10, the 1560/1561 series chassis, incorporates some important changes — the power board has been completely relaid, and moulded frames replace the metal runners previously used. The chopper transistor is a BU508A, introduced for production convenience and reliability. As with the Decca 140, the sync processor/timebase generator i.c. is a TDA2578A, this time with a TDA3652 as field driver/output device. Connections between the power, signals and tube base boards are made by means of plugs and sockets instead of wire-wrapped pins. To suit the degaussing component layout, the degaussing coils are physically reversed on the c.r.t.

ANOTHER HDTV PROPOSAL

CBS in the USA is backing a compatible 525/1050 line system in the event of high-definition TV transmissions being started. The system would use two channels, one carrying a standard 525-line, 4:3 aspect ratio signal and the other an additional 525 lines with 5:3 aspect ratio for interlacing with the standard channel. The higher resolution would be lost at the edges of the screen, but these are not the main source of attention. A substantial digital memory would be required to assemble the high-definition picture.

US DBS TV SERVICE

The first commercial DBS service has been started in the USA, by United Satellite Communications Incorporated. There's nothing new about satellite reception in the USA of course, but the signals received until now have been those being distributed by broadcasting and cable networks, a practice which the FCC has ruled to be perfectly legal (on the grounds, apparently, that if they are there it can't be illegal to receive them). The USCI service will be via a narrow-beam transponder on a Canadian satellite, beamed at the Indianapolis area. For an initial charge of \$300 USCI will instal an aerial and converter/descrambler: a monthly charge of \$39·95 will provide a 24-hour, five-channel service.

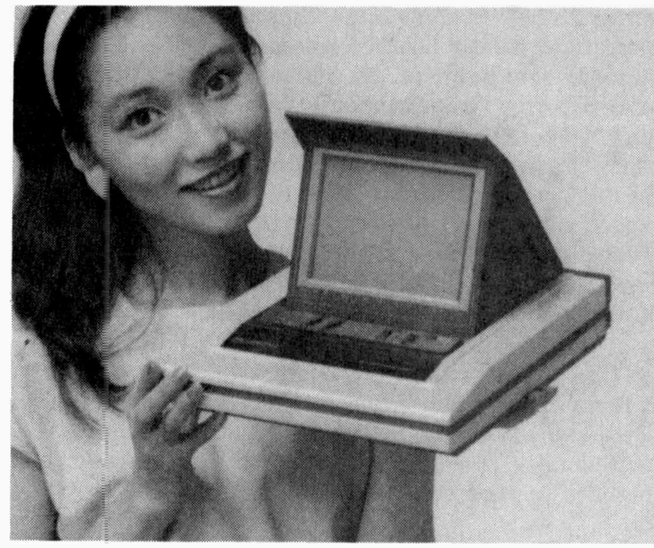
Rupert Murdoch's News America group has decided to delay the start of such a service until higher power satellites become available — News America had previously leased five transponders for six years at a charge of \$75 million and are now seeking other uses for these satellite channels.

MAJOR DEVELOPMENTS FROM MATSUSHITA

Matsushita have announced a multifunctional digital TV set and a portable rear-projection colour set with a 6·5in. screen. The digital TV set will go on sale in Japan early this year and the projection set will be available within a year. There are no plans at present to market either product in the UK.

The digital TV set uses two i.c.s and four l.s.i.c.s including a newly developed microcomputer chip. There's a comprehensive remote control system and the features include picture-within-a-picture — a digitally processed 6in. colour picture can be inserted in the main 20in. display. The use of digital circuitry is said to give crisper images due to the reduction of spots, flickering and colour saturation.

The portable projection colour set has a collapsible screen that folds down into an attache case measuring 25 × 8·5 × 31cm and weighing only 3kg. In comparison, a conventional 7in. portable weighs almost twice as much and is nearly twice the size. The power consumption is also reduced, at only 12W. In addition to off-air reception



Matsushita's rear-projection colour portable receiver.

the set can be used as a portable display terminal. The set is based on the technology developed for Matsushita's large-screen projection sytem, using three 5cm. projection tubes foı red, green and blue.

VIDEO STATISTICS

The number of VCRs in use world wide now exceeds forty million: this is just one item from a detailed statistical survey published in the November 1983 issue of *Screen Digest*, a media newsletter which is now in its thirteenth year of publication. Video statistics surveys and national report round-ups are published twice yearly, in the May and November issues. Details of the newsletter can be obtained from 37 Gower Street, London WC1E 6HH.

PRESTEL TELEXING

A new service launched by British Telecom enables any Prestel terminal to be used to send messages to telex machines in the UK — there are plans to expand the service to cover Europe and the rest of the world, starting later this year. A successfully transmitted message costs fifty pence plus VAT and the normal telephone and Prestel

Amongst the features of Matsushita's multifunctional digital receiver is colour picture within a picture, shown here.

time charges. Prestel Telex Link message pages have space for around a hundred words — about half the telex messages sent between UK destinations are of this length or less. To send a message, the Telex Link index is called up on the Prestel screen and the message "pro-forma" page selected. The telex address and text are then entered via the keyboard. Confirmation of delivery is sent to the sender via Prestel's Mailbox electronic mail service. The reverse capability to send messages from telex machines to Prestel terminals is under development and is expected to enter service later this year.

ORTHOPERSPECTA SOUND

A three-signal sound system, left plus right plus centre, has been announced by Salora for TV receiver use. The conventional L and R signals are decoded and then matrixed to produce a centre signal.

NEWS FROM PYE

The Pye Apprentice of the Year award for 1983 was won by Andrew Farnell of J. B. Postle (Cromer), Norfolk.

Pye are continuing the tradition of keeping large-screen monochrome sets in their range with two new models, the 7205 (20in.) and 7245 (22in.). Suggested prices are £120 and £125 respectively. The new slimline L7 chassis is used in these sets.

BINATONE TO PRODUCE TV SETS

Binatone are to start assembly of 14 and 20 inch colour sets at Milton Keynes later this year. The aim is a production rate of 100,000-150,000 sets a year depending on market conditions. Binatone will also be opening a 100,000 sq. ft. factory outside New Delhi to produce TV and audio equipment for the expanding Indian market.

VIDEOTAPE NEWS

High-grade tapes have been introduced by Philips "to do justice to the new, high-specification, second generation V2000 machines". A new magnetic coating with better uniformity is used and the tape slitting has been made more precise. The VCC240 cassette gives 2 × 2 hours playing time at around £10 and the VCC360 2 × 3 hours at about £13.

3M are giving a guarantee with their latest Scotch tapes that picture quality will never deteriorate however many recordings are made on it. The new tape uses a tough binder for the coating and is also back coated to help eliminate static and protect the polyester film base material.

VINTAGE TUBES

Following a recent purchase of electronic equipment, The Vintage Wireless Company (Tudor House, Cossham Street, Mangotsfield, Bristol BS17 3EN) are able to supply brand new 9in. picture tubes suitable for use in many sets dating from the forties and early fifties — such tubes are generally unobtainable. They are Ferranti type T9/3 and T9/5 and are all packed in their original cartons. The price is £27 each or £40 for two, these prices including VAT but not postage. Brief details: triode gun; international octal base; 4V, 1A heater; the T9/5 differs in having an external conductive coating.

NEW DX-TV MAGAZINE

A new magazine for all DX enthusiasts is being edited and produced by Keith Hamer and Garry Smith. The first issue of the magazine, called *Teleradio News*, is no. 7 dated October — if that sounds a bit unusual, the explanation is that the magazine is successor to an earlier one edited by Cyril Willis. Publication is bi-monthly and subscriptions (from HS Publications, 7 Epping Close Derby DE3 4HR) cost £4·50 for six issues (UK and world wide by surface post — £7 for six issues sent air mail world wide). In addition to DX-TV, the magazine covers radio DX, equipment, video plus radio and TV topics in general.

NEW COAXIAL CONDUCTOR WIRE

Texas Instruments have introduced in the UK a copper-clad aluminium wire for use as the inner conductor in coaxial cable. More than 30,000 tons of the material have been sold in the USA, where it has virtually replaced solid copper for the centre conductor. Texas say that the wire gives a cost saving of twenty per cent, with attenuation at 400MHz up to eighteen per cent lower. The copper-clad aluminium is produced by a continuous solid-state bonding process pioneered by Texas Instruments.

WILLOW VALE CATALOGUE

A new trade price catalogue from Willow Vale Electronics Ltd. (Old Hall Works, Shinfield, Reading RG2 9DP) is available free of charge to dealers. It covers a very wide range of TV/VCR etc. parts, including many service manuals. There's also a VCR spares supplement. Willow Vale have recently been appointed official spare parts distributors for Sharp (UK) Ltd. to non-Sharp account holders.

VIDEO DISC SCENE

Thorn-EMI are to launch the VHD video disc system in the UK after all, but strictly for commercial, industrial and institutional applications. Thorn's comment that there are "no plans for a consumer launch yet" seems to leave this option still open however. Meanwhile GEC-McMichael have introduced two CED disc players, Models V5001 (mono) and V5000 (stereo), at the same prices as the Hitachi equivalents (£199.95 and £229.95 respectively), while on the LaserVision front Philips have started a major sales campaign with reduced disc prices, a doubling of the number of stockists (including selected branches of Rumbelows, Currys, Laskys and Comet) and a £1 million advertising campaign.

SCOPEX RECEIVERSHIP

The assets of Scopex, which was put into receivership recently, have been bought by Bridage Scientific Instruments Ltd. of Skipton, North Yorkshire. Bridage will be fulfilling all outstanding orders for Scopex oscilloscopes and intend to continue manufacture of the range, which Bridage say is complementary to their existing range.

VCR NEWS

Sanyo's first UK assembled Betamax VCR, Model VTC5150, has now been introduced at a suggested price of £379·95. It's a top loader with a comprehensive specification. Sanyo is also to start producing Betamax machines in Taiwan.

Second-generation V2000 machines have now been introduced by Philips and Pye (see mention in Teletopics, July 1983). The Philips machines are Models VR2324 and VR2334, the Pye versions being Models 23V34 and 23V33. Philips say the machines use a refined version of the DTF system called Super DTF.

Panasonic have introduced the first VCR in the UK featuring hi-fi VHS — the system of recording stereo sound signals on the tape helically (see Teletopics, October 1983). The techique is used in Model NV850.

Akai have introduced a budget-price VCR, Model VS1EK, with a suggested price of £500. It features multi-function infra-red remote control and Akai's on-screen system for displaying tuning and programming information.

Kodak are reported to have developed an 8mm VCR standard that uses perpendicular rather than helical scanning.

It seems that a number of Philips VHS machines, produced by Sharp and intended for non-European distribution, have been imported into the UK. Philips point out that these do not carry their guarantee.

OBITUARY

F. Howard Steele, managing director of Sony Broadcast Ltd., has died at the age of 54. Mr. Steele joined the ITA (as it then was) in 1966, as chief engineer, becoming director of engineering in 1969. He moved to Sony Broadcast in 1978. During his time with the IBA the network was converted to colour and significant developments in digital TV signal processing were developed and brought into operation.

Satellite TVRO System

Part 4

Nick Harrold

Since the start of this series, my installation has been upgraded by replacing the initial 1·2m dish with a Harrison Bros 8ft petal dish. As a result the signals have been considerably improved – not only because of the extra gain provided by the larger dish but also as a result of reduced ground noise pickup, a major factor when a very small dish is used.

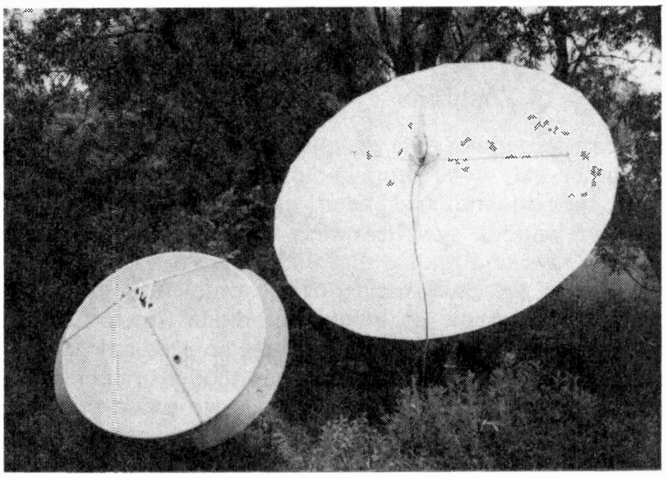
Photo 1 shows the Harrison 8ft petal dish fitted with the 4GHz head unit, with the 1.2m dish used for the initial experiments in the foreground to the left. The higher F/D (focal length/diameter) ratio of the basic 6ft dish (0·42) compared to the 1.2m one (0·25) has many advantages, one being that the diameter of the dish can be increased at some later date (when funds permit) to a calculated 10ft, bringing the F/D ratio down to about 0·25 (the minimum possible). An add on kit enables the basic 6ft petal dish to be upgraded to 8ft, giving an F/D ratio of 0·32. When this extension was added, a worthwhile, cost effective improvement was noted. Further information on these dishes can be obtained from Harrison Bros, 22 Milton Road, Westcliffe on Sea, Essex. The firm can also supply gallium arsenide f.e.t.s and other difficult to get microwave components.

Photo 2 shows Moscow ch. 1 received on a 6ft dish. This satellite's other two channels can be received in colour with the dish extended to 8ft. Photos 3 and 4 show one of the weaker signals receivable (Morocco) and the sorts of results obtainable with 4 and 6ft diameter dishes respectively.

