FEBRUARY 1977 45p

TELEVISION

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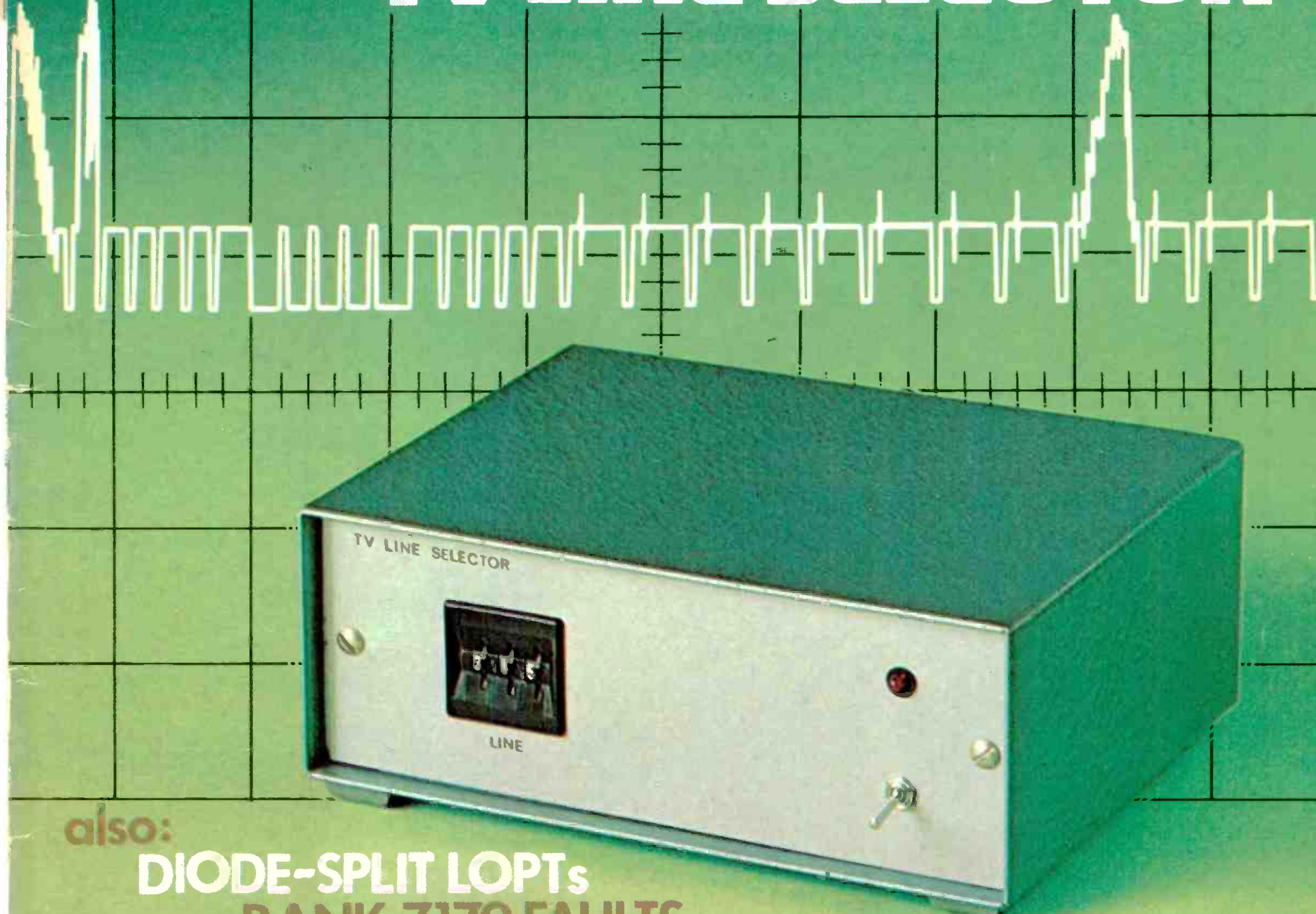

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BRC Colour 8000	75p
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GEC 27840	75p
GEC 2000	75p
Phillips G9	35p

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AA116	14p	OA85	11p	BA130	35p	BAX16	6p
AA117	14p	OA90	6p	BA145	16p	BAY38	10p
AA119	8p	OA91	6p	BA148	16p	IN4148	4p
OA47	6p	OA95	6p	BA154	12p	BY206	30p
OA79	6p	OA202	11p	BA155	15p		

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AC126	23p	AF181	49p	BC183L	10p	BD144	2.10	BF271	15p
AC127	30p	AF186	39p	BC183LB	10p	BD155	74p	BF273	15p
AC12701	50p	AF239	39p	BC184L	10p	BD157	74p	BF274	15p
AC128	23p	AL102	1.05	BC186	24p	BD183	55p	BF336	34p
AC12801	50p	AU107	1.05	BC187	26p	BD235	74p	BF337	34p
AC141	24p	AU110	1.85	BC203	15p	BD237	74p	BF338	34p
AC141K	40p	AU113	2.20	BC204	15p	BD238	74p	BF458	59p
AC142	24p	BC107	10p	BC205	15p	BDX32	2.50	BFX29	29p
AC142K	25p	BC108	10p	BC206	15p	BF115	19p	BFX84	24p
AC153	23p	BC109	10p	BC207	15p	BF118	25p	BFX85	25p
AC176	24p	BC113	12p	BC208	11p	BF121	24p	BFX88	23p
AC17601	50p	BC114	19p	BC209	15p	BF152	30p	BFX89	30p
AC187	23p	BC115	19p	BC212L	11p	BF154	30p	BFY50	22p
AC187K	24p	BC116	19p	BC213L	11p	BF157	30p	BFY51	22p
AC188	24p	BC117	19p	BC214L	11p	BF158	24p	BFY52	22p
AC188K	40p	BC118	28p	BC225	15p	BF163	24p	BU105/01	1.90
AC193K	29p	BC119	28p	BC237	15p	BF167	24p	BU105/02	1.90
AC194K	31p	BC125	21p	BC238	11p	BF173	24p	BU105/04	2.50
AD140	45p	BC126	19p	BC251A	16p	BF177	29p	BU108	3.00
AD142	50p	BC136	19p	BC301	32p	BF178	32p	BU126	2.90
AD143	50p	BC137	19p	BC303	59p	BF179	32p	BU204	1.90
AD145	50p	BC138	19p	BC307	11p	BF180	34p	BU205	1.90
AD149	1.00	BC139	19p	BC308	9p	BF181	32p	BU206	1.90
AD161	45p	BC142	29p	BC327	12p	BF182	43p	BU208	3.00
AD162	45p	BC143	34p	BC328	12p	BF183	43p	MJE340	65p
AF114	50p	BC147	12p	BC337	15p	BF184	25p	MJE520	80p
AF115	23p	BC148	11p	BC547	12p	BF185	25p	MJE2955	1.10
AF116	23p	BC149	13p	BD115	64p	BF194	14p	MJE3055	73p
AF117	19p	BC153	19p	BD116	60p	BF195	14p	MPSU05	65p
AF118	48p	BC154	19p	BD124	79p	BF196	14p	MPSU55	1.25
AF121	30p	BC157	14p	BD131	44p	BF197	14p	R2008B	2.00
AF124	23p	BC158	12p	BD132	49p	BF198	19p	R2009	2.00
AF125	23p	BC159	14p	BD133	49p	BF199	24p	R2010B	2.00
AF126	23p	BC171	14p	BD134	49p	BF200	34p	TIP31A	60p
AF127	23p	BC172	13p	BD135	39p	BF240	19p	TIP32A	60p
AF139	34p	BC178	21p	BD136	45p	BF241	21p		
AF178	53p	BC179	19p	BD137	47p	BF256LC	44p		

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EF184	46p	PCL84	80p	PL519	3.00
EH90	90p	PCL85	75p	PY500A	1.90
PCC89	60p	PCL86	75p	PY800	65p
PCC189	60p	PFL200	85p	PL802	4.00

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BRC1500 (24")	3.00	GEC 2028	7.10
BRC3500	6.60	GEC 2110	7.10
BRC8000	2.90	ITT CVC5	6.60
BRC8500	5.50	RRI 111/174	10.00
BRC9000	7.75	RRI A823	7.70
Decca CS190	7.10	Korting 90°	7.10
Philips G8	7.30	Tanberg	7.10

TELEVISION

February 1977

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CORRESPONDENCE
All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Fleetway House, Farringdon Street, London EC4A 4AD. All other correspondence should be addressed to the Editor, "Television", Fleetway House, Farringdon Street, London EC4A 4AD.

BINDERS AND INDEXES
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QUERIES
We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television*, but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them. All correspondents expecting a reply should enclose a stamped addressed envelope.
Requests for advice in dealing with servicing problems should be directed to our Queries Service. For details see our regular feature "Your Problems Solved".

this month

OUR NEXT ISSUE DATED MARCH WILL BE PUBLISHED ON FEBRUARY 21

TELEVISION

TELETEXT: TIME TO GET ON

Is there or isn't there a Teletext service? The public may well wonder. It's now over four years since the BBC and the IBA first announced proposals for such a service. The BBC started regular transmissions of their Ceefax Teletext system in mid-1973, while a unified standard – a combination of Ceefax and the IBA's Oracle system – was decided on over two years ago. While the BBC has been transmitting the service for some three and a half years, the IBA had to wait until arrangements could be made with the various programme companies. The ITV Teletext service in fact started in the London area in mid-1975 and is now being progressively spread through the regions. But what impact has it all had on the public? Unfortunately, from the public's point of view there has been little other than the occasional article in the press and those twinkling lines across the top of the screen to bring home the fact of this radically new offering.

There are two reasons for this situation. First, the government seems to regard the service as "experimental". Secondly, there is the small number of decoders available to date and their high cost.

In connection with the first point it's welcome news that the Home Office has approved the continuation of the transmissions until August 1979. There is little doubt however that the system is here to stay. So why this pusillanimous approach? Why not a full commitment here and now, and an end to the no longer true talk of an "experimental service".

This leads to the second point, getting the public interested and getting decoders into people's homes. It's interesting to compare the situation with that of television itself in the thirties. In the early days, incredible though it may now seem, there was some scepticism as to whether television was ever likely to be a practical matter – though it's not perhaps quite so incredible if the very early demonstrations are recalled. Then, in 1936, the BBC's TV service started. Public response was held back during the pre-war period however due to the relatively high price of TV receivers. In fact, taking the wartime period into account as well, it took something like twenty years for television to become an accepted part of the general public's everyday life.

Is the complementary Teletext service going to have such a long gestation period? We earnestly hope not, for one thing is certain. If we don't get on with it, others will. Already concern is being expressed by UK setmakers over developments in Japan, while much work on similar systems has been done both on the Continent and in the USA. But as in 1936 the UK is still in the lead, with the only regular Teletext transmissions.

What's necessary is to overcome the present chicken and egg situation. Until the public is offered a reasonably priced way of receiving the Teletext transmissions the service will remain in its present limbo. To start with, kits for the enthusiast will help encourage interest. There are now several either on the market or about to become available. And next month *Television* makes its contribution: we shall be starting a series of articles which will give full constructional details – printed circuit boards will be available – of a fully tried and tested design for plugging into the receiver's aerial socket.

Enthusiast interest helps. We hope it will have a proselyting effect. But the real breakthrough must come from the setmakers so that the general public has access to the service. The large rental organisations would seem to be in the best position to give a lead here, by offering subscribers an aerial socket adaptor at a reasonable weekly charge. Their large scale operations should ensure an adequate market, while a separate decoder, though technically a less elegant solution than carrying out decoding in the set itself, would overcome the drawback of having to buy a new set. Once decoders appear in the high road shops and rental outlets we can expect the public to accept Teletext as a natural addition to their sources of information. The aim must be to get the public as used to switching on Teletext as collecting the morning paper from their letterboxes.

CORRECTION

An error occurred in the note beneath the circuit diagram of the Decca Gypsy on pages 140-1 last month. C95 is 0·022μF in the 15in. version of this chassis.

teletopics

TELETEXT: ON THE MOVE

Bill Wood of the BBC Engineering Information Service has been making optimistic comments about the development of the Teletext service. He says that most major TV setmakers have initiated programmes for the production of decoders, and believes that the current production rate of about 200 a year will escalate to thousands a month during the first quarter of 1977, with the prospect that 50,000 or so sets will be equipped to receive Teletext by the end of the year.

Meanwhile, Texas Instruments have announced that their Tifax decoder module is now available. The one-off price is understood to be about £132 and the quantity price £80. Texas say they hope that this will fall to the region of £30-40 once production builds up. One of the main customers at present for Tifax modules is understood to be Radio Rentals, so there is hope that this rental chain's outlets will be offering sets able to decode and display the Teletext transmissions before long.

The Texas Instruments Tifax decoder module is for use within TV sets: the demodulated signal enters the decoder at video frequency, the module providing drives for the set's video output stage(s). Since with this technique the results depend on the performance of the set's i.f. strip, it is unlikely that sets other than those designed with Teletext in mind could be modified by incorporating a Tifax module. This limitation does not apply where the decoder has its own tuner and i.f. strip, decoding and remodulating the Teletext signal for feeding to the set's aerial socket. While it's likely that the i.f. performance of sets produced in the future will be suitable for use with internal v.f. decoder modules, for the present time the best approach for the industry would seem to us to lie in the provision of external decoders which can be used with any receiver.

BEAB approval has now been given to Rank's 22in. Bush Model BC6333 which incorporates a Teletext decoder. This was the first such set to be offered on the domestic TV market. We understand that ITT plan to launch a model equipped for Teletext reception shortly.

DECCA FIRST WITH 20AX

Decca is the first UK setmaker to launch a range of colour receivers fitted with the New Mullard 110° 20AX self-converging in-line gun c.r.t. So far six models fitted with the 100 series modular chassis – we shall be giving more details of this shortly – have been announced. There is a standard 22in. table set, Model CV1051, and a 26in. version, Model CZ1052. The other four models will feature the new Deccasonic remote control system, which provides for channel changing, volume increase or decrease, and sound muting to a preset level. There will be two table models, CV1061 (22in.) and CZ1062 (26in.), a contemporary 26in. console (CZ1072), and a Queen Anne style console (CZ1082).

NEW LINE OUTPUT TRANSISTOR

A new line output transistor, type BU500, has been introduced by Texas Instruments. It is primarily designed for colour TV chassis using the new generation of 110° in-line gun c.r.t.s. In addition to having a high gain when saturated and fast switching performance, the device, which is rated at 1500V and 6A, can withstand turn-off transients of up to 16A at 500V. Texas guarantee the transient turn-off limit of every device, therefore it's possible to confirm safety margins for the transistor under fault conditions such as e.h.t. flashovers.

COLOUR TV DELIVERIES

The latest (October 1976) figures for colour set deliveries to the trade suggest that the bottom of the recession in this market passed some months ago. Deliveries were higher than the corresponding month in 1975 in each month after May. The lowest delivery figures occurred over the February-April period. The abysmal start to 1976 still leaves deliveries 10% lower than in 1975, but there has been a clear increase in more recent months.

FROM SETMAKERS' SERVICE DEPARTMENTS

The recommended replacement mains rectifier thyristor for use in the Philips G8 chassis is now the Mullard type OT112. For replacement purposes in earlier sets not fitted with this type of thyristor a thyristor kit, part number 310 27336, is available from CES. We receive a trickle of letters from readers experiencing difficulties with the colour-difference amplifier panel used in the Pye 691 and subsequent hybrid colour chassis. One cause of trouble with this panel is overheating – this is becoming more noticeable as the sets age of course. Pye have now advised that for long term reliability it is preferable to change the four valveholders on the panel to stand-off types.

VIDEODISCS

Some recently released figures show how poorly the world's first videodisc system, Telefunken-Decca's Ted, has done since it was first introduced on the German market eighteen months ago. Some 15,000 Ted videodisc players have been produced, but of an estimated 6,000 delivered to retailers it's thought that only about 2,000 have been sold. The outlook seems rather bleak if an advanced piece of domestic electronics fails to catch on in the German market. Meanwhile Philips are for the present keeping quiet about their VLP videodisc system and seem to have no plans to launch it in the foreseeable future. One begins to wonder whether there really is much of a market for prerecorded video. After all, the only comparable form of entertainment, home movies, has hardly been a major preoccupation with the public.

TELETEXT LEVEL CHANGE

As a result of the more precise specification of the binary "1" data level to 66% ± 6% (where black level is 0% and white level 100%), the nominal amplitude level of the Oracle Teletext transmissions is being reduced slightly, from 71% to 66%. The change is unlikely to affect the operation of existing Teletext decoders but will be of benefit to viewers who have receivers that are susceptible to intercarrier-type data buzz.

TV UP-CONVERTER

We have received a number of letters from readers asking about the availability of the BF357K transistor recommended for use in the up-converter featured in our September 1976 issue. Author W.S.J. Brice tells us that this transistor should be available through Texas stockists and is stocked by Clearline (Bampton), Brook Street, Bampton, Devon, who can also supply the boards and other components for the up-converter. The Mullard BFX89 is an equivalent so far as this circuit is concerned. The BFY90 could also be used but may have to be selected in order to achieve reliable oscillator operation and good signal-to-noise ratio.