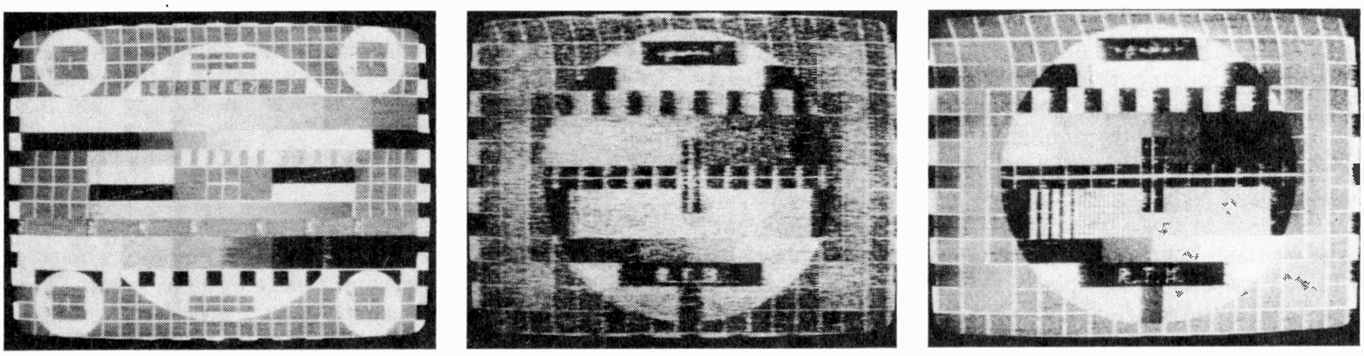
With a Band I tuner modified for 70MHz instead of a u.h.f. tuner it would seem possible to use the circuitry described in these articles with the 4GHz front end described by Hugh Cocks in the May issue, but this has not been tried. A head unit with a nominal output at 750MHz is now available from Hugh Cocks (Cripps Corner, Robertsbridge, East Sussex, TN32 5RY).

Over to You!

In conclusion, I hope that these articles have shed some light on techniques suitable for satellite DX-TV reception. We look forward to reports from other readers on the results they manage to achieve.



1: Harrison 8ft petal dish on the right, with the originally used 1·2m dish on the left.



2 (left): Moscow ch. 1 received with a 6ft dish. 3 (centre): Weak Moroccan signal received with a 4ft dish. 4 (right): Improved Moroccan reception with a 6ft dish.

VCR Clinic

Reports from Steve Beeching, T.Eng. (C.E.I.), Derek Snelling, John Coombes, Mike Sarre, Peter H. Dolman, T.Eng. (C.E.I.) and Philip Blundell, Tech. (C.E.I.)

Hitachi VT8300

An Hitachi VT8300 came along from another dealer. His customer's complaint was that the picture would jump up and down in the still mode. My dealer friend had attempted to twiddle the appropriate adjustment, R1101, with no apparent results. When I tried, there was no way in which the visual search board could be set up properly.

In a case like this the first check should be the drum feedback pulse (PG1 and PG2) settings. Each should be set, using a test tape, so that the edges of the pulses occur six and a half lines before the field sync pulse. This setting was all right.

Somewhat puzzled, I did a recording and found that the head crossover switching point occurred too high up the picture. So the record setting (R686) was off, but this couldn't be set up. I ran out of twiddle whilst the switching pulse edge was after the field sync pulse, never mind six and a half lines before it.

Further inspection revealed that the drum servo was not at optimum – though still locked, it was out of phase and the sample pulse sat at almost the top of the ramp. In order to restore normal working the drum servo had first to be set up, then the timing of the record switching, and finally all the presets on the visual search board had to be adjusted. Apparently the previous engineer (?) had adjusted the servo on the living room carpet without a scope! **S.B.**

A Batch of Toshibas

We had something of a problem with a Toshiba V5470 the other day – the drum motor was still running even after the cassette had been ejected. After checking whether various switches were contacting when they shouldn't be, and finding that they weren't, attention was directed to the basic nature of the problem, i.e. to the drum motor circuit. A number of diodes on the servo panel go to various 12V rails, forming an AND type circuit to provide power during the relevant modes of operation. By tracing back through these diodes we found that the playback 12V rail was high – not at full voltage, but sufficiently to turn the motor on. One unusual effect was the fact that the motor ran only when the VTR/TV switch was in the VTR position. Most odd.

The question was where this rogue 12V supply was coming from? Since the exact voltage level was immaterial, a logic probe and an oscilloscope were used for the chase. Now underneath the V5470, where the drive belts are, there's a sneaky little panel with sockets on it – called the relay board. By disconnecting plug P831, the various 12V sources can be isolated at its pins. Fortunately only one pin was high, pin 105. Following through the circuit (no easy job at the best of times) led me to P981 on the switch circuit board, behind the front panel, where the VTR/TV switching takes place. Diode D988 on this board was found to be short-circuit.

Next came a simple one: a new V9600 that didn't flash its digits when setting up the clock of timer. A new timer i.c. cured that.

A fairly common fault with the V8600 (V8700 when remote control is included) is intermittent timer operation. It's normally caused by oil contaminating the take-up clutch drive pulley. A simple test is to switch the machine to standby, then switch back whilst holding down the play button. This simulates timer switch on. The capstan/pinch roller combination should start to drive the tape, with the take-up spool increasing the torque. If the take-up torque is insufficient, tape slack occurs and the slack sensor operates, thus shutting the machine down before it's got started.

Well, I did everything I could think of to increase the starting take-up torque, including trying a new take-up turntable. Then I thought about timing – say delaying the pinch solenoid or the slack sensor operation. Now when you look at the slack sensor circuit you see that there's already a delay network which is included to allow the slack sensor arm to swing in at start up without the machine shutting down. The slack sensor switch closes at 5V, the rise time being delayed by the 4·7μF capacitor C628 charging via R697 (100kΩ). Obviously the delay was not enough in certain circumstances, so I put another 4·7μF capacitor in parallel with C628. **S.B.**

Sony C7

We discussed this interesting little problem, concerning a Sony C7, with E.T. who resides on the south coast. Occasionally the machine would not allow the cassette compartment to open after unthreading. The cause can be the threading ring turning slightly anticlockwise (threading) after hitting the end stop at the completion of unthreading, presumably due to stored energy in the threading drive belt. If you consider the motor driving the threading ring via a belt, the micro switch and systems control will remove the power from the motor when the ring hits the end stop, but the motor won't stop instantly and a certain amount of over run will take place. As the threading ring can't go any farther, the belt acts as a store for the over run energy and when the motor stops the energy will be released, the belt moving the ring back slightly in the threading direction. Hope that's clear! Anyway, this movement of the threading ring will inhibit operation of the eject mechanism – as it would rightly do if the tape was in fact threaded.

E.T. has devised a method to switch on a transistor across the motor to act as a brake. However I favour increasing the threading ring friction by adjusting a little roller at the back of the drum mechanics – it adjusts the ring tension. **S.B.**

Aerial Amplifier Failures

During August we had rather a lot of thunderstorms here in the Midlands, some quite bad. As usual, whenever there's a thunderstorm the aerial terminal board on at least one Panasonic machine goes faulty. This gives the symptom of either a low-gain picture on the TV set though o.k. through the VCR, or o.k. on the TV set but low gain through the VCR. This time we had seven faulty machines

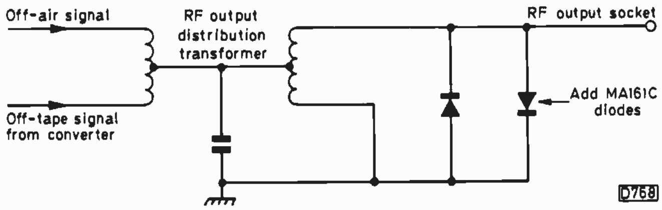


Fig. 1: Adding diodes to provide protection on the aerial terminal board in Panasonic machines.

in four weeks, including a Mitsubishi HS303 and an Hitachi VT11.

Panasonic consider the aerial terminal board to be a service replacement item, so they don't supply a circuit. As some of these machines are now going out of guarantee however we decided to take the bold step of repairing one. We assumed that the fault would be a defective transistor and found that they were all the same. As we couldn't find any equivalents we had to order some. When they arrived we found that Panasonic had sent kits containing a transistor, two diodes and a modification sheet to prevent further failure of the transistors. With the three I've repaired so far, Q3 and Q4 have both failed. See Fig. 1. **D.S.**

Capstan Motors

This time capstan motors have been "failure of the month". I've changed two in 3V29s for wobbling sound and a colleague changed another. In addition he had to change one in an Hitachi VT9500 and another in an Hitachi VT11, in both cases for jamming. **D.S.**

Hitachi VT8500

The following two problems have occurred several times on the Hitachi VT8500.

Intermittent loss of vision in the E-E mode (and loss of recorded picture): Check the earthing of the print inside the screened i.f. unit (especially that associated with the chassis end of R858). The print is connected back to chassis via various metalwork lugs that project through the board: these become dry-jointed, causing intermittent operation.

Intermittent loss of capstan servo control on replay: Suspect C515 of being low in value. This 470μF electrolytic decouples pin 3 of IC502, i.e. the replay control pulse amplifier. Unless this pin is well decoupled the amplifier's gain will be inadequate, hence the large capacitance value. A check on the waveform (not shown in the manual) at TP502 will assist in checking the amplifier's operation: for reliable servo control there should be pulses of 2·8V peak-to-peak at this point. **P.H.D.**

Ferguson 3V29

The problem with a Ferguson 3V29 was a rolling noise bar through the picture. Obviously something was failing to lock. A check inside the machine revealed a thick piece of cloth that was wedged by the pinch wheel. Perhaps this was preventing the pinch wheel contacting the capstan properly, with the result that the speed varied? Removing the cloth made no difference.

Time was then spent tracing why the machine had suddenly decided to fail to complete the loading operation. This time we found a hair grip jammed against the pinch wheel solenoid. Going back to the original fault, after a careful check for other signs of customer abuse we got out the scope and found that the drum sample pulse was missing from the trapezoidal waveform during playback but would appear when the machine completed unloading after being put in the stop mode. Exactly the reverse of what should happen!

Convinced that one of the deck switches was operating incorrectly we checked the lot, then in turn replaced the servo, MDA and mechacon boards in an effort to narrow down the source of the fault. All to no avail. On finally checking every input to the servo panel we found that there was an incorrect voltage at pin 14 during stop. This came from the tracking control which turned out to be open-circuit. Judging by the state of the machine, this was probably caused by a blow with a blunt instrument or an attempt to rotate the control past its end stop. While I can understand an open-circuit tracking control causing a rolling noise bar – I've had a similar fault on a 3V22 – I can't quite see how it "reversed" the appearance of the sample pulse. That's the sort of obscure symptom you increasingly seem to get however as logic gates take over more and more of the machines' operation. **D.S.**

Panasonic NV333

Apart from the pinch wheel modification, the on-off switch and high back tension problems we've had little trouble with the Panasonic NV333. Then along came one that wouldn't go and the lid wouldn't stay down. It's not an easy model to service – you can't work on the machine with the bottom panel hinged out as the connectors from the front control panel have to be removed. Anyway, to the fault in hand. Preliminary tests revealed that when any mode was selected the play LED would light up and then go off after a couple of seconds, the power supply switching off. From this it seemed that the command had been received and that the machine had made an attempt to carry it out without success. Knowing that current Panasonics tend to use the loading motor for eject, and that the eject lever was held open, I tried turning the loading pulley manually (being careful, so as not to damage the mechanism). This returned the eject lever. I then checked the loading motor and found that there were no voltages on this whichever mode was selected.

The loading motor drive circuit is on the system control board. It consists of a bridge arrangement comprising transistors Q6026-9. Brown heatmarks were immediately noticed on the board below Q6028 and Q6029, and on test the former turned out to be open-circuit while the latter was short-circuit. Replacing these restored normal operation. **M.S.**

Toshiba V8600

Here are some faults we've had recently on these machines.

Negative picture/incorrect colours: This can be due to the TV/VCR switch but on one occasion we traced the problem to switching transistor Q661 (2SC2236Y) on the servo logic panel. It controls the supply to the modulator. Check by replacement.

Poor stills: Remove the bottom cover and turn around the plug from the heads (red and white leads).

Intermittent colour/flashing red, green, blue: A check at pin 15 of the divider i.c. (IC208) in the reference signal PPL, using a frequency counter, produced a reading of 25kHz instead of 15·625kHz. Replacing the i.c. (type MB14300M) rectified the fault.

Remote knocking noise in operation: This can be due to the planetary gear touching capacitors on the video board. The cure is to redress capacitors C229, C479, C230, C247. **J.C.**

Sharp VCRs

Here are a couple of faults we encounter fairly regularly on Sharp machines.
Model VC9300: Goes into the stop mode intermittently whilst playing. Clean the take-up jockey pulley; if still in trouble, suspect that the reel motor has a dead spot.
Model VC9700: For intermittent failure to record sound, clean the bias oscillator switching relays. If the off-tape f.m. is low (poor recordings), suspect that one of the video heads is out of specification. If the capstan speed is too fast, check the frequency of the playback 50Hz signal from the YC panel and C774 on the servo panel. **P.B.**

Ferguson 3V31/JVC HR7650

The problem we've had on some of these machines is black flashing lines, or sometimes an intermittent blank screen, on E-to-E or recording, the machine working all right on replay. The cause is that C19 in the tuner/i.f. board a.g.c. detector circuit is leaky. **P.B.**

VCR Servicing

Part 24 ***Mike Phelan***

In the next couple of instalments we'll be taking a look at portable VCRs, in particular the Ferguson 3V24 (JVC HR2200). One might think that a portable is not much different from an ordinary domestic machine – maybe it's just a video with a handle? That's not quite the story however. Imagine carrying a domestic VCR and a camera around for an hour or two: from this one can appreciate that a portable machine is a rather different kettle of fish.

Reducing the Weight

The main consideration is of course weight. A domestic machine contains a lot of bits that are unnecessary in a portable. As audio and video are being supplied by the camera, a tuner and i.f. strip are not required. Neither do we need a clock/timer. This reduces the weight considerably. The machine has to run off its own 12V battery (rechargeable) or a 12V car battery, so we don't need a mains power supply. Facilities for battery charging and mains operation must be available, but can be contained in a separate unit. This can also incorporate a tuner, i.f. strip and timer for domestic use of the equipment. Current consumption must be kept to a minimum – a compromise is required between battery size/weight and recording time (remember that the camera also draws current from the video battery).

The 3V24 uses plastics extensively in its chassis and cabinet, and employs a nickel-cadmium battery, thus saving considerable weight. Lead-acid and nickel-cadmium batteries both have their pros and cons. Lead-acid batteries are heavier but their charging conditions need

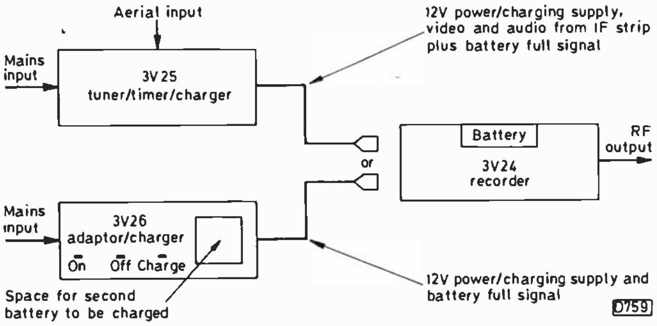


Fig. 105: Use of the 3V24 portable VCR with a 3V25 tuner/timer/charger or a 3V26 charger.

less attention. A nickel-cadmium battery must be discharged before charging, otherwise maximum capacity will not be achieved – this is also dependent on ambient temperature.

The 3V24 is complemented by either the 3V26 mains adaptor-charger or the 3V25 which is these plus a tuner-timer (see Fig. 105). The 3V26 can charge two batteries – first the one in the machine then, when that's charged, a spare in the 3V26 automatically begins to charge.

As the machine will be used outdoors, possibly in damp conditions, there's a danger of damage to both the tape and the heads due to condensation on the latter. A drum heater could be included but would consume quite a lot of current, which can ill be afforded. Instead, a compromise is adopted – a heater that's powered only when the mains adaptor is in use and the VCR is switched off. A dew sensor inhibits any functions if the machine is damp.

Most of the more recent VCRs we've encountered have two solenoids, one to operate the brake mechanism and one for the pinch roller. They have two windings, a low-resistance one to pull the solenoid in and a hold winding which takes less current but sufficient to keep the solenoid attracted once the pull-in winding has been de-energised. Unfortunately this type of solenoid is a little extravagant in weight, size and current consumption. The 3V24 has two solenoids with only one winding and a permanent magnet to hold in the plunger. A short pulse through the coil draws the plunger in, after which it's held by the magnet. To release the solenoid, a pulse of opposite polarity is applied to the coil to cancel the field and release the plunger, which is lightly spring loaded. This arrangement presents a problem: unlike the usual system, there's nothing to tell the machine which position the solenoid is in – no current flows in either condition. To overcome this problem a microswitch is attached to the mechanism operated by the solenoid, indicating the plunger position.

The Ferguson 3V24

Now for a closer look at the 3V24. Considerable ingenuity has been used to get everything in (see Fig. 106). The panel marked MDA is the motor drive amplifier for the direct drive head drum motor, which is very similar to that used in the 3V23. The MDA board uses normal components for the larger active devices and the electrolytic capacitors, but most of the resistors and jumper links are surface-mounted components – these are components made on a substrate without leads and soldered on the print side of the panel. Components of this type (see Teletopics last month) are extensively used in cameras – diodes, transistors and capacitors as well as resistors (see Fig. 107) can all be made in this way. Most of these "chip" components are the same size, about 3 × 5 × 2mm, and apart from the transistors which have three connections they all look identical. They can be replaced with normal components in an emergency, provided you have the manual to tell you what the component actually is and its rating/value.

Battery/Mains Operation

Fig. 108 shows the 3V24 connected to a 3V25 tuner-timer. When the machine is battery operated S3, which is operated by plugging in/unplugging the 3V25, connects the battery to the power switch and rails. Diode D9A is reverse biased so that the heater is off.

On a long session it may be necessary to change batteries several times. Normally the machine will unlace and go to stop when the power is reapplied after an interrupted recording. If the rec-lock switch is closed however the machine will always start up in record. This feature is made use of when in the timer mode with the 3V25 – the connection via pin 5 of the connecting socket can short out the rec-lock switch via D11 so that the record mode is entered when power is applied.

When the 3V25 is plugged in S3 changes over, connecting the power switch to the supply at pin 6. The battery is then connected to the charging supply via D10 and D9A, but little charging takes place due to the voltage drop across these two diodes. Provided the 3V24 is switched off, the heater is energised. When the machine is switched on transistor X24 switches off, cutting out the heater. To charge the battery, you switch the 3V25 off and then press the charge switch. This energises the relay, the first pair of contacts keeping the relay supplied via D9 after the charge button is released, the second pair of contacts connecting the charging line to pin 1 of the connector. The series resistor/thermistor combination approximates to a constant-current supply. When charging is complete, the battery temperature rises and the thermal switch opens, breaking the earth return from the relay winding and releasing it. If the 3V25 is switched on whilst charging, the off switch opens with the same result.

The 3V26's charging circuit is similar, but with two relays, one to change over the charging to the second battery. In addition, if the 3V24 is switched on the charging is stopped. This is done by the connection to pin 5 of the socket, used with the 3V25 for timer start. When the 3V24 is switched on, 12V appears at pin 5 (from R74). This switches off the relays in the 3V26. You can now see why D11 is fitted: so that the rec-lock switch, if closed, doesn't prevent the "charge off" line rising to 12V. This little bit of the circuit is interesting as it uses one pin of the socket for two completely different purposes, depending on which unit is plugged in.

In the next instalment we'll look at the mechanism control system, which is somewhat simpler than that used in the 3V23.

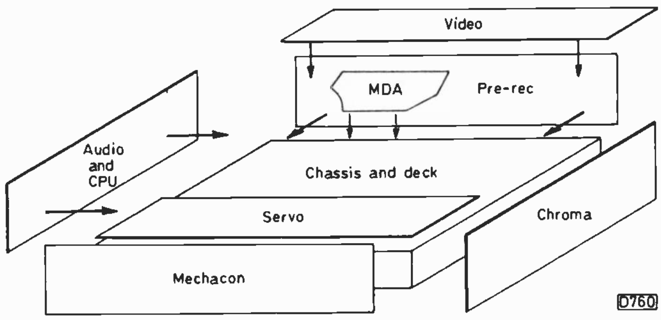


Fig. 106: Compact arrangement of the 3V24's chassis (bottom view).

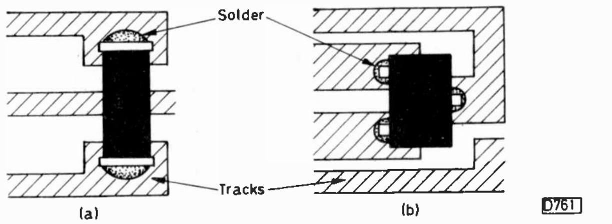


Fig. 107: Surface-mounted components. (a) Resistor, jumper jumper (zero ohms resistor), capacitor or diode. (b) Transistor. During board assembly the components are held in position with glue prior to being soldered.

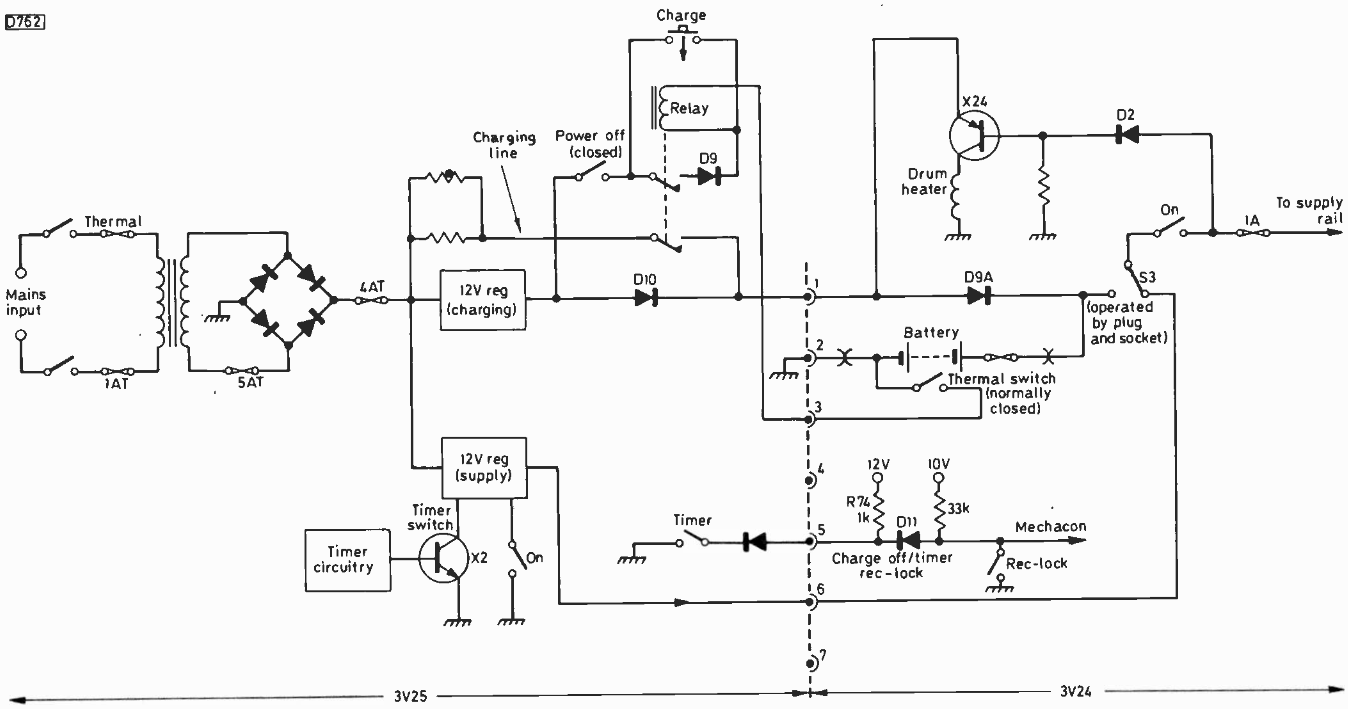


Fig. 108: Ferguson 3V24 VCR connected to a 3V25 tuner/timer/charger unit.

Auto Channel Scanner

James Dilworth, A.M.I.E.

This project started with the thought that it would be a good idea to be able to monitor the locally available TV channels, enabling one to view the whole selection and choose anything of particular interest. The auto channel scanner was thus devised. It can select four (or eight) channels in sequence for eight-ten seconds each so that they are all monitored at least once a minute. If an interesting programme is seen, the scan/normal switch is operated and the set then returns to the normal mode of channel tuning.

Channel Selection

The circuit (see Fig. 1) employs an SAS660 channel selector i.c. and an NE555 timer i.c. The SAS660 has extra circuitry at its number one input (pin 10) to ensure that this channel is selected when the circuit is first switched on. This produces an output of 12V at pin 9 and 33V at pin 6. The output at pin 9 can be used to drive a channel indicator LED and/or for band switching if this is required. The 33V output is the tuning supply voltage of course.

Channel Stepping

To step IC1 to the next channel, a positive-going pulse from IC2 is applied to pin 2 via C11 and D5. This increases the voltage across R10, which is the common emitter return for the four input stages. When this potential rises, the four inputs are unlatched and switched off. If say input one (pin 10) was on at the instant of switching, a negative pulse will appear at pin 6. This is fed via C8 and R7 to input two (pin 12), switching this on. Input two then latches and remains on until another pulse arrives at pin 2. A similar sequence switches on inputs three and four.

Extra Channels

If more than four channels are required an SAS670 i.c. can be added. This is identical to the SAS660 except that there's no automatic input one selection at switch on. Connect pin 2 of the two i.c.s together (see Fig. 2), using R10 as a common load for both pins. Both i.c.s are similarly wired but C7 and R6 are now connected to pin 10 of the SAS670, with coupling back from pin 3 of this i.c. to pin 10 of the SAS660. This gives switching for eight channels.

Timer

The 555 timer i.c. is used in the astable mode. Whilst C12 is charging via VR1 and R12 the output at pin 3 is high. Tr1 is thus switched off. When the charge across C12 has risen sufficiently the output at pin 3 goes low, switching on Tr1 to produce a positive-going pulse at its collector. In this condition the voltage at pin 7 falls to chassis potential and C12 is discharged via R13. When C12 has almost discharged pin 3 goes high and the cycle starts again. The pulses appearing at the collector of Tr1 are used to step IC1 through sequential channel changes and are also used to blank the audio and video signals to

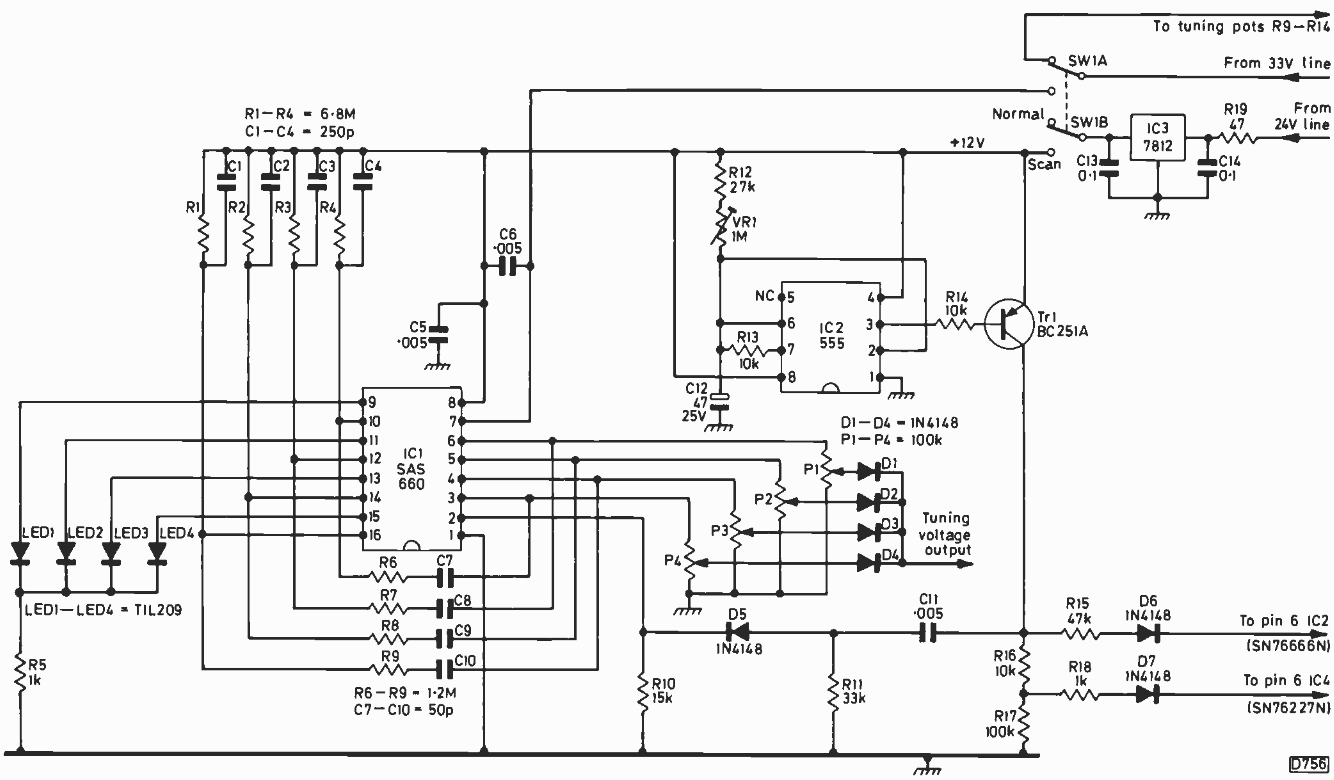


Fig. 1: Circuit of the auto channel scanner for four-channel operation.

minimise picture and sound disturbance between channel changes.