MAINS FUSES: GEC C2110 CHASSIS

Following a recent article (September 1976) on the GEC C2110 series solid-state colour chassis, GEC have asked us to make clear the current mains fuses specified by them for use in this chassis. FS1 should be a 3·15A slow-blow type and FS2, which is in the feed to the degaussing circuit, a standard 2A type.

NEW TV ICs

A new TV sound channel i.c., the TDA2190, has been announced by SGS-ATES. This is a combined intercarrier sound/audio output i.c. with new features, including a constant-amplitude output for VCR recording (conforming to the DIN standard) and a power output stage which can operate as a normal class B amplifier or with constant current consumption. Limiting starts at a very low level, typically 30μV, and the d.c. volume control range is typically 90dB. The output power is typically 4·2W into 16Ω at 24V. SGS-ATES also announce the availability of their three-chip PAL decoder package – TDA2140, TDA2150, TDA2160. For further details of these see *More About TV ICs* in our July 1976 issue.

NEW AERIALS

Three interesting new aerials have been added to the Jaybeam Multibeam range. The multi-director assemblies and launch elements of the present models are retained but in addition the new models have extra large reflectors. This combination is said to give greatly improved directivity and better rejection of signals arriving from all angles outside the main beam. The new models are the MSG8 (with eight director assemblies) at £10·45, the MSG15 (15 director assemblies) at £18·70 and the MSG21 (21 director assemblies) at £27·50 – all prices exclude VAT.

Two aerials have been added to the current Antiference range. The ten-element Trucolour TC10 is a grouped aerial – available for channel groups A, B, C/D and E – and occupies 40 per cent less storage space than its predecessor. Of particular interest is the Extragain XG5. This is a high-gain wideband design with full-wave elements – multi-element director assemblies, X-dipole and angled reflector, plus a half-wave resonator element to couple the director chain to the dipole. Type XG5/K covers channels 21-48 and type XG5/W channels 21-68.

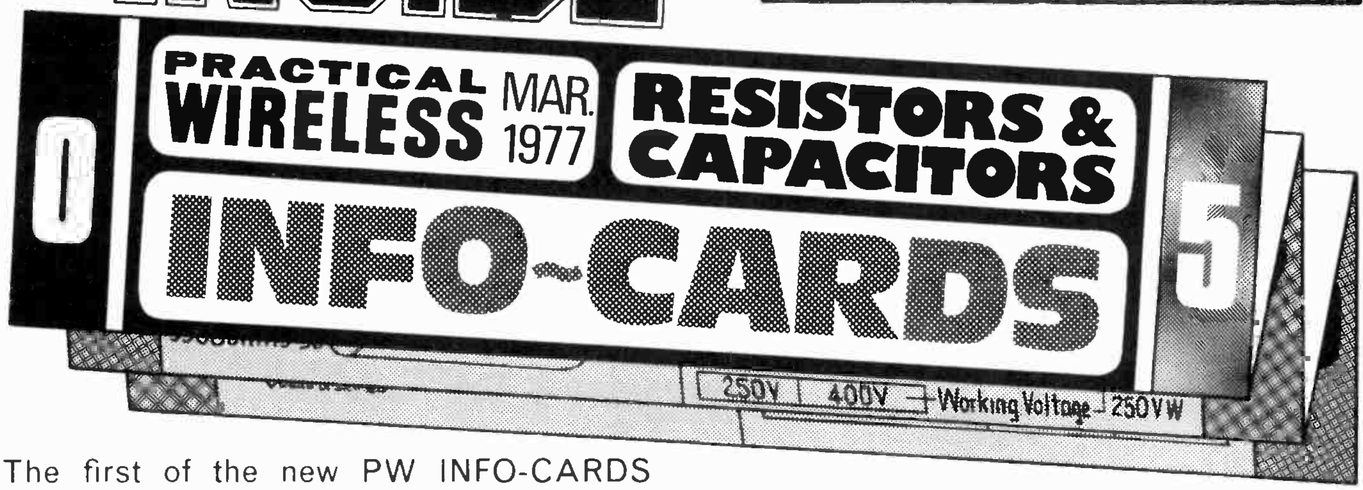
TRANSMITTER OPENINGS

The following transmitters are now in operation:
Auchtermuchty (Fife) BBC-1 (Scotland) channel 39, BBC-2 channel 45. Receiving aerial group B.
Barskeoch Hill (Near Dalbeattie, S.W. Scotland) BBC-1 channel 55, BBC-2 channel 62. Receiving aerial group C/D.
Beecroft Hill (West Leeds) BBC-1 (North) channel 55, BBC-2 channel 62. Receiving aerial group C/D.
Carnane (Douglas, Isle of Man) BBC-2 channel 66, BBC-1 channel 68. Receiving aerial group C/D.
Combe Martin (Devon) BBC-1 channel 39, BBC-2 channel 45. Receiving aerial group B.
Cow Hill (Fort William) BBC-1 (Scotland) channel 40, BBC-2 channel 46. Receiving aerial group B.
New Galloway (S.W. Scotland) BBC-2 channel 26, BBC-1 channel 33. Receiving aerial group A.
Larne (County Antrim) BBC-1 channel 39. Receiving aerial group B.
Llandinam (Montgomery) BBC Wales channel 44, BBC-2 channel 51. Receiving aerial group B.
Llanidloes (Powys) ITV channel 25 (HTV Wales). Receiving aerial group A.
Long Mountain (Montgomery) BBC Wales channel 58, BBC-2 channel 64. Receiving aerial group C/D.
Poole (Dorset) ITV channel 60 (Southern Television). Receiving aerial group C/D.
Shotley Bridge (Consett, Co. Durham) BBC-1 (North East) channel 22, BBC-2 channel 28. Receiving aerial group A.
Thornhill (S.W. Scotland) BBC-1 channel 57, BBC-2 channel 63. Receiving aerial group C/D.
Tidworth (Hants) BBC-1 (South) channel 22, BBC-2 channel 28. Receiving aerial group A. Note that this is the first of a new generation of very low power relay stations. Until now the relay stations necessary to fill in gaps in the u.h.f. coverage have required a brick or prefabricated building to house the transmitters, and a lattice steel or concrete tower to support the aerials. The new equipment, developed by the BBC, is designed for serving small communities and operates at very low power levels. It's small enough to be housed in a box which can be bolted to a simple pole supporting the receiving and transmitting aerials – which are also a product of BBC research. The new stations are thus less expensive and easier to install.
Tiverton (Devon) BBC-1 (South West) channel 40, BBC-2 channel 46. Receiving aerial group B.
West Kilbride ITV channel 41 (Scottish Television), BBC-2 channel 44, BBC-1 (Scotland) channel 51. Receiving aerial group B.

All these transmissions are vertically polarised.

*FREE INSIDE

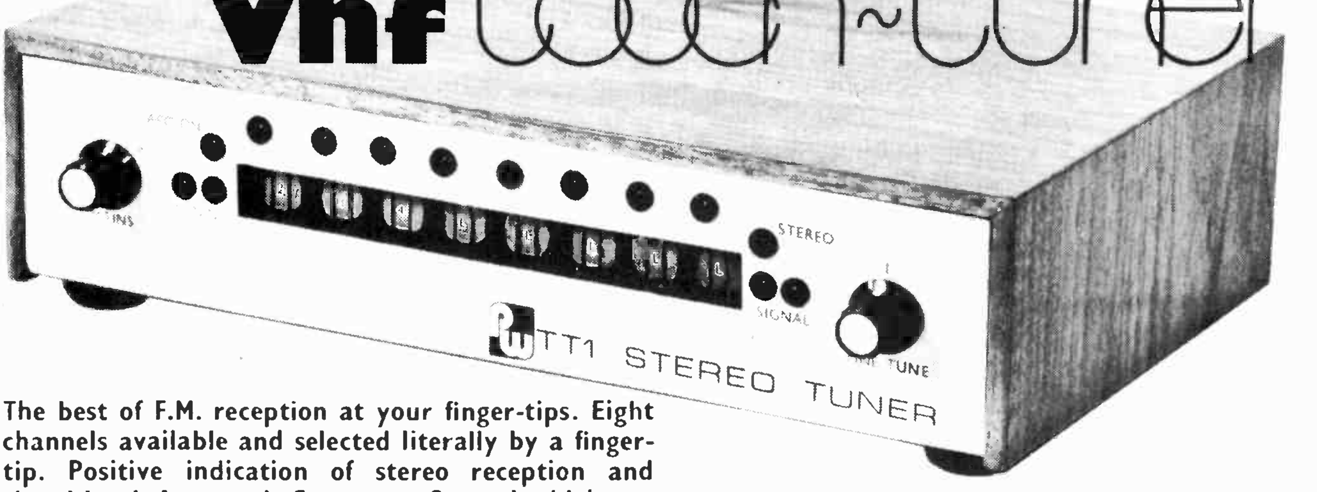
IN NEXT MONTH'S PRACTICAL WIRELESS



The first of the new PW INFO-CARDS contains much useful information on Resistors and Capacitors in a readily available form. You'll find the Card very handy in your workshop or you can fold it up and put it in your pocket when you go buying components

PW

stereo vhf touch-tuner



The best of F.M. reception at your finger-tips. Eight channels available and selected literally by a finger-tip. Positive indication of stereo reception and signal level. Automatic Frequency Control which can be over-ridden, again by the touch of a finger.