Use with the Thorn 9000 Chassis

The prototype scanner was fitted to a 20in. Thorn colour receiver (9000 chassis). The sound blanking pulses are fed via R15 and D6 to pin 6 of the SN76666N intercarrier sound i.c. to reduce sound hiss. Similar pulses are fed via R18 and D7 to pin 6 of the SN76227N colour demodulator/matrixing i.c. to blank out the screen between channel changes. R13 sets the blanking time – replacing this with a 50kΩ potentiometer enables the period to be adjusted. The lower the resistance value the quicker C12 will discharge, hence the shorter the blanking period – no damage will occur if R13 is reduced to zero resistance. The time delay between channel changes can be varied by means of VR1 – typically 3-30 seconds blanking with a delay of 8-10 seconds is most suitable.

The scanner was built on a piece of stripboard: as the layout doesn't appear to be critical, no further details are given. Don't worry if the channel scanning doesn't run in the proper sequence when the unit is first tried – this particular i.c. can be temperamental, but if the unit is left running for a few minutes it will eventually settle down and run in the correct sequence.

Break the print between the TAA550 33V stabiliser and the tuning potentiometers and wire SW1A across the break (see Fig. 3). In addition, lift one end of R2 and add a 1N4148 diode as shown – the tuning feed from the scanner unit goes to the junction of these components. There's a 12V line on the 9000's tuning board, but powering the timer i.c. and the LEDs from this line would tend to reduce the tuner's supply, possibly causing problems. Instead, a 12V supply is obtained from the 24V rail via R19/IC3. This leaves plenty of current available for the LEDs etc.

The unit has been in use over long periods and has proved to be reliable.

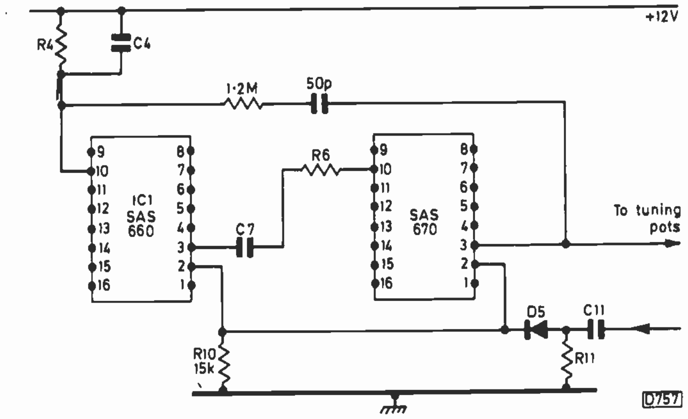


Fig. 2: Addition of an SAS670 i.c. for eight-channel scanning. The rest of the connections to the SAS670 are as for the SAS660, see Fig. 1.

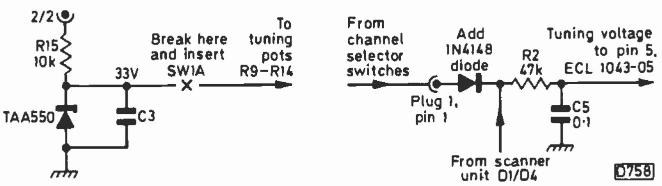


Fig. 3: Modifications to the tuning board on the Thorn 9000 chassis to incorporate the auto channel scanning facility.

TV Fault Finding

Reports from Mick Dutton, John Coombes, Richard Roscoe, D. C. J. Tilley and John Bourne

ITT CVC1100 Chassis

There are several points worth noting on this chassis. First of all the switch-mode power supply is designed to produce the correct output voltage only when there's a load present. This means that if the line output stage is inoperative for some reason, e.g. failure of the line oscillator, the power supply's output will rise and the over-voltage protection zener diode D658 will conduct, blowing the fuse. A fault in the power supply itself resulting in excessive output will also bring the zener diode into operation.

The recommended way of tackling a dead set is to disable the line output stage by shorting together the base and emitter of the line output transistor and to connect a 100W bulb as a dummy load in parallel with the zener diode. The set can then be switched on and the power supply checked. If it's o.k., remove the short from the line output transistor but leave the bulb connected. It's now possible to work on the line output stage without risk of damaging the power supply. No attempt should be made to run the set with the zener diode removed and no dummy load in place – excessive output from the power supply can lead to high e.h.t. and tube damage.

The switch-mode transformer drives two rectifiers, one providing the 115V h.t. line, the other the 20V supply for the audio output stage. The line oscillator's start-up supply is derived from this 20V rail, via transistor T602. If the latter goes short-circuit, the picture is modulated in sympathy with the sound. A similar problem can be caused by the screw at the rear right of the chassis not making proper contact: this screw provides an earth connection between the main panel and the vertical power supply end panel. **M.D.**

Decca 120/130 Series Chassis

Two problems have recently become quite common on this chassis. The first is intermittent channel change on both remote control and standard sets. We've found that the problem is due to tracking within the focus spark gap on the tube base. With care it's possible to open the gap slightly to clear the tracking while leaving the gap still functional. The second problem is snow on the screen with no tuning ability on models using touch tune panel ASS.5.0979-5. This is due to RM17 (560kΩ) going open-circuit, as a result of which there's no tuning voltage output. If this resistor has gone high in value the fault will be intermittent or it will be possible to tune in some channels only. **M.D.**

Mitsubishi CT2206B

Here are some faults we've had on this model. If the set drifts off tune – this usually happens after the set has been on for some time – check transistor Q7B5 (2SC711A) on the touch sensor panel. Intermittent sound can be caused by dry-joints on the audio output transistors Q352/3. In one case however we found that the voltage at pin 13 of the M5144P intercarrier sound i.c. (IC301) was varying due a poor spot on the carbon track of the tone control VR371. Replacing this restored normal sound. In the event of intermittent lack of height with incorrect horizontal convergence, check the convergence potentiometer on the panel mounted on the scan coils — the cause is usually a dry-joint on the earth pin. **J.C.**

Thorn TX90 Chassis

There are quite a few of these portables around now and we've had a couple in for repair. The first fault was simple – the 1A mains fuse had blown due to one of the diodes (D123, BY127) in the h.t. rectifier circuit going short-circuit. The trouble with the second set was no results apart from a faint line whistle. This turned out to be due to a crack in the print between pin 10 of the line output transformer and the collector of the T9064V line output transistor. The set worked after we repaired this, but on soak test there was intermittent line collapse. This was traced to cracked print around the line driver transformer T103. **M.D.**

GEC C1653

This portable was only two weeks old when the customer complained that it kept switching itself off. We found that the stand-by light came on in the fault condition but the set couldn't be switched back on via the handset. Flexing the printed panel with the back removed made the set go into the fault condition, and the trouble was eventually traced to a dry-joint on pin 2 of the line output transformer. The interesting point is that the soldering looked perfect, but when resolding the joint we found that the line output transformer pin was contaminated, causing the bad joint.

It seems to be a common problem with this chassis, both on the wound components and the socket half of the plugs/sockets that connect the control panel to the main chassis. We've also had a case of dry-joints inside the tuner/i.f. can causing tuning drift, while several new sets were found to have the chassis broken in two on being unpacked, due to very poor support beneath it. **M.D.**

Rank Z718 Chassis

The line output transformer in the Rank Z718 chassis is generally reliable. We had one of these sets that ate transformers however (four). The trouble was eventually traced to 5C13 (0·01μF) in the fifth harmonic tuning circuit. Perhaps we should have been warned by the letter on mistuning and its effects in the July 1983 issue of *Television.* **D.C.J.T.**

Amstrad CTV1000

The problem with this 10in. mains/battery colour portable was normal sound but just a blank white raster. A scope check revealed that there was no video information going into the M51393AP decoder i.c. The chroma and luminance inputs to this i.c. both come from an emitter-follower, Q7601 (2SC1675), which turned out to be short-circuit base-to-emitter. A replacement was fitted, but there was still no video information.

The tuner and i.f. section of this set are contained within a single can, the video output being d.c. coupled to the base of the emitter-follower. A replacement tuner/i.f. can restored the picture, but during a soak test it disappeared again, leaving the blank white raster. On checking through we found that once more we had a faulty emitter-follower transistor and i.f. can. This time however there was a direct short measurable from the transistor's emitter to chassis, due to the chroma coupling capacitor C7901 (240pF) being short-circuit (the earth return is via the following 10μH peaking coil L7901). Fitting replacements and setting up the grey scale produced an excellent picture. **M.D.**

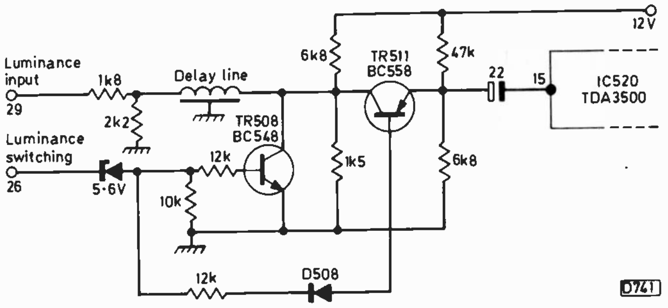


Fig. 1: Luminance signal switching circuit used in the Grundig GSC700 chassis.

Thorn TX9 Chassis

This set (main panel PC1001) was dead with a blown mains fuse. We couldn't detect any shorts on the h.t. rail and as the thyristors in the power supply measured correctly we replaced the fuse, removed the h.t. link, and measured the h.t. at switch on. The voltage started to rise, then the fuse blew. On closer examination we found that R195 (6·8kΩ) in the excess-current control transistor's collector circuit was burnt. A check on the excess-current trip circuit then revealed that the transistor (VT66, BF435), its biasing zener diode W83 (5·6V) and its base decoupling capacitor C152 (10μF) were all short-circuit. Replacing these items provided a cure. **M.D.**

More Grundig Gremlins

There's a similar gremlin in the Supercolour 80 chassis (GSC700) to that described in the May 1983 issue (Fault Report, page 354). This chassis is found in a large number of models and is quite distinctive in design, consisting of about a dozen little circuit boards enclosed in metal cases plugged into a large, vertical backplane. These modules are sealed by two red plastic lugs which have to be broken before the board can be extracted from the case. Presumably they serve some good purpose in the Grundig scheme of things, but we can't see it.

The previous report highlighted a problem with a through-board earth link in the RGB output stages, on module 29301-046.02, causing loss of picture. In the RGB module used in this chassis there are three through-the-board earth links, one for each primary colour. These are at the earthy end of R574 (blue), R551 (green) and R531 (red). If a link is lost completely, the screen will flood with the relevant colour. More often however all the links become suspect to a greater or lesser extent, the result being that the grey scale drifts around in a not unattractive way, producing a veritable kaleidoscope of hues. Whatever the specific symptoms, always repair all three links. It will avoid embarrassing calls, believe me.

Another fault we had recently on this module is worth recounting, not only because it was peculiar to this specific Grundig circuit but also because the symptoms were very misleading. The area of interest, the luminance signal path from the input to the RGB module to pin 15 of the TDA3500 matrixing i.c., is shown in Fig. 1. The two transistors TR508 and TR511 are used to switch off the normal luminance channel in certain circumstances, e.g. teletext operation. Pin 26 of the module is normally low, with the result that TR508 is off and TR511 is on. To switch off the luminance, pin 26 rises to 12V.

The fault was an intermittent plastic picture, i.e. a flat, smeary, low-contrast picture with edges highlighted – the sort of picture caused by an open-circuit video coupling capacitor. Tapping the module made the fault come and go, so we hung a scope lead on to various points to monitor the waveforms. All was well up to the collector of TR511, but the emitter waveform was incorrect. Clearly TR511's switching action was impaired for some reason, only the higher video frequencies getting through. A meter check showed that TR511 wasn't being turned off when the voltage at pin 26 rose – in fact the base, emitter and collector voltages all fell. We thought TR511 might be faulty, but a new BC558 didn't improve matters. By lifting one end of various resistors we eventually traced the cause of the fall in voltages around TR511 to a leak to earth in the luminance delay line. Interestingly, the actual signal through the delay line was unaffected by this leak: it was the effect of TR511 being starved of current that caused the symptoms. **R.R.**

Thorn TX9 Chassis

The latest version of the Thorn TX9 chassis, using main panel PC1044, has a chopper power supply. We've had one or two cases of a dead set with the mains fuse blown due to the chopper transistor TR62 (T9063V or BU508) being short-circuit. The no h.t. symptom leaves the reservoir capacitor C140 (150μF) fully charged for some time after the set has been switched off – discharge it via a resistor of say 15Ω, especially if you are about to replace the chopper transistor. Note that the main frame is isolated – when making voltage measurements etc., use either the body of the varicap tuner or the line output transformer's heatsink as the "chassis" point. **J.B.**

Hitachi NP81CQ Mk II Chassis

A low-frequency hum on sound, most noticeable when the bass and treble controls are at maximum, and varying with picture content, is due to ripple on the 12V supply reaching pin 6 (volume control pin) of the TDA1035S sound i.c. (IC401). The cure is to fit a 22kΩ, $\frac{1}{4}$W resistor in series with D402. In some chassis however a 22kΩ resistor is fitted in place of D402. The result of this is a burst of sound at switch on regardless of the setting of the volume control. If this is the case, fit a 1N4148 diode in series with the resistor – polarity as marked on the PCB. **J.B.**

Thorn TX10 Chassis

A colleague had a 26in. Model 3788 on the bench with severe purity errors. After checking the degaussing circuit, manually degaussing the tube, and ensuring that the scanning yoke was pushed fully forward along the c.r.t. neck, he switched the set on – only to be greeted by the same symptoms. So in went a new A66-540AX (30AX) tube. Once again the same symptoms were present. A 30AX deflection yoke from a stock set was then tried and this time the problem was cured.