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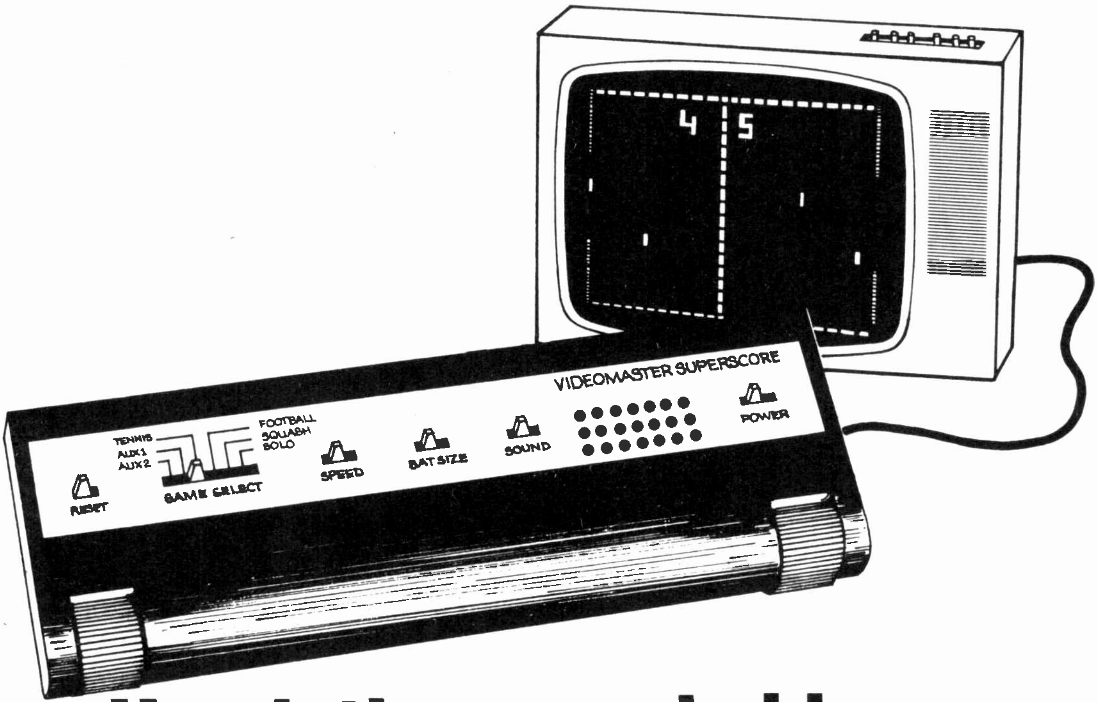

Here's the remarkable new VIDEOMASTER(TM) Superscore Home TV Game

Get it together for only £24.95

Available to you in kit form at the same moment as its national launch, the brilliant new Videomaster Superscore contains the latest product of MOS technology: a TV game chip.

The logic contained in it had previously to be generated by 100 TTL devices. Now it is condensed into one 28-pin chip.

This all-new Videomaster plugs into your 625-line UHF TV set (for overseas customers having VHF sets we can supply the necessary VHF modulator) to give you four exciting games (including tennis and football) and two future game options. It features on-screen digital scoring, realistic hit sounds, two bat sizes, two ball speeds, automatic serving and much more. It runs on six $1\frac{1}{2}$ volt SP11 type batteries (not supplied).

The Videomaster Superscore kit costs only £24.95 including VAT (recommended retail price of the ready built model is over £40.00) and comes complete with ready-tuned UHF or VHF modulator, circuit board with printed legend, all resistors, transistors and diodes, built-in loudspeaker, socket for mains adaptor, and, of course, the TV game chip itself.

Easy to put together the Superscore has full assembly instructions, circuit diagram and circuit description. Don't miss this chance to own the newest electronic game at such low cost.

POST TODAY TO:

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Please send me (insert No. requ'd)..................Videomaster Superscore Kits at £24.95 (inc. VAT & P&P in UK) or £23.10+£4.00 for P&P overseas)

I enclose my cheque/money order* for £.................. VHF modulator required YES/NO* T.86

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EKCO MODELS TC208 to TV417.
FERGUSON MODELS 305 to 438, 506 to 546.
FERRANTI MODELS 1084 to 1092.

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5Z3	1.00	6GH8A	0.80	30PL13	1.00	ECH81	0.35	P61	0.60		2.00
5Z4G	0.48	6GK5	0.75	30PL14	1.29	ECH83	0.50	PC86	0.62	QV06/20	
6/30L2	0.79	6GU7	0.90	50CD6G		ECH84	0.50	PC88	0.62		3.50
6AC7	0.55	6H6GT	0.30		1.20	ECL80	0.45	PC92	0.55	R19	0.75
6AG7	0.60	6J5GT	0.50	85A2	0.75	ECL82	0.40	PC97	0.39	UABC80	
6AH6	0.70	6J6	0.35	150B2	1.00	ECL83	0.74	PC900	0.40		0.45
6AK5	0.45	6JU8A	0.90	807	1.10	ECL86	0.50	PCC84	0.39	UAF42	0.70
6AM8A	0.70	6K7G	0.35	5763	1.65	EF22	1.00	PCC85	0.47	UBC41	0.50
6AN8	0.70	6K8G	0.50	AZ31	0.60	EF40	0.78	PCC89	0.49	UBC81	0.55
6AQ5	0.47	6L6GC	0.70	AZ41	0.50	EF41	0.75	PCC189	0.52	UBF80	0.50
6AR5	0.80	6L7(M)	0.60	B36	0.75	EF80	0.29	PCF80	0.40	UBF89	0.39
6AT6	0.50	6N7GT	0.70	DY86/7	0.35	EF83	1.25	PCF82	0.45	UC92	0.50
6AU6	0.40	6Q7G	0.50	DY802	0.45	EF85	0.36	PCF86	0.57	UCC85	0.45
6AV6	0.50	6Q7GT	0.50	E80CF	5.00	EF86	0.45	PCF200	1.20	UCF80	0.80
6AW8A	0.84	6SA7	0.55	E88CC	1.20	EF89	0.32	PCF201	1.00	UCH42	0.71
6AX4	0.75	6SG7	0.50	E180F	1.15	EF91	0.50	PCF801	0.49	UCH81	0.45
6BA6	0.40	6V6G	0.30	E188CC	2.50	EF92	0.50	PCF802	0.54	UCL82	0.45
6BC8	0.90	6X4	0.45	EA50	0.40	EF183	0.36	PCF805	1.00	UCL83	0.57
6BE6	0.40	6X5GT	0.45	EABC80		EF184	0.36	PCF806	0.53	UF41	0.70
6BH6	0.70	9D7	0.70		0.40	EH90	0.45	PCH200	1.00	UF42	0.80
6BJ6	0.65	10C2	0.70	EAF42	0.70	EL34	0.90	PCL82	0.40	UF80	0.40
6BK7A	0.85	10F1	0.67	EAF801	0.75	EL41	0.57	PCL83	0.49	UF85	0.50
6BQ7A	0.60	10F18	0.65	EB34	0.30	EL81	0.65	PCL84	0.46	UF89	0.45
6BR7	1.00	10P13	0.80	EB91	0.17	EL84	0.34	PCL86	0.54	UL41	0.70
6BR8	1.25	10P14	2.50	EBC41	0.75	EL95	0.67	PCL805	0.60	UL84	0.43
6BW6	1.00	12AT6	0.45	EBC81	0.45	EL360	1.80	PFL200	0.70	UM80	0.60
6BW7	0.65	12AU6	0.50	EBF80	0.40	EL506	1.20	PL36	0.60	UY41	0.50
6BZ6	0.60	12AV6	0.60	EBF83	0.45	EM80	0.55	PL81	0.49	UY85	0.35
6C4	0.40	12BA6	0.50	EBF89	0.40	EM81	0.60	PL81A	0.53	U19	4.00
6CB6A	0.50	12BE6	0.55	EC86	0.84	EM84	0.45	PL82	0.37	U25	0.71
6CD6G	1.60	12BH7	0.55	EC88	0.84	EM87	1.10	PL83	0.45	U26	0.60
6CG8A	0.90	12BY7	0.85	EC92	0.55	EY51	0.45	PL84	0.50	U191	0.50
6CL6	0.75	19AQ5	0.65	ECC33	2.00	EY81	0.45	PL504	0.90	U251	1.00
6CL8A	0.95	19G6	6.50	ECC35	2.00	EY83	0.60	PL508	1.00	U404	0.75
6CM7	1.00	19H1	4.00	ECC40	0.90	EY87/6	0.37	PL509	1.55	U801	0.80
6CU5	0.90	20P1	1.00	ECC81	0.34	EY88	0.55	PY33/2	0.50	VR105	0.50
6DE7	0.90	20P4	0.84	ECC82	0.34	EZ40	0.52	PY80	0.50	X41	1.00
6DT6A	0.85	30C15	0.77	ECC83	0.34	EZ41	0.52	PY81	0.40	Z759	5.85