On examining the two yokes side by side it was noticed that the bar magnets differed. It turned out that a 22in. 30AX yoke, type AT1260, had been fitted by mistake during manufacture. The 22 and 26in. deflection yokes look identical from outside, when mounted on the tube, but there's this difference: the 22in. yoke, type AT1260, has 2½in. long magnets while the 26in. yoke, type AT1270, has 1½in. long magnets.

When fitting/ordering 30AX yokes, check that you have the right type!

We've found that the message received/standby LED in some remote control sets (Models 3767/88/95/96/063) incorporating the infra-red preamplifier module type PC984 may remain illuminated for some time after the set has been switched on in strong ambient lighting conditions. This is due to the cut out holes in the screening can being too large, thereby allowing more light in than required. The cure is to mask off the unwanted gap, using black PVC tape, so that only the surface of the photodiodes remains exposed.

A couple of these sets came in with tripping symptoms. In each case unplugging the line scan connector PL14 removed the overload, which was caused by the BU208A line output transistor (TR831). **J.B.**

GEC C2233

An uncontrollable bright raster (20AX Mk II chassis) usually means that the RGB output transistors are incorrectly biased due to R281 (82kΩ) being open-circuit. **J.C.**

Servicing Notes on the Sony SLC7UB

David Botto

The Sony SLC7UB is one of the most complex of VCRs. We now find it arriving in increasing numbers on the service bench, complete with puzzling faults.

Dead Machine

Suppose you've a dead machine. The first thing to do is to remove the top case. But the cassette compartment won't open without the power being on! Take out the two little screws under the cassette lid ornamental belt, then the six long screws that hold the cabinet top. The top and lid can now be easily lifted away, after which the works are revealed.

First check fuse F004 (400mAT) on the FS-6 fuse board (we'll use Sony's board identification letters in this article). This fuse likes to go open-circuit for no apparent reason. Replace it and everything starts up again. The suggested modification is a wire link. I can't bring myself to do this however and fit a 1·6A anti-surge fuse.

The power supply is in two sections: the switch-mode regulator board SR-08-2 and the "ever" power supply board SR-08-1 – the latter powers the timer and aerial amplifier unless the main power switch S9504 is in the off position. See Fig. 1.

Failure of the mains input fuse F006 (2AT) on board LF-11 means a fault on the SR-08 power panels. To check the fuse you first have to remove the front control panel – not forgetting the little slider knob on the front (this can fly off never to be seen again). Then remove the two screws securing the timer and ease it forward. The various plugs can now be removed from the FS-6 fuse board and the SR-08 power supply unit unbolted and removed. Be careful when removing any of the plugs in the machine: the print is extra fine and easily breaks, which will result in lots of nice new faults.

The switch-mode regulator is not of the usual type used in TV sets. It consists of a control i.c. that drives a push-pull switch. Check the two switching transistors Q101/2 (both type 2SC2335). You will probably find one or both short-circuit, with the surge limiter resistor R101 (3·3Ω, 3W) open-circuit. A special replacement kit, type A6738-159A, is available from Sony. It contains the two transistors, with special 15Ω resistors already soldered to them, and new mica washers. In addition a replacement for R101 is supplied, also two 3·3kΩ resistors and an 820Ω one. The 820Ω resistor should be fitted in position R205 (originally 2·7kΩ) and the 3·3kΩ resistors in positions R210/211 (originally 4·7kΩ). Replace the TL494CN control i.c. (IC1) at the same time or you may get the unit back in a week or so . . . Some later C7s already incorporate these modifictions: they are usually the units with a large "C7" on the front control panel.

Picture/Sound Disturbances

Dirty heads can give a noisy picture. They can also give a picture that's o.k. in the pause mode but not in the play mode, due to the control track not being picked up. Clean the video, control and audio heads – in fact everything in the tape path. Use only a proper head cleaning kit and video cleaning fluid, and remember that cotton buds are sure death to video heads!

Changing the video heads should be attempted only with the special Sony kit to hand: accuracy is to microns!

A nasty fault to trace is when the picture breaks up after the machine has been running for about twenty minutes. For a cure replace the playback amplifier i.c. (IC1, type CX134A) on board RF-2. You can check it by spraying gently with freezer. Weird effects due to no picture from one head occur if either of the head preamplifier f.e.t.s (Q3/4, both type 2SK152) on this board fails.

Absence of colour in both the E-E and playback modes is usually due to the CX130 i.c. (IC6) on board CR-4 being defective.

If the colour intensity varies up and down, suspect IC5 (CX145) on the YC-6 board: when it starts to fail the burst level goes up and down. Most other colour faults we've had seem to be due to IC11 (CX130) or IC6 (CX832) on this board.

Wow on the sound with the picture breaking up can be traced to IC3 (TC4011BP) on the AS-3 audio and servo board. Another cause of wow on this panel is Q14's collector load resistor R68 (10kΩ) changing value. Something else to check is IC12 (M58478P) on the YC-6 board.

If the audio doesn't mute in the triple-speed mode, check transistors Q3-6 (all type 2SA1027R) on the SY-11 board.

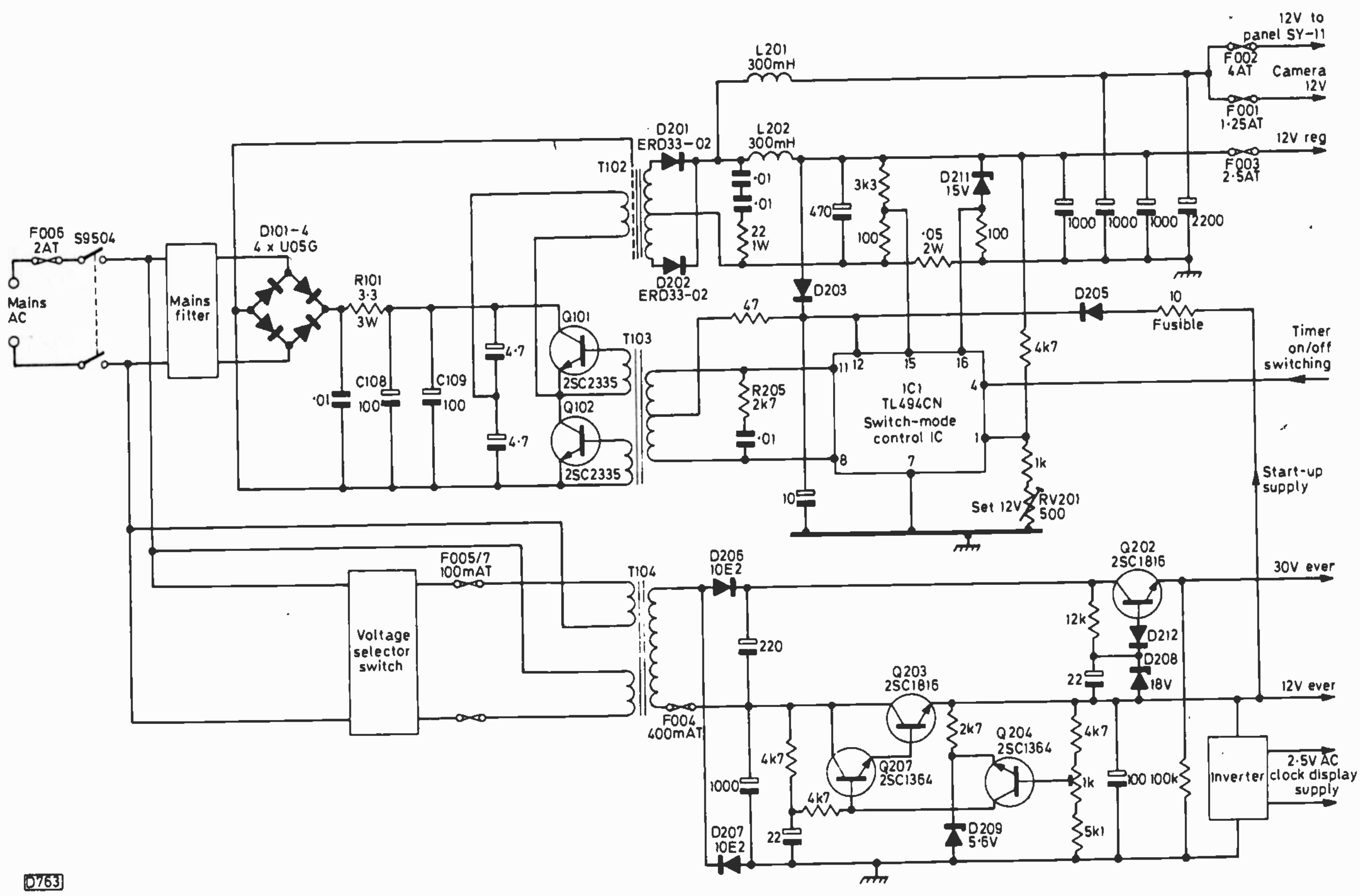


Fig. 1: Simplified circuit of the power supply used in the Sony SLC7UB. Diodes are type 1S1585 if not otherwise shown.

A ticking noise on playback is caused by servo pulses interfering with the audio circuits: the cure is to fit an 0·03μF capacitor between pins 8 and 9 of connector CN4702 on the SJ-1 board.

Tuning Troubles

In the case of a dead tuner, first make sure that the camera switch is in the tuner position. The switching transistor Q6511 (2SA772, 2SB733 or 2SB739) on board PC-1 can fail, giving various tuner fault symptoms. Use a 2SB740 for better reliability.

IC7 (TC4011BP) on board CH-3 consists of four NAND gates. When these gates fail they cause a variety of faults: channel 18 appearing; all LEDs lit; stations not locking on to auto tuning; plus the clock giving strange readings. Fortunately it's easy to check with a logic probe or a digital multimeter to measure the highs and lows. Failure of IC1 (CX804) on this board can result in all the LEDs lighting at once and the clock output being dim or non-existent. If you can't lock the channels, the digital tuning i.c. (IC4, CX760) is probably the culprit. If the information is lost after tuning all the channels, replace the memory i.c. (IC3, CX761).

Function Faults

Intermittent start or load up of the tape is a hard fault to find. The cause is dry-joints on diodes D710 and D712 (both 1S1555) on the SJ-1 board.

When the machine stays in the rewind mode whatever you do to it, check the inductance of L2 (33mH) on the SY-11 panel. It's connected between pin 7 of IC8 (BX342) and chassis, and can go open-circuit. If the machine won't rewind and the motors aren't running, check L1 (33mH) between pin 7 of IC9 (BX342) and chassis for being open-circuit. The only reliable cure when the machine is trying to rewind (motor running, spools slipping) is to fit the Sony rewind kit A6706-348A (X3653-3150 above serial no. 355300).

No functions can be caused by the 10V regulator transistor Q25 (2SC1364) on the syscon panel SY-11 failing or leaking. At the same time check the associated zener diode D18 (RD11E-B).

Timer Faults

Quite a variety of faults can occur on timer board TM-10. The i.c.s are not easy to change because of the double-sided print. First check the voltages at the regulator transistor Q1 (2SA773 or 2SA684): if the collector voltage is not 29V, check this transistor. Next check the switching transistor Q3 (2SC1364). Then move on to the i.c.s. First replace IC8 (TC4071BP). If this doesn't clear the fault change IC7 (TC4081BP). Experience shows that the fault will be found before reaching the main, 42-pin timer chip IC1 (MB8841-180). The only way to remove these i.c.s without ruining the board is to cut the pins with a fine pair of sidecutters, then unsolder the pins one at a time. Fortunately IC1 seldom fails.

Final Notes

Note that the mains fuse F006 is on the live side of the mains switch, also that the reservoir capacitors C108 and C109 (both 100μF, 400V) retain their charge and can give you a very nasty shock. Finally note that the SLC7E is almost identical to the SLC7UB.

Test Card Saga

Keith Hamer and
Garry Smith

We last published an article on this subject back in May 1978. Afterwards several readers wrote to ask whether there would be another delve into the archives. Fortunately the age of the VCR is now firmly established, and it's a relatively simple matter to photograph the more elusive test cards and captions. Some may appear on the screen for only a few minutes, at awkward times of the day. This time we'll review some BBC graphics used since 1980, with a look at several modified versions of test card F.

Globes and Clocks

The familiar BBC-1 globe caption has been used for many years to introduce the next programme. It's remained largely unaltered for well over ten years. The monochrome model of the Earth, illuminated from within, is viewed by a camera, the appropriate colour information being added at a later stage. The reflection is produced by a specially curved mirror behind the small globe, and the caption itself rotates only when the camera is activated from the control console — so it isn't whirling around all day for nothing. Occasionally things go wrong and the Earth is seen tottering around on its axis. Sometimes it refuses to budge at all! The globe caption at Television Centre is to be converted to an electronic type, in much the same way that the clock caption was changed, thus dispensing with the camera and associated equipment. Regional clock captions are still of the mechanical variety, though designed to look like the new generation of clock transmitted by BBC London.

It was decided in September 1981 to update the form of identification used on the BBC-1 globe and clock captions, so all the regions had to change their style of lettering to the "two-line" effect. For some curious reason London decided to alter the globe colour: the land mass became a sickly shade of green instead of custardy yellow. This varied from region to region, and it was not unknown for viewers to demand a call from the rental service engineer. The situation eventually sorted itself out, with a return to the good old custardy yellow.

The BBC celebrated its 60th anniversary in August 1982. Even the globe caption identification was changed to "60 BBC Years". Just as we've been looking into the archives to present this article, so for a whole week the BBC went berserk with archive material. Each day produced a couple of vintage "interlude" films, such as the famous "Potter's Wheel", "The Kitten" and "Rough Sea on Rocks", all from the early fifties. The programme opening sequences during August/September 1982 were also interesting, as some of the original opening music from the fifties, sixties and seventies had been found in the archives. Mention was made in our last article of some specially composed guitar pieces that were played at the start of programmes each day. Despite correspondence with the BBC about these, no one seemed to be able to shed any light on the subject until the 60th anniversary celebrations. Recordings of some of these pieces were lurking in the depths of Television Centre and some were transmitted with the special globe caption, including one called "Blue Part Invention".

Christmas Captions

At Christmas, BBC-1 dispenses with the standard globe caption for the duration of the festivities in favour of a special Christmas caption which is always unveiled during the afternoon on Christmas Eve, traditionally just before a feature film. The theme in 1980 was a group of skaters (see Fig. 1). There was more to this caption than some viewers may have realised. Until the late afternoon the scene was a crisp, sunny day: when the caption was used to introduce the early evening programmes the background was dimly lit then, for the late evening programmes, the moon and stars came out.

Viewers indulging in the festive spirit during Christmas 1981 may be forgiven for thinking they were seeing double or worse — instead of just one Earth there were no less than five. The various sized globes were made to resemble Christmas tree decorations, the colours including red, green, blue, orange and purple.

The 1982 caption was not so colourful and at first glance (see Fig. 3) didn't appear to be too inventive. On closer inspection however one noticed that the twelve segments of the snowflake revolved, each catching the light. It was probably all done by mirrors.

A large rotating snowflake was used in the 1980 BBC-2 Christmas caption (Fig. 4). It revolved a little unsteadily at times, but nothing too disastrous happened to it. It was made of glass or plastic and the people in presentation must have thought that this was a good medium to work with as the following two years' captions were also transparent.

The three revolving candles (Fig. 5) first appeared on December 24th, 1981. They remained in service for five days. At the start of each programme opening sequence the candles could be seen with a festive ditty apparently composed for the occasion.

The 1982 BBC-2 Christmas caption again involved three items rotating on something like a record turntable. Not candles this time but Christmas trees (Fig. 6). Unfortunately these didn't seem to revolve with quite the same accuracy as the previous year's candles, and on several occasions one of the trees looked as though it was being prematurely felled! The caption was clean enough on the 24th, but by late evening on the 28th there were one or two smudgy fingerprints on at least one of the glass evergreens.

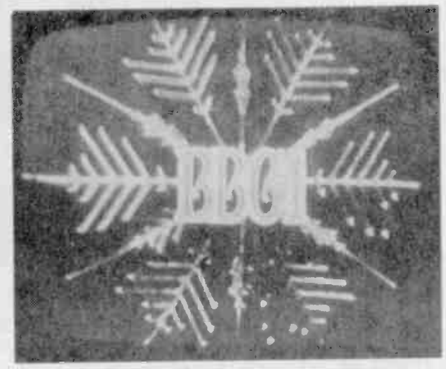
Christmas Test Cards

Christmas is traditionally the time when the Television Centre engineers in charge of the trade test transmissions amuse themselves with the test card. Various additions are often superimposed — these seem to depend on the type of equipment available at the time. For example, Christmas Day 1980 saw a variety of amendments to test card F (Figs. 7-10). These included holly superimposed on the corner focusing bars and another version with holly and red (pink actually) berries over the letterbox area, a Christmas pudding lodged on top of the table, and an extra button on Carole's toy. For approximately ten minutes the test card was radiated with the whole of the centre portion reversed.

Test card antics were seen during the entire week

1: BBC-1 Christmas caption used in 1980, featuring skaters.

2: An unusual BBC-1 caption used in 1981.

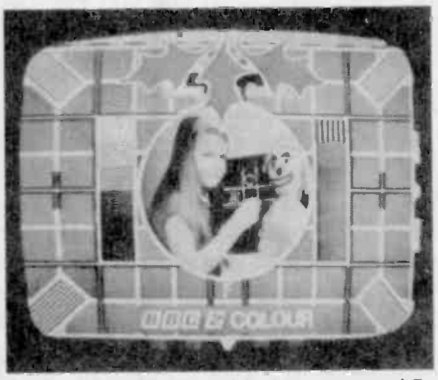


3: The BBC-1 revolving snowflake caption used in 1982.

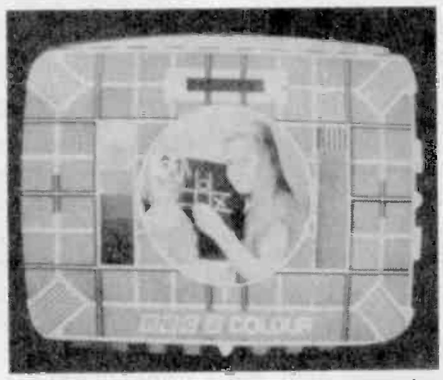
4: The BBC-2 snowflake caption used in 1980.

5: Red candles and green holly, used by BBC-2 in 1981.

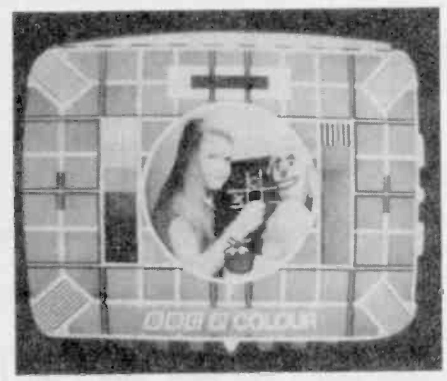
6: BBC-2 1982 caption featuring revolving Christmas trees.



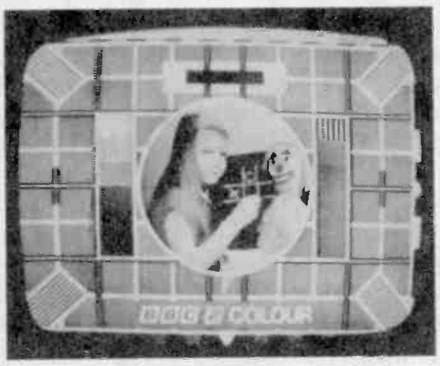
7: A sprig of holly added to test card F.



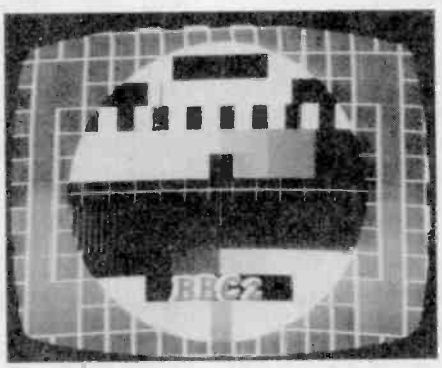
8: Test card F with the centre portion reversed — seen in 1980.



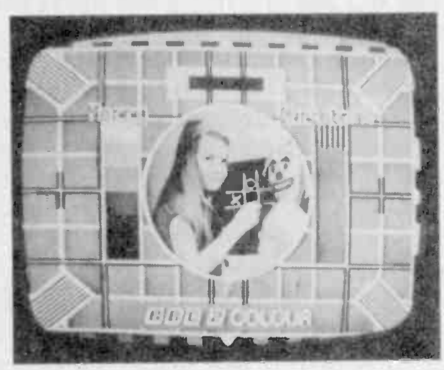
9: Test card F gains a Christmas pudding.



10: An extra button on Carole's doll in 1980.



11: Test card G with Christmas BBC-2 identification, 1981.



12: A "Merry Christmas" from test card F in 1982.

leading up to Christmas 1981, including the word "colour" in a bright and cheerful yellow. For about five minutes an electronic game of noughts and crosses occupied the entire central area. Perhaps some readers have photographs of this — we don't! Even the electronic test card G was not left out of it: a specially generated identification (Fig. 11) was shown, consisting of large red graphics with a white outline — occasionally the colour scheme changed, running through the colours of the rainbow.

The engineers didn't seem to be in quite such a festive mood in 1982. The fun and games are always welcome however and the authors will remain on the lookout! As mentioned on another occasion, we'd be delighted to hear from anyone with photographs of unusual test cards or recordings of music from the test card C era.

Service Bureau

Requests for advice in dealing with servicing problems must be accompanied by a £1·00 postal order (made out to IPC Magazines Ltd.), the query coupon on page 151 and a stamped addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets nor answer queries over the telephone.

VCR/TV COMBINATION

There's a playback problem when I use my Sanyo VTC5300P VCR with my Sony KV1612UB colour set – this particular combination produces a vertical line of white dots down the right-hand side of the picture, about an inch from the edge of the screen. The Sanyo machine operates perfectly with another, smaller Sony set, and also with an old dual-standard Decca colour set. The offending line is faint but seems to vary in intensity with different tapes. I've modified the VCR to give still pictures during pause (by removing the video blanking): this shows up the line clearly as small, intermittent white dots that flare slightly to the right. An attenuator has been tried in the feed to the TV set, and the VCR's modulator has been replaced.

The effect is almost certainly due to radiation from the TV set's line timebase finding its way into the VCR's low-level video replay circuits. This will be proved by separating the two physically. An earthed mesh or foil screen between the two may suffice, though an internal screening kit could be available – one was provided for the earlier VTC9300P and worked very well.

PHILIPS G11 CHASSIS

The problem is that the picture jumps. It's more noticeable with a test card, giving the impression that the camera is being moved up and down very quickly. There's no slip and everything else works correctly.

First check that the various timebase panel connectors (top left looking in from the back) are making well, then suspect the TDA2600 field timebase chip's holder – it can disintegrate with heat. The i.c. itself is not above suspicion – if a replacement is required, smear the metal part with silicone grease to ensure good thermal contact with the heatsink.

GRUNDIG 8610

The problem is bowing at the sides of the screen – the raster sides are about two inches in at the centre.

The fault is lack of EW raster correction. Check fuse Si627 (3·15A) which supplies the EW modulator circuit. It may well have blown. If replacing the fuse fails to cure the problem, check the SKE4F2/04 modulator diodes Di627 and Di627a and the Darlington driver transistor Tr495 (BD677). These items are on the 29301-041.01 "OW modulator" module.

DECCA 30 SERIES CHASSIS

The fault is a vertical line at the centre of the screen. Viewed from the front, it's a dark line that separates the screen into two sections, with reducing width across the right-hand part. The width control does not function. The line output stage valves and the line output transformer have been replaced and all associated components checked.

The effect sounds like foldover. This sort of thing often has its source in the line generator rather than the output stage. An oscilloscope is almost essential to check the line drive waveform at pins 1, 8 of the PL509 line output valve. It will probably be far from the correct rectangular shape. Suspects are the PCF802 line oscillator valve, the electrolytics C423 (8μF) and C419 (5μF) in this stage, also the feed resistor R441 (220Ω) and the anode load resistor R444 (33kΩ).

THORN 3000 CHASSIS

After half an hour or so a vertical line appears at the right-hand side of the screen, about quarter of an inch wide and running from the top to the bottom – it looks like a twisted rope. The effect is more noticeable on colour than monochrome.

The problem is almost certainly in the line scan or chopper department. Before delving into these however try decoupling the 12V line at the tuner with an 0·1μF capacitor. If this fails to provide a cure, check that the ferrite beads are in place on the collector and base leads of the chopper transistor VT604 and the cathode lead of the power supply efficiency diode W616. Then if necessary check the smoothing components L502 and C514 (4·7μF) on the line timebase panel.

PHILIPS TX CHASSIS

The problem is no sound or raster with the 10·5V line low at approximately 4V. R110 across the regulator transistor appears to be too hot. Removing the line output transistor restores the supply line to normal. Despite extensive checks in the line output stage and replacement of the line output transistor however no shorts/leaks have been found. What next?

The cause of the trouble could well be in the power supply circuit – for example the driver transistor TS111 going open-circuit so that the series regulator transistor is off. This would prevent the line output stage working properly since the only feed would be via R110. Another cause we found recently was a break in the copper track for the 26V line, close to the line output transformer. This had exactly the same effect. The break was not visible to the naked eye and was found only by painstaking continuity tests.

PANASONIC TC2205

There is sound but no picture, though the e.h.t. and first anode voltages are present. The i.f. and decoder i.c.s have been replaced without improving matters and the only clue seems to be incorrect voltages around the 12V regulator transistor Q851 – there's 18V at its emitter, and the base voltage is 14·9V instead of 12V. Initially the picture would appear at switch on then disappear five minutes later. Now it doesn't come on at all.

First get the 12V supply right. Check Q851 for leakage then if necessary replace the 6V zener diodes D857/8 in Q851's base circuit. If the picture is still absent when the 12V line is back to normal, check for 7·5V at the cathode of zener diode D351 – this diode sets the bias at the emitters of the RGB output transistors. If the voltage here is in excess of 7·5V, replace D351 (BZX61C7V5).

PYE 697 CHASSIS

I have a problem in using this set for VCR playback. Slight pulling for two inches or so at the top occurs on normal playback: on speed search, change of scene or change of advertisement there is complete loss of line hold.

Try removing the anti-hunt network R207/C208 in the flywheel sync filter circuit. If this cures the problem, fit a switch so that the network can be kept in circuit for off-air reception and switched open-circuit for VCR operation.

TEST CASE

253

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

The rapid evolution of the portable VCR means that many older machines – and in this context old can mean only two or three years – very quickly become obsolescent. The plans announced or leaked by various manufacturers suggest that even such exotic machines as the Sony F1 may before long be left high and dry on the beach of obsolescence, their place perhaps being taken by the camcorder type of video.

The first JVC portable to be released in the UK was the HR4100E, a fairly weighty piano-key operated machine that shared the basic deck mechanics and a lot of the electronics with the contemporary domestic HR3300 and similar models. The HR4100E doesn't incorporate a mains power supply or tuner/timer and i.f. circuitry, add-on units being available to provide these. It does include an r.f. modulator however, so that the machine can be used in isolation for playback through a u.h.f. TV receiver.

This business of extras such as the AA-P41EK power unit and TU-41EK tuner/timer tends to complicate matters when things go wrong. If the tape is being chewed up the deck is clearly in trouble, but what about intermittent off-air recording or no results at all? In cases like this we prefer to have the whole lot on the bench in front of us, and to assess and service it as a complete system. Such an ensemble is a depressing thing to see on the waiting repair bench, with all its bits and pieces and spaghetti like web of interconnecting wires. We found one at large on the in bench a while ago, with the terse comment "buzzes" on the job card.