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Receiving Extra Channels

James Burton-Stewart

THE large number of high-power u.h.f. transmitters in use in the UK means that with suitable equipment extra channels can very often be received on a regular basis. As an example of the potential for multi-channel reception, in the area where the author lives the Crystal Palace, Hannington, Oxford and Sandy Heath transmitters can all be received, giving Thames/London Weekend, Southern, ATV and Anglia, while a number of other transmissions are present "in the noise", i.e. they are so weak that the noise almost completely masks the signal. Under certain conditions however the signal strength rises sufficiently to give reception of entertainment value of these weaker transmissions. The purpose of this article is to give guidance on multi-channel reception possibilities.

The most important thing is the choice of the aerial to be used. Wherever possible mount the aerial outside, well clear of local obstructions, and align it carefully towards the transmitter so that the strongest possible signal is obtained.

Where only two transmitters are to be received the most economic approach is to mount two aerials on a single mast as shown in photograph A. It is best to use separate coaxial downleads feeding a switching box, with a single lead from this to the set. The aerials must obviously correspond with the channels used by the transmitters concerned.

Aerials produced in the UK are either "wideband" or "grouped". The former cover a wide band of channels – some cover the whole of Bands IV and V – while the latter cover the various standard channel groupings –A, channels 21-34; B, channels 39-53; C/D, channels 48-68; and E, channels 39-68.

It's unrealistic to mount more than two u.h.f. aerials on a mast. This is mainly due to the cost of low-loss coaxial cable – which must always be used at u.h.f. Aerial switching also becomes difficult, though the downleads can be manually swopped. It is much better to use a rotatable array – rotator kits include a motor unit to drive the mast and a remote control unit. Photograph B shows my own rotatable mast.

There are several rotators on the market. The one I am using at present is the Stolle which is marketed by Jaybeam. I previously used a Cornell Dubilier device but this is not suitable with more than one aerial mounted on the mast. Another rotator is marketed by Antiference. With more than one aerial on the mast a thrust bearer should be added to protect the motor unit from the effects produced by strong winds.

Commercial rotators are expensive. A serviceable and low-cost manual rotator can be constructed however. This is suitable only for single-storey properties or where easy access can be gained to the mast – say from a balcony. Use stand-off brackets and slightly slacken the V bolts which hold the mast in place. Attach a length of mast – about a foot – to the main mast by means of a universal mast clamp. Turning this rotates the mast – see photograph C.

Selecting an Aerial

The aerial to use depends on the channel and signal strength. Neighbouring transmitters operate on different channels in order to avoid co-channel interference, and the channel groups are generally different. So to receive two transmitters two different channel group aerials can be mounted on the mast. For three or more transmitters the most convenient arrangement is a wideband aerial mounted on a rotatable mast.

There are some very impressive wideband aerials on the market. The important considerations are gain and front-to-back ratio. Unless the incoming signals are pretty strong good gain is essential. Front-to-back ratio refers to the aerial's ability to reject off-beam signals. With strong signals a log-periodic aerial is suitable. These have good front-to-back ratio and wideband coverage, though the gain is lower than that of the conventional Yagi aerial. The log-periodic's directivity assists in combating ghosting and the lack of gain can always be compensated for by using a mast-head amplifier.

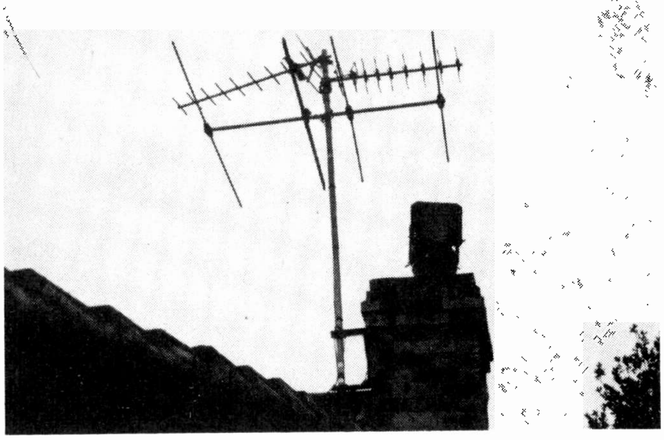


Photo A: Typical installation for the reception of two u.h.f. transmitters. The Antiference TC13 on the left is directed towards Sandy Heath (Anglia ITV) while the Jaybeam MBM30 on the right receives the Oxford (ATV) transmissions.

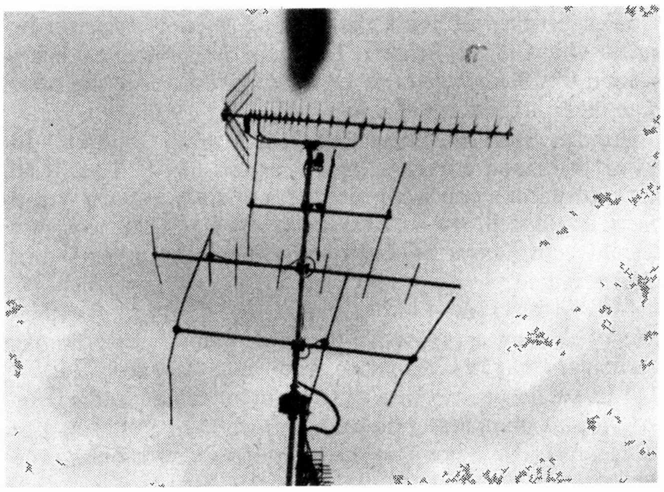


Photo B: The author's rotatable mast. The aerials, from the top, are a Fuba XC391D (u.h.f.), Antiference f.m. aerial, Jaybeam Astrabeam for Band III and a Maxview Band I array. All fully rotatable.

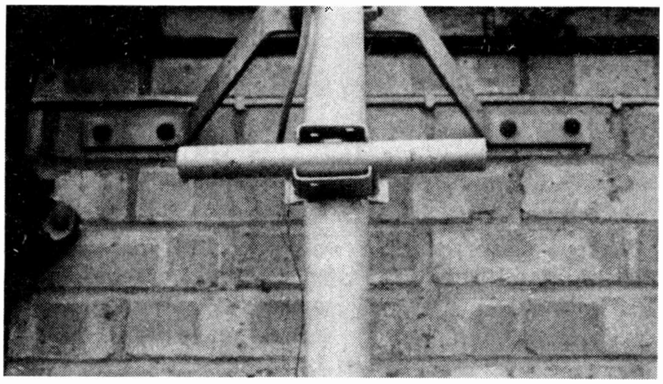


Photo C: A simple method of making a mast rotatable. Courtesy Ian Beckett.

To receive a weak signal from a particular transmitter however a conventional Yagi aerial of the correct group is more efficient.

Suitable Aerials

Since March 1974 I have been using a Fuba XC391D aerial for DX reception and multi-channel reception from adjacent UK transmitters. This is a wideband aerial whose coverage extends over most of the u.h.f. TV spectrum, with the gain maintained constant throughout the band. It's basically a substantial Yagi with a director chain consisting of multi-element assemblies. More recently Antiference have introduced similar types of aerial – their XG21K covers channels 21-48 while the XG21W covers channels 21-68. There are also the standard grouped versions of this aerial.

Jaybeam describe their elaborate superfringe MBM88 array as "one of the most powerful u.h.f. aerials in Europe". This is available only in grouped versions and has a gain of around 18dB. Not quite so elaborate but undoubtedly a fine aerial is their MBM48 which has a gain of approximately 15dB.

Wolsey Aerials have a range of wideband models that are particularly well suited to multi-channel reception. The Colour King is extensively used on the Continent and features stacked bowtie dipoles and a substantial reflector – the design is similar in fact to that used for transmitters. It gives a remarkably constant gain over the entire u.h.f. spectrum and, used with their astonishing Supa Nova amplifier, provides a highly effective installation. The smaller brother of the Colour King is, not surprisingly, called the Colour Prince. The gain is quoted as being around 12dB and tends to be less constant over the band than that of the more regal King.

Premier Aerials' interesting XS22 array is useful in giving wideband coverage over channels 39-68. Thus if all the transmitters you want to receive operate in Band V this aerial could well be a suitable choice. Their CG18 array has quoted gain figures of 12dB average for group A, B and C/D versions.

Maxview aerials quote a gain figure of 14dB for their twenty element array, while the listed gain of their Trimax wideband array is 17dB with a front-to-back ratio of 26dB.

Table 1 lists a selection of relevant aerials available from the various manufacturers we approached in preparing this article. Wherever possible the gain and front-to-back ratio figures are given.

Preamplifiers

There are a number of excellent signal preamplifiers on the market. They are of either the mast-head or set-back variety. Mast-head preamplifiers should be connected to the feeder as closely as possible to the aerial. If not battery operated they are powered via the coaxial downlead. Set-back types simply clip on the back of the receiver of course. The mast-head variety is usually more effective, since the signal level is raised before being fed down the coaxial cable with its inevitable losses. Both types are effective in improving weak-signal reception however. If DX TV reception is intended a mast-head preamplifier is almost a must.

For normal multi-channel reception however you might well find that the signal from a good aerial is adequate without the need to resort to using a preamplifier. Bear in mind that considerably more signal is required for satisfactory colour reception than for monochrome reception. Where only mediocre colour reception is obtained the addition of a preamplifier should provide satisfactory results.

Like aerials, preamplifiers are available in wideband or grouped versions. The latter are generally more efficient since narrowband operation gives increased gain with less noise. It must also be remembered however that as the gain increases so too does the noise. Noise displays itself as a mild background hum or as snow on the screen, and undoes some of the benefit obtained by the use of a preamplifier.

We have had excellent results from the Labgear range of preamplifiers, while interest in the Wolsey range has been growing recently on account of the phenomenally low noise figures combined with high gain. Their Spectrum, Supa Nova, Orbit and Saturn amplifiers are all worth considering.

For really high gain the varicap-tuned Schrader amplifier can be used. I have myself been using one of these for some years and have found that it gives high gain though with rather a high level of noise. It performs very well with the Fuba XC391D aerial previously mentioned. The advantage of a varicap tuned preamplifier is that the gain is concentrated on the channel to which the operator has tuned. For

Table 1 : Aerials suitable for multi-channel reception

Make and Model	*Groups*	*Typical gain (dB)*	*Average front-to-back ratio (dB)*
Antiference			
TC18	A, B, C/D, E	16	30.7
XG8	A, B, C/D, K, W*	16	28
XG14	A, B, C/D, K, W*	17	30
XG21	A, B, C/D, K, W*	19	33
Jaybeam			
MBM48	A, B, C/D	14	—
MBM88	A, B, C/D	18	—
LBM2	Wideband (log-periodic)	—	—
Maxview			
20-element	B, C	14	24
Trimax	Wideband	17	26
Premier			
CG18	A, B, C/D	12	13.15
XS22	A, B, C/D, E	—	—
Wolsey			
Colour King	Wideband	15	25
Colour Prince	Wideband	12	25

*K and W are wideband versions – see text.

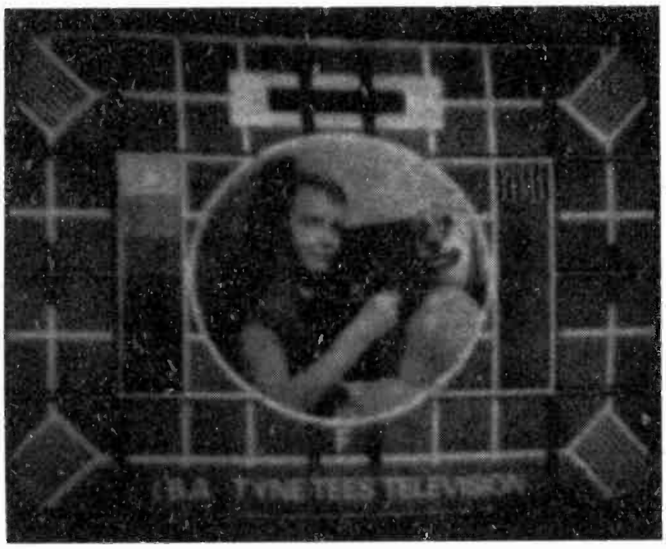


Photo D: A typical tropospheric signal – Bilsdale West Moor (Tyne Tees programmes) received at the author's home in North Buckinghamshire. Channel 29.

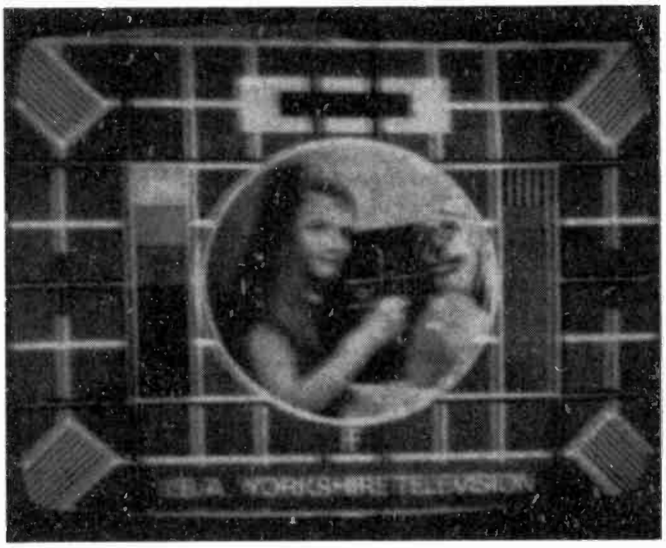


Photo E: Another example of tropospheric reception, again in North Bucks, this time Belmont (Yorkshire TV). Channel 25.

this purpose a single-core cable has to be run up the mast. In view of their cost varicap preamplifiers are probably of interest only to the DX enthusiast.

Constructors will find a simple preamplifier design by Hugh Cocks in the December 1975 issue of *Television.*

Checking for Signals

An efficient way of finding out which transmitters may be giving good enough signals is to tune critically over the u.h.f. spectrum on a portable receiver out of doors and as close as possible to the proposed site of the aerial. This should reveal any worthwhile signals. Remember that an external aerial will always give better pictures than the aerials supplied with portables: thus any signals discovered will be much stronger when a permanent array has been installed.

The Engineering Information Departments of the BBC and the IBA have much useful information available, including service area maps of all their main stations. Remember however that reception is often possible well beyond the official service areas shown on such maps. The maps will also be found in the IBA's annual "TV and Radio" handbook, while the IBA also publishes an

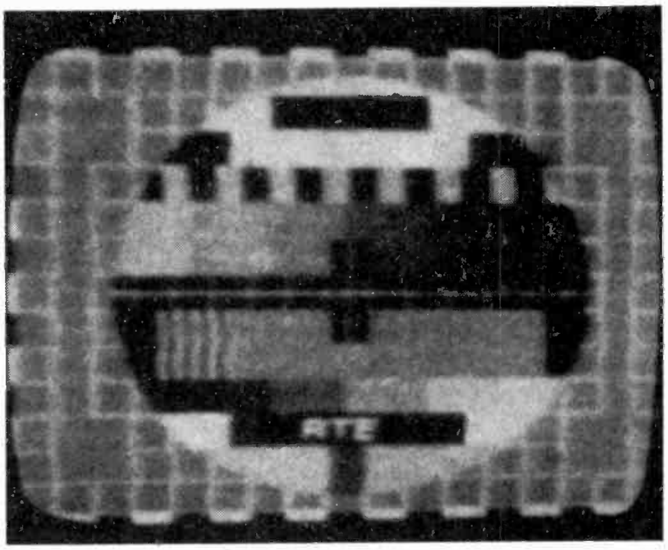


Photo F: The Dublin transmitter on channel B7 is received daily in North Buckinghamshire.

indispensible "Pocket Guide to Transmitters" which lists all the transmitters, their channels and, in the case of ITV, the programme companies using each transmitter. The addresses are: Independent Broadcasting Authority, Engineering Information Service, Crawley Court, Winchester, Hants SO21 2QA, and British Broadcasting Corporation, Engineering Information Department, Broadcasting House, London W1A 1AA.

VHF Possibilities

If signals are available from more than one v.h.f. transmitter there is no reason why an additional aerial should not be erected for this purpose. It is unlikely that the 405-line service will continue much beyond 1980 however, though future policy awaits the publication of the Annan Committee report later this year. In view of this and the bulky nature of v.h.f. aerials compared to u.h.f. types multichannel reception can hardly be considered economic at v.h.f.

Tropospheric Signals

Many viewers are puzzled by the phenomenon of Tropospheric propagation. This occurs when disturbances in the Troposphere lead to signal propagation over much greater than normal distances. More stations can be received by exploiting this possibility – but only on a temporary basis! For the DXer, Tropospheric disturbances are the main source of his signals during much of the year when there are no Sporadic E openings. The multi-channel viewer can just as well benefit from Tropospheric propagation however. A rotatable array is a great asset since to obtain maximum signal strength the aerial will almost inevitably require rotation.

When the Tropospheric conditions are right the author can receive signals from Bilsdale, Belmont and Emley Moor, while the Mendip, Moel-y-Parc, Wenvoe, Caradon Hill, Stockland Hill and Winter Hill transmitters may also be available. Sometimes as many as ten of the IBA's fourteen main stations can be received!

It's worth investigating the possibilities of receiving extra channels therefore. Modern high-gain aerials and amplifiers make a great difference. Once suitably equipped, the viewer has a greater choice of programmes and many hours of fascinating fishing for extra signals will ensue. ■

The Philips G6 Colour Chassis

A. Denham

THERE are still a lot of colour sets around fitted with the Philips G6 chassis, and many are now appearing on the second-hand market. In view of this the following notes, based on seven years' experience of these sets, may be of help to readers. For further information and circuitry, see the July 1973 and July 1975 issues of *Television* and subsequent issues (in both cases). The information which follows is based on the single-standard version of the chassis. The earlier dual-standard version is very similar however apart from the 405-line facilities and one or two extra features which were later removed.

The Signal Circuits

We'll start with the decoder – one of the few hybrid ones to have been produced. The basic design used in the dual-standard chassis was retained, but with one less PCC85 valve. This serves as chroma a.g.c. and colour-killer and can be removed to over-ride the colour-killer since its heater is not part of the main series heater chain – it's fed from a separate tap on the mains transformer primary winding.

The reference oscillator consists of a PCF802, with the pentode section the oscillator proper and the triode section acting as a reactance stage. The anodes of both sections are fed via *RC* decoupling networks and the resistors are prone to going open-circuit, giving the symptom no colour of course. The pentode feed resistor is R7282 (12kΩ) to the left of the PCF802, while the triode's feed resistor is R7271 (33kΩ) and is beneath it.

No colour due to no burst (coloured bands when the PCC85 is removed) is often due to the EF184 (V7008) burst amplifier valve's screen grid feed resistor cooking up. This is R7261 (100kΩ). The first chroma amplifier's screen grid feed resistor R7140 can also burn up. Its value is 22kΩ. Check the associated decoupling capacitor C7025 (0·047μF). In this case the fault is simply no colour.

The amplitude of the R–Y signal is set by a 100Ω preset control (R7173) in the emitter circuit of the BF195 R–Y preamplifier transistor (T7012). Lack of the R–Y signal can be due to this control going open-circuit at one end. The trouble can be intermittent.

Hanover blinds (the bistable stopped) are generally due to one of the BF194 bistable circuit transistors (T7013/4) packing up. If the circuit is operating correctly each transistor should have about 5V at its collector. Another cause of this fault is the ident diode X7322 (OA91).

No ident (green faces sometimes) has been traced to only two components by me, either the ident amplifier transistor T7015 (BC107) or the tuning capacitor C7094 (0·027μF) in its collector circuit.

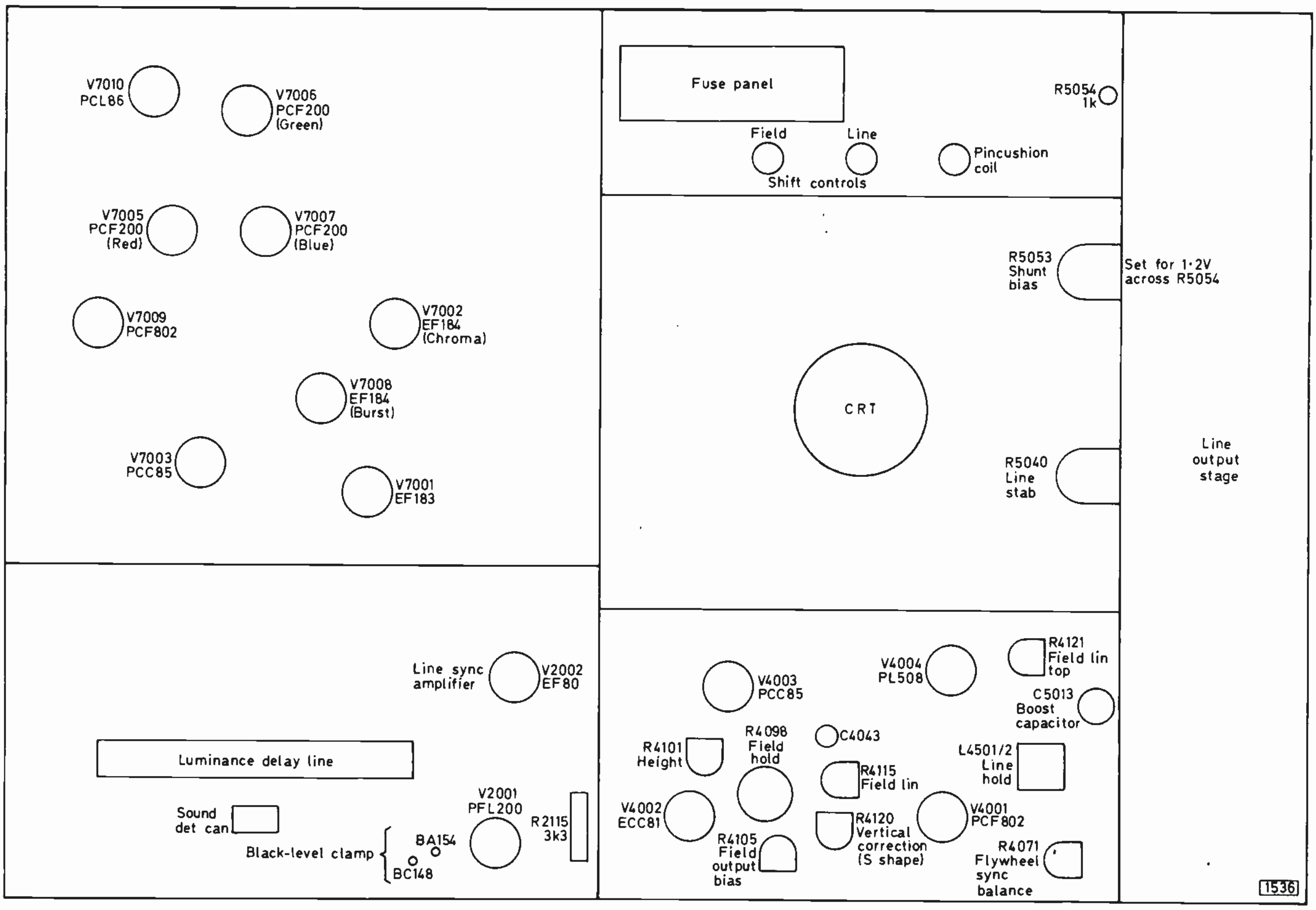


Fig. 1: Rear chassis view of the Philips G6.

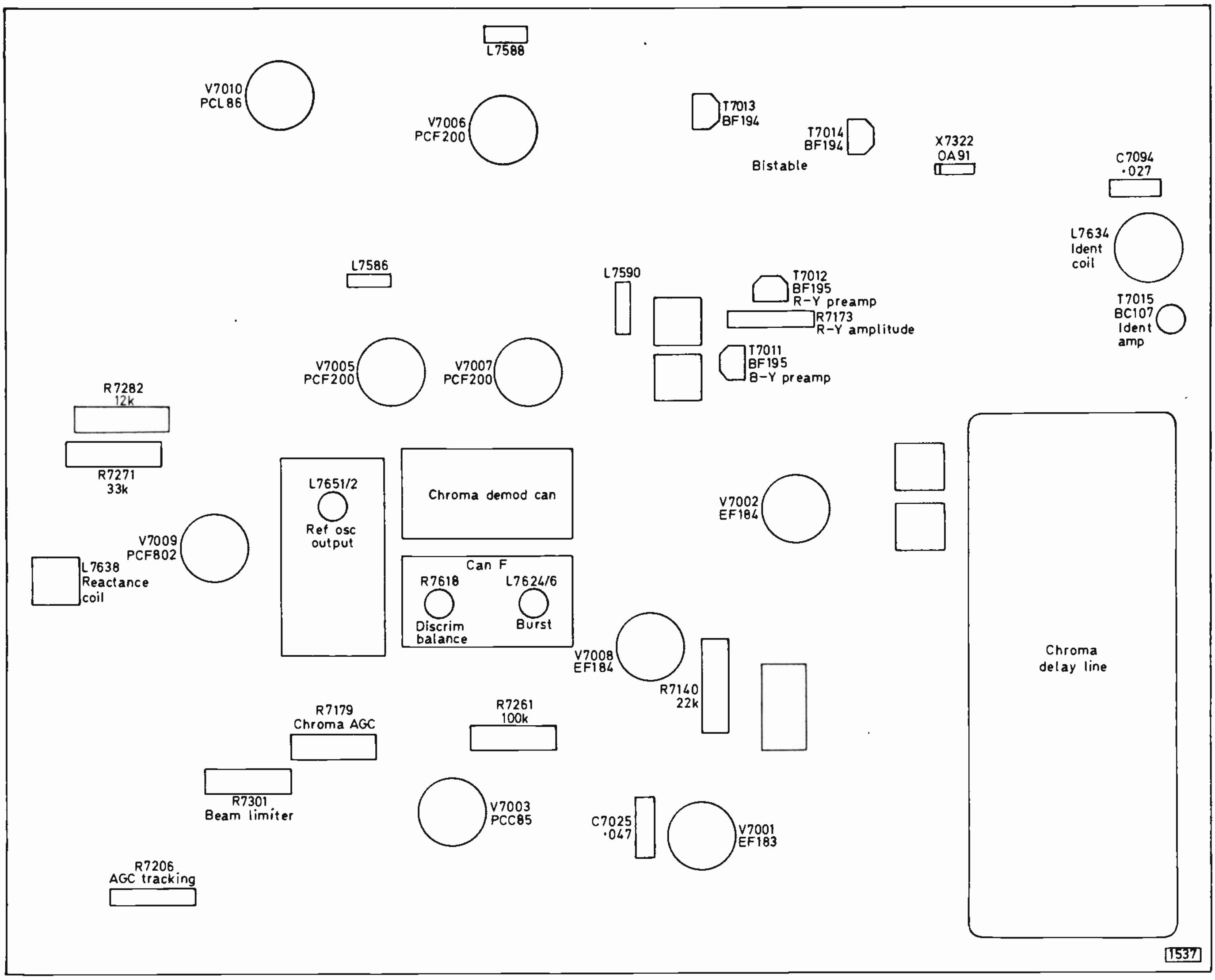


Fig. 2: Layout of the decoder panel.

An intermittent blank red, green or blue raster can be due to the small PCF200 colour-difference amplifier anode circuit peaking coils. They are L7586, L7588 and L7590 respectively.

The setting up procedure I use is given later.

Faults in the i.f. section are few and far between. If the picture vanishes after a while it's worth checking the setting of the e.h.t. stabiliser triode's bias control (see later). No luminance or weak sync usually means trouble with the BC148 black-level clamp transistor T2146 or its associated diode X2152 (BA154). These are in the control grid circuit of the luminance section of the PFL200 valve (V2001). Use a 1N4148 as a replacement for the diode. In the earlier dual-standard chassis a simple diode d.c. restorer circuit is used here. Loss of line sync only can be due to the following EF80 line sync amplifier valve (V2002).

A frightening fault at first sight, especially if the set is on maintenance, is no brightness with an unhealthy green glow in the c.r.t. neck. This is usually due to the PFL200 luminance amplifier section's anode load resistor R2115 (3·3kΩ) going open-circuit, though it can be the tube.

Caption buzz will usually respond to a slight tweak on the sound detector coil. Any other i.f. alignment is asking for trouble.

Timebase Faults

A common fault in the field timebase is jitter with bottom foldover. This can be due to the PL508 field output valve (V4004), its cathode decoupling electrolytic C4043 (32μF) or simply the bias preset requiring adjustment. This is R4105 (1MΩ) and should be set for 12·5V at the cathode of the PL508.

The main fault in the line output stage seems to be the transformer. The CES part number is 140.17011 (wired bobbin). Apart from smoke, the symptoms range from lack of width to a bright red glow in the output stage valves (PL509 and PY500) even though drive is present (−72V) at the control grid of the PL509. The last transformer I purchased was around £10.

Similar symptoms, i.e. reduced width plus a smell of burning plastic, can be due to shorting turns on the d.c. feed choke which is on the focus board, between the top caps of the PL509 and the PY500.

Poor focus is a common complaint and can be due to the EY51 focus rectifier V5005 losing emission or to one or more of the high-value resistors in the focus control chain going open-circuit. A BY182 or similar silicon e.h.t. rectifier gives good results as a replacement for the EY51.

Lack of height accompanied by lack of brightness has been traced to the 560kΩ resistor to the rear of the e.h.t. bias preset increasing in value. This is a high-voltage Philips type resistor. It's the feed resistor from the boost rail to the field charging circuit, but since the e.h.t. stabiliser operates on the basis of sampling the boost voltage a change of value in this resistor will affect the brightness as well.

Power Supply Faults

Few faults seem to occur in the power supply. I've only once had to change a dropper. Poor colour and contrast ranges can be caused by the 10kΩ resistor R1047 which feeds the rectifier providing the −130V supply, while a hum bar is often due to the screws holding the smoothing cans in place or the tag strip working loose. Incidentally, the line output stage h.t. feed resistor R1073 was 15Ω in earlier versions. It was later reduced to 10Ω to cut down on thermal fuse failure (FS1115 in the line output stage).

Setting Up

The setting up procedure I use is as follows. Philips will probably faint!
(1) Switch the set on and allow it to warm up for at least half an hour.
(2) Switch off the c.r.t. first anode controls.
(3) Set the line stabilisation/boost potentiometer R5040 for 590V (570V on later line output transformers) across the 0·47μF boost capacitor C5013. This is mounted on the outside of the line output stage screen.
(4) Set the shunt bias preset R5053 for 1·2V across the e.h.t. stabiliser triode's 1kΩ cathode resistor R5054 at the top of the board above the shunt bias control.
(5) Switch on the c.r.t. first anode controls.

And to set up the decoder:
(1) Carry out above procedure.
(2) Remove the PCC85 valve from the decoder panel.
(3) With no signal (aerial disconnected) adjust the reference oscillator's output tuned circuit (L7651/2) for minimum voltage across the 12kΩ anode feed resistor R7282.
(4) Reconnect the aerial, short the slider of the burst detector balance potentiometer to chassis, i.e. pin 1 of can F, and tune the reactance coil L7638 for zero beat. Then remove the short.
(5) Using an oscilloscope, trim the burst amplifier tuned circuit L7624/5/6 for maximum amplitude burst at the anode of the EF184 burst amplifier valve V7008.
(6) Finally, set the detector balance control R7618 (inside can F) for locked colour. ■

LETTERS

PHILIPS 320 CHASSIS

Since the Philips 320 chassis has been featured recently I thought you might be interested to hear of the following fault we experienced recently on one of these sets – we found it rather typical.

The set arrived with no sound or raster – in fact with a blown mains fuse. We'd replaced this fuse, using a 1·6A type, about a fortnight previously, so we weren't too surprised to find the set back again. This time R2561 which feeds the field output stage had also met its end, and a quick check revealed that both the transistors in the field output stage were short-circuit. These were duly replaced, along with R2561, the mains fuse and the l.t. supply fuse FS2618 which had also blown, and on switching on all was well. As a routine check we measured the l.t. rail voltage and the voltages at the emitters of the field output transistors: all was well. The set was left switched on for half an hour, giving a really first class picture – then the field began to bounce about once a second. A bit distressed, we grabbed an Avo and measured the l.t. voltage which was jumping from 32V to 40V. Then we realised, though not quickly enough, that the power supply was at fault, the thyristor rectifier shorting out in pulses about once a second (in fact if you blew hard on it you could slow it down!). These rectified mains pulses (340V no less) hit the line output stage and when combined with the line flyback pulses must have produced quite a back-e.m.f., sadly a little too much for the e.h.t. stick which burnt up smelling not unlike rotting cod, arcing as it did and so killing the line output transistor.

The most annoying thing about this fault was that as it was of a pulse nature it did not affect the safety glow switch at all – this didn't even glow in pulses, let alone fire and blow the fuse. The