It was put on the service bench and hooked up with the small-screen Hitachi set we use as a monitor for VCRs under repair. With a good test tape, a wee bit of buzz was evident on quiet sound pasages, though not enough to suggest that a real fault was present. The same slight vision buzz could be discerned when we played an alignment tape. Next we tried making a recording. The TU-41EK's button seven was tuned to Channel 4 from the local transmitter, and the recording was monitored on the little Hitachi set. A shattering buzz accompanied the music!

An attempt was made to tune out the buzz by adjusting the sound detector quadrature coil T502 in the tuner/timer. The vision buzz couldn't be eliminated, so the core was left in the original position, which did provide minimum buzz. We didn't have another HR4100 available to provide a cross check, so the tape just recorded was played back, now carrying a Ch. 4 test card.

Was ever confusion worse confounded! The tape played back with the same level of buzz as the alignment tape... Off we went to try our tape in another VHS machine. This time the replay was perfectly satisfactory, with no discernible buzz at all. When one reaches a point like this the thing to do is to stop rushing about, brew some coffee, and think about the symptoms. By the time the coffee had gone a diagnosis had been arrived at. If you haven't got there yet, put down the magazine, make the coffee and ponder on the basic features of home video recording formats. Answer next month.

ANSWER TO TEST CASE 252
– page 97 last month –

Last month we described an encounter between an inexperienced technician and a Beovision 5000 colour set, the problem being a pumping effect in the set's power supply. The technician observed that the raster and sound appeared on each pump cycle, and was in fact correct in his initial conclusion that excessive h.t. voltage was responsible. As a result, one of the protection sensing devices, zener diode 6D15 which monitors the 25V rail or zener diode 6D19 which indirectly monitors the e.h.t. voltage, was tripping the power supply. His mistake was to use an AVO to check this!

Because of the inertia of the instrument's moving coil and pointer needle it couldn't respond quickly enough to the momentary pulses of h.t. So the low reading obtained was a false one. A check with an oscilloscope revealed that the h.t. line was in fact rising momentarily to about 185V between trip cycles (the nominally 172V line). The cause was a faulty set-h.t. potentiometer, 6R39. Fitting a replacement and setting up cured the problem.

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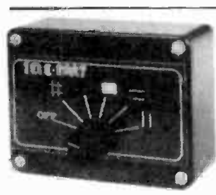

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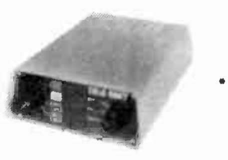

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• Sound

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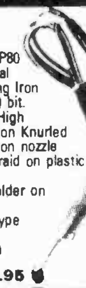

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BC118	0.110
BC140	0.190
BC141	0.190
BC142	0.190
BC143	0.190
BC147	0.055
BC148	0.055
BC149	0.055

BC157	0.055
BC159	0.055
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BC183	0.060
BC183L	0.060
BC184	0.060
BC184L	0.060
BC212	0.060
BC212L	0.060
BC213	0.060
BC213L	0.060
BC214	0.060
BC214L	0.060
BC237	0.070
BC238	0.070
BC300	0.160
BC301	0.180
BC302	0.180
BC303	0.180
BC327	0.060
BC382	0.060
BC337	0.060
BC328	0.060
BC557	0.060
BCY32	1.500
BCY33	1.500
BCY34	1.500
BCY42	0.200
BCY56	0.160
BCY70	0.160
BCY71	0.160
BCY72	0.160
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BD124	1.100
BD128	0.350
BD131	0.250
BD132	0.250
BD135	0.200
BD136	0.200
BD137	0.200
BD138	0.200
BD139	0.200
BD140	0.200
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BD538	0.400
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BF459	0.190
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BFX85	0.200
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BU204	0.750
BU205	0.700
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BU408	1.000
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2N.3771	0.850
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2N.4036	0.250
2N.4037	0.250
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2N.4444	0.760
2N.5061	0.200
2N.5294	0.300
2N.5296	0.300
2N.6106	0.400
2N.6107	0.400
2N.6109	0.400

3N.128	0.550
3N.143	0.650
IN.914	0.020
IN.4001	0.040
IN.4002	0.040
IN.4003	0.040
IN.4004	0.040
IN.4005	0.040
IN.4006	0.040
IN.4007	0.050
IN.4148	0.020
IN.5400	0.090
IN.5401	0.100
IN.5402	0.100
IN.5403	0.110
IN.5404	0.110
IN.5405	0.120
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NE556	0.400
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BYX55/600	0.300
BYX55/600	0.300
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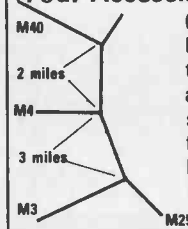

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3500 AI pots	50p
9000 Frame panel	£7
3 Way regulated adaptor 240V 6V/7.5/9V/300mA	£3.50
Rank/Toshiba preh unit 0354	£9.50
2 banks of 3 PB unit. Pye 731	£2
4 Push button unit preh	£1.00
6 Push button VHF/UHF for v/cap. GEC-Decca type	£7.00
7 Push button for CVC5 ITT	£8.00
KT3 12 Push button unit	£3.00
6 Push button Unit Thorn	£1.00
6 Push button unit for GEC 2040 and ELC 1043/05	£6.00
6 Push button unit PYE 713	£7.00
7 Lamps for P.B./Unit	10p

Mains Droppers

Pye 731 3+56+27R	50p
3500 Thorn 6/1/100	60p
Thorn 50/17/1K5	£1.00
120/20/20/48/117	£1.00
270/10/6 for Thorn 4000	50p
18/320/70/39	£1.10
Thorn 50-40R-1K5	50p
Aerial Socket and Lead	35p
Pye, Thorn, ITT, Thyristor, Philips G11 122	60p
Rank Toshiba Tube Bases	30p

Speakers

6×4G11	25 ohm	£1.00
5¼×2¼	3 ohm	£1.00
5×3	80 ohm	70p
5×3	50 ohm	50p
5×3	35 ohm	70p
5×3	15 ohm	80p
6×4	15 ohm	£1.00
7×3	70 ohm	£1.00
5×3	8 ohm	70p
7×3	16 ohm	£1.00
5" dia	16 ohm	£1.00
5" dia	8 ohm	£1.50
6½" dia	4 ohm	£1.50
6½" dia	3 ohm	£1.50
2¾" dia	8 ohm	75p
3" dia	8 ohm	75p
3" dia	15 ohm	60p

Metal Wire Ends

TD15 boost diode 1500V	20p

Diodes

BY 127	10p
BY 133	10p
BY 134	10p
BY 176	25p
BY 179	40p
BY 184	25p
BY 187	10p
BY 190	40p
BY 196	30p
BY 198	10p
BY 204/4	8p
BY 206	8p
BY 210/400	5p
BY 210/600	8p
BY 210/800	10p
BY 223	80p
BY 224/600	50p
BY 226	15p
BY 227	15p
BY 228	20p
BY 229/400	30p
BY 234	10p
BY 237	5p
BY 254	10p
BY 255	10p
BY 298	10p
BY 299	10p
BY 406	8p
BY 527	20p
BY 407a	10p
BY 602	10p
F 247	10p
XK 3102	50p
XK 3123	50p
Thorn A1	10p
Hitachi 2A/1500V metal case wire end	20p

Line Transformers

G8 Trans. Philips	£7.50
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
CVC40 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
GEC 2040	£5.00
GEC 2110	£7.00
Pye mono	£3.00
Rank mono T704A	£3.50
CVC32 ITT	£7.50
EHT Split Diode Leads	£1.00

Triplers

11 TEZ Rank	£3.00
KT3	£4.00
G9 Philips	£4.00
GEC 2110	£4.00
9500 Thorn	£4.50
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
G8 Philips	£4.50
Decca 80 100	£4.50
LP1194 Pye 731	£3.50
Grundig TVK 52	£2.50
11TBQ	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
BG 100/61	£3.25
BG 200/43	£3.00
GEC Portable Line Trans.	£3.00
G8 Convergence Panel	£12.00
T/text ultrasonic rec'r panel	£14.00
Video cassette lamps on lead. 12-14V.	50p or 3 for £1.00
GEC 8 touch unit assy complete with all I.C.'s + pots	£6.00
G11 E.W. coils	£1.00
G11 6 Button Key Switch	£2.00
G11 Transient Suppressors 245V	10 for £1.00
G11 Scan Coils	£5.00
KT3 IF panel	£6.00
KT3 AE Sockets	25p
NPN PNP 80V 6 Amp TO66 O.P. Trans.	pair 25p
5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
Control panel 5 sliders + mains lead	£1.50
G11 8 touch button unit replaces old 6 P.B.U.	£20
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans. & Rec Stick for Portable	£3.00
CVC 20/25/30/35/40 decoder panel	£10
CVC 20/25/30/35/40 decoder panel (untested)	£5
CVC 40/45 IF panel	£5
40K Transducer	50p
PHILIPS NE511N	£1.20
LM337M Reg.	30p
20 GEC Black Spark Gaps	£1.00
G11 Line Driver Transformer	35p

International Rectifier EHT Diodes G770/HV34 6KV	3 for 8p
6A/600V Stud Diodes	20p
6A/1000V Stud Diodes	20p
EHT Rectifier wire ends 16Kv	10p
25A473 PNP C/P	10p

GEC portable chassis + LOPT	£6
Thorn 1613/1713 chassis	£9.75
Hills 520 multimeter + case. 20,000Ω/volt, fuse diode protected + logic test facility. 10meg/1200 volt	£19.50

NEW MULLARD TELETEX

Decoder Panel (VM6230)	£15.00
Panel 6101	£15.00
Panel 6330	£15.00
G8 T/Unit Panel	£12.00
G8 IF Panel	£12.00
G8 Line O/P Panel	£12.00
G8 Power Supply	£12.00
G8 IF & Chroma	£15

G11 IF Detector	£3.00
Complete CVC 825 Chassis (both panels)	£40.00
AEC V/Cap Resistor Unit UHF with IC SAS660 SAS670	£3.00
Z714 RANK IF Panels 6MHz 1 I.C. SL437F	£3.00
Z909B RANK IF Panels Export 5.5MHz 2 I.C.'s TBA1205B TCA2705Q	£2.50
Z743 RANK IF Panel Export 5.5MHz 3 I.C.'s TBA750+SC9504P+SC9503P	£1.50
G11 dynamic correction panel	£6
CVC 20 Front panel with sliders + mains input panel	£4
CVC 40 PUSH BUTTON ASSY with sliders: complete with lamp assy + pots	£14
CVC 5 Mains on/off + 5 pots	£2
GEC Convergence panel TO CLEAR	£1
Universal Focus. Fits Pye, Thorn and Decca Units. Large Type	75p
Decca Small	75p
KT3 Focus Unit	75p
ITT Small for use with Split Diode	50p
TV11	50p
Remo TV12SP	50p
TV13	50p
TV14	50p
TV18	60p
TV20	£1.00
TV45	50p
Thorn 14/1500 rec stick	5p
16 Button Key Pad 1 to 0 + * + #+ 4 blank	£3.00

Condensers

470/16	6p
1500/16	20p
3300/16	20p
10000/16	25p
15000/16	50p
3300/18	20p
47/25	5p
470/25	5p
680/25	5p
1000/25 Radial	10p
1500/25	10p
3300/25	20p
4700/25	25p
5000/25	25p
470/35	6p
2200/35	25p
100/40	5p
220/40	5p
400/40	20p
1250/40	20p
1500/40	20p
2500/40	25p
1000/50	20p
1250/50	25p
2000/50	20p
3000/50	25p
2.2/63	5p
15/63	5p
47/63 Bipolar	15p
100/63	6p
2200/63	50p
250/64	10p
3300/70	50p
.1/100	5p
1/100 × 10	30p
4.7M/100	5p
140/100	25p
470/100	20p
800/160	50p
G11 0.91/210 scan coil correction	25p
.1/250 Pulse	5p
G11 0.47/250	10p
2,2 250v	10p
3n3/250 A.C.	10p
.39/250V	15p
4n7/250 tested 5KV	25p
22/250	15p
47/250	10p
100/250	20p
G11 470/250V	£1.75
500/250	50p
GEC600/250	60p
700/250	£1
800/250	40p
32/300	20p
4/350	5p
8/350	8p
12/300	10p
600/300V	£1.50
4.7M/350v	10p
16/350	25p
33/350	20p
50/350	10p
220/350	30p
300/350	40p
22/375	15p
220/385	75p
330/385 CVC 820HT	60p
0.1/400	15p
KT3 E/W .39/400	20p
.56K/400v	20p
8/400	15p
33/400	20p
400/400	40p
394K/400V	20p
220/450	40p
0.1/600	15p
.047/600	15p
0.047/1000	10p
0.01/1000	10p
0.1/1000	10p
.15/1000	20p
.47/250V A.C.	10p
.47/1000	50p
.001K/1250	10p
0.0047/1500	10p
.005/1500	10p
.0105/1500	10p
1n8/1500	15p
2n2/1500	15p
G11.11000/1500	15p
.01/1600	15p
G11.8200/2KV	15p
0.1/2KV	20p
10n/2KV	15p
3n9/2KV	15p
0.0015/2KV	10p
5n2/2KV	10p
6n2/2KV	15p
7500pf/2KV	10p
4n7/2KV	15p
8n2/2KV	15p
20n/2KV	15p
0.0082/2500	15p
150/3500	10p
1800/4KV	5p
4.7nf/5KV	10p
170/8KV	10p
180/8KV	10p
210/8KV	10p
1000/10KV	10p
210/12KV	10p
1000/12KV	10p
1200/12KV	10p

Infra Red and Ultrasonic G11 Teletext Decoder Panel	£30
RANK & ITT Mains Remote On-Off Switch (720R)	£1.50
RANK & ITT Mains Remote Switch 2865 ohm	£1.50
RANK & ITT Remote Switch 2800 ohm	£1.50
G11 Mains Switch	40p
ITT Mains Switch 4 amp	30p
GEC Mains Switch 4 amp	30p
Petrick Mains Switch 4 amp	30p
THORN Rotary Mains Switch	50p
G8 Mains Switch	75p
Mains Dropper PYE 3R5+15R+45R	50p
Thyristor 600/4 amp C106/2	24p
G11 Preh Red LED P/Button for C.H. Change	20p
RANK TOSHIBA Transductors TPC-2011	50p
CVC 5 Mains on/off +250K+100K+500K+50K+500K Pot on Panel	£2.00
Thorn Thermal Cut Out	75p
Thorn 12 or 24 volt battery convertor to mains for portable colour T/V	£12.00 Post £1

Multi-Caps

Thorn 3500 175/100/100/350v	£2.50
KT3/200/25/25/385v	£1.00
47/220/350v	60p
150/150/100/100/100/320v	£2.00
2500/2500/63v	50p
470/470/250v	50p
150/200/200/300v	70p
400/400/200v	£1.70
300/100/100/16/275v	£1.50
100/200/325v	40p
150/150/100/375v	£1.50
300/300/100/32/32/300v	2.00
1500/2000/30v	50p
400/200/200/350v	
150/150/100/100/320v	£2.00
100/350 + 300/200/100/16/275v	£2.00
300+300/300	£1.00
225+25/380	70p

ITT Panels

CMA 10	£2.00
CMA 11	£2.00
CMA 30	£2.00
CMA 40	£1.50
CMC 10/2	£5.00
CMC 16	£4.00
CMC 38	£8.00
CMC 45	£1.50
CMC 47	£1.00
CMC 52	£15
CMC 57	£6.00
CMC 58	£8.00
CMC 59	£8.00
CMC 67	£3.75
CMC 67/2	£4.00
CMC 68	£4.00
CMD 12	£10
CMD 32	£5.00
CMD 40	£5.00
CMD 41	£5.00
CMF 25	£2.00
CMF 26	£2.00
CMF 31	£1.50
CMF 40	£2.00
CMH 10	£1.50
CMH 31	£1.00
CMK 12 (untested)	£4.00
CMK 30 (untested)	£4.00
CMN 20	£1.50
CMN 21	£1.50
CMN 40	£1.00
CMN 45	25p
CMP 10	£2.00
CMP 11	£2.00
CMP 30	£2.00
CMP 40	£2.00
CMS 11	£2.00
CMS 40	£2.00
CMU 12	£10.00
CMU 14	£8.00
CMU 30	£7.00
CMU 40	£7.00
CMU 45	£5.00
GMA 90	£5.00
GMC 120	£2.50
GMR 64	£5.00
TMN 2	£2.00
VCA 20	£10
VCA 21	£10.00
VMC 26	£3.00
VMC 34	£5.00
VMC 44 + 45	£4.00
VMC 51	£5.00

Hand Sets

Transducer Hand Set Insert, crystal, transducer, SAA 1124 & lead	£3.50
Thorn 4000 insert with 7 buttons	£5.00
Thorn 9000; 2 button sound + channel	£3.50
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£19.00
C11 Ultrasonic full teletext for G26c 674/02 and G22c 66/02	£16.00
Philips, 2 button	£8.00
Rank, Infra-red	£10.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
G11, Full remote top button assy.	£12.00
G11, Full remote repair service (exchange unit)	£12.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00

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ELC1043/05 Mullard	£6.00
ELC1043 (Ex Panel)	£3.75
ELC1042 ,,	£5.00
ELC2000 ,,	£7.00
ELC2004	£10.00
EL2006	£10.00
EL2060 ,,	£7.00
ELC2060 on panel NEW	£5.00
Mullard 1043/05 on panel	£5.00
U321 (UHF) Mullard	£7.00
U322 (UHF) ,,	£4.00
V314 (VHF) ,,	£5.00
U341 UHF	£7.00
ELC1043/05 Thorn	£5.90
Small V/Cap Mitsumi UHF ,,	£4.00
VHF ,,	£3.00
Portable & rotary Tuners Sanyo & Mitsumi UHF	£5.00
NSF-UHF-VHF	£8.00
SONY 1400KV Tuner unit	£3.50
TV Sound tuner kit for sound on your Hi Fi	£9.50
G11 Tuner/U321	£7.00
Thorn Tuner PANEL with 6×100K pots + cursors NO TUNER	£2.00
U321 on panel ITT 40	£6.00
Tuner unit VHS Sylvania GTR Videon MTS 900	£2.50
Thorn 3500 tuner panel with ELC 1043/05+pots	£7.00
Mullard	£10.00
Video Modulator. Application, video tape recorders, TV cameras, video games, closed circuit T/V, C.C.I.R. system. Data supplied.	
Berec Battery SB1142 2 amp discharge current 8.4 volts with magnet switch made for emergency lighting. Nickel cadmium battery	£4.00
Sylvania UHF VHF F6013 (Fits Rank)	£6.00
Sylvania F6003	£6.00
Sylvania UHF F4720B	£6.00
Sylvania VHF 900	£6.00
Decca Bradford Tuner 5 Button	£4.00
Small Tuner DX 175-220MHz Auto Changeover	£5.00
9000 Thorn Tuner on Panel	£7.00
D.P.D.T. switch Black knob: Chassis or PCB mount	4p each or 40 for £1.00

T.V. Tubes

12" A31/300 Hitachi	£12	Add £2 P&P each
15" A38/170W Hitachi	£8	

THORN 1400 4P.B. Mech. Tuner	
THORN 1500 4P.B. Mech. Tuner	
THORN 1590 4P.B. Mech. Tuner	
THORN 3500 4P.B. Mech. Tuner	
THORN 8000 4P.B. Mech. Tuner	
THORN 8500 4P.B. Mech. Tuner	
All new & boxed	£4 each + £1 postage each

Diodes

1 Amp 1600v	7p
3 Amp 100v	7p
7 Seg Display, Led Red	50p
Delay Lines	
TAU80	£1.00
DL20A	80p
DL70	£1.00
DL600	£1.00
DL700	£1.00
UDL11	30p
KT 3 Luminence	75p
Luminance Delay Line MDL-CBL Min.	50p
3.15 Fuses	4p
Co-Ax Joint	12p
Co-Ax Belling Lee Plug	12p
Co-As Splitter	£1.00
UHF Modulator CCIR	£3.00
Infra Red Emitting Diode	20p
NE286H Small Neon Lamps GEC	5p
Mullard 5 Watt Amps. LP1162 New	75p

Integrated Circuits

AC76003	£1.50
AM25LS23PC	10p
BAV40	40p
BRC-M-200	40p

BRC-M-300	50p
BRC 1330	75p
BTT822	£1.00
BTT6016	£1.20
BTT6018/ML237B	£1.50
BTT6218	£1.50
BTT8124	£1.00
BTT8224	£1.00
CA270AE	50p
CA270CW	50p
CA270CE	50p
CA920AE	£1.00
CA1310	50p
CA3065Q	50p
CA3089Q	50p
CA3094AE	50p
CA3146	£1.00
CBF16848	50p
CD4510	30p
DM7492	50p
HEF4001	10p
HBF4011AF	10p
HEF4016	15p
HEF4053B	30p
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
MC476p	£1.00
MC1307	75p
MC1330	75p
MC1349	50p
MC1352	£1.00
MC1358	£1.00
MC14001	10p
MC14002	15p
MC14013	25p
MC14016	25p
MC14066	30p
MC14069	15p
MC14514	50p
MC1748	80p
MCM2114	75p
MEM4956	£1.00
ML231	£2.50
ML232	£1.20
ML236E	£1.50
ML237B	£1.50
ML238B	£3.50
ML239	£3.00
MM5387	£1.00
MM5611	£1.00
MM5840	75p
N64100	£1.00
NE545B (Dolby)	75p
NE555P	60p
NE555	60p
IL-1	30p
OPT600	30p
OPT601	30p
SAA611	£1.00
SAA661	£1.75
SAA1020	£4.00
SAA1021	£4.00
SAA1024	£2.50
SAA1025	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1124	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£3.00
SAA1250	£3.00
SAA1272	£3.00
SAA1276	£3.00
SAA5000	£1.50

SAA5000A	£1.50
SAA5012	£3.50
SAA5012A	£4.00
SAA5020	£3.50
SAA5030	£5.00
SAA5040	£3.50
SAA5040A	£4.40
SAA5050	£3.50
SAF1039	£2.00
SAS560	£1.00
SAS570	£1.00
SA5660	£1.00
SAS670	£1.00
SL901B	£4.40
SL918-SL917 MOD	£6.00
TAA320A	50p
TAA470	£1.50
TAA550	25p
TAA570	75p
TAA611	£1.50
TAA621	£2.00
TAA661	£1.75
TAA641	£1.50
TA7117	50p
TA7315AP	50p
TA7607AP	40p
TA7609P	50p
TBA120A	40p
TBA120AS	50p
TBA120SA	40p
TBA120B	40p
TBA120SB	40p
TBA120SQ	£1.00
TBA120U	50p
TBA120C	40p
TBA1441	£1.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA510	£1.00
TBA510Q	£1.00
TBA520	£1.00
TBA530	£1.00
TBA540	£1.00
TBA550Q	£2.50
TBA560CQ	£1.00
TBA570	£1.00
TBA625	50p
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TBA651	£1.00
TBA673	£1.00
TBA720A	£1.00
TBA750Q	£1.20
TBA780	£1.50
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TBA820	70p
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TBA900	£1.20
TBA920	£1.50
TBA920Q	£1.50
TBA950	£1.00
TBA990Q	£1.00
TMS1000NL	£4.00
TMS1943NL	£2.00
TMS9980	£4.00
TMS9901	£2.00
TMS2716JL	£2.00
TMS3529	£2.00
TMS4014	£1.50
TX012	£5.00
TMS9902	£3.00
UPD2114C 4K RAM 400ns	75p
ULN2216	75p
SN29848	50p
SN74107	£1.00
SN74167	70p
SN7472N	20p
SN75108AN	£1.00
SN76001	£1.00
SN76003	£1.00
SN76018	£1.00
SN76008	£1.00
SN76023N	£1.50
SN76033	£1.50
SN76115	50p
SN76131	50p
SN76226	£1.00
SN76227	60p
SN76228N	£1.00
SN76532N	50p
SN76544N	£2.00

SN76545	£3.50
SN76546	£1.00
SN76550	30p
SN76552	30p
SN76570	£1.00
SN76620	50p
SN76650	50p
SN76660	40p
SN76620AN	50p
SN76666	£1.00
SN76707N	75p
SN76708AN	75p
SN76720	£1.00
UA783P3C	40p
Semiconductors	
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BT106	£1.20
BT106 Plastic	50p
BT109	£1.00
BT138/10A	70p
BT146	30p
TCA270	£1.00
TCA270Q	£1.00
TCA640	£1.00
TCA660	£1.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£1.00
TCA830	£1.00
TCEP100	£2.25
TCE120CQ	£1.00
TDA440Q	£1.00
TDA1003A	£1.00
TDA1010	£1.00
TDA1060A	£1.50
TDA1151	30p
TDA1170	£1.00
TDA1190	£1.00
TDA1327A	£1.00
TDA1412	30p
TDA2010	£1.00
TDA2140	£3.50
TDA2522	£1.00
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2575A	£1.00
TDA2581	£4.00
TDA2590	£1.00
TDA2593	£1.00
TDA2560	50p
TDA2600	£5.00
TDA2653	£1.00
TDA2002	£1.00
TDA2640	80p
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TDA2593	£1.00
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TDA3500	£2.00
TDA3560	£3.50
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TDA3950	£1.50
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AC151	15p
AC131	15p
AC138	15p
AC152	15p
AC153K	15p
AC142K	15p
AC169	15p

AC176	15p
AC176K	15p
AC178K	15p
AC179	15p
AC186	15p
AC187K	15p
AC188	15p
AC188K	15p
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BD507	50p
BD509	30p
BD510	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
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BD646	50p
BD676A	30p
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BF115	20p
BF121	20p
BF127	20p
BF137	20p
BF157	20p
BF160	20p
BF161	20p
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BF179	30p
BF180	20p
BF181	20p
BF182	20p
BF184	20p
BF194	10p
BF195	10p
BF196	10p
BF197	12p
BF198	10p
BF199	10p
BF200	20p
BF222	10p
BF224	15p
BF238	20p
BF240	16p
BF244	40p
BF245b	20p
BF256	10p
BF257	20p
BF258	25p
BF259	25p
BF262	15p
BF263p	25p
BF264	15p
BF271	10p
BF273	10p
BF274	10p
BF324	25p
BF355	30p
BF362	20p
BF363	15p
BF367	15p
BF391	15p
BF394	10p
BF419	30p
BF423	15p
BF448	30p
BF450	20p
BF458	30p
BF459	30p
BF468	30p
BF469	30p
BF470	20p
BF480	50p
BF594	10p
BF597	10p
BF694	10p
BF757	30p
BF758	30p
BF760	30p
BF761	30p
BF858	30p
BF871	30p
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BFR39	15p
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BFR81	15p
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BFS60	10p
BFT34	15p
BFT43	10p
BFT84	8p

BFT43	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
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BPW41	25p
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2N4444	£1.00
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2N5983	30p
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2N6133	20p
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2SB474	30p
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BC107	10p
BC108	10p
BC109	5p
BC113	10p
BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC125	10p
BC139	10p
BC141	25p
BC142	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC159	10p
BC160	25p
BC171	10p
BC172	10p
BC173	10p
BC174	10p
BC182L	10p
BC183	10p
BC184	10p
BC187	10p
BC204	10p
BC207	10p
BC212	10p
BC213	10p
BC214	10p
BC237	10p
BC238	8p
BC239	10p
BC250	8p
BC251	10p
BC252	10p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p

BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
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BD116	25p
BD124	50p
BD124 (metal)	60p
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BD132/676a	30p
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BD136	30p
BD176	25p
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BD202	60p
BD204	60p
BD221	20p
BD222	30p
BD226	20p
BD233	30p
BD235	30p
BD238	30p
BD239	15p
BD243a	30p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD332	20p
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T/V 4.433-619KHz	50p
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8.8867-238KHz Min	50p
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40 Pin × 4	£1.00
42 Pin × 5	£1.00
28 Pin × 5	80p
16 Pin × 10	70p
24 Pin × 5	75p
14 Pin × 10	70p
18 Pin × 10	80p

DIL – QIL

16 Pin × 10	£1.00
18 Pin × 10	£1.00
28 Pin × 4	£1.00

QUIL – QUIL

16 Pin × 10	£1.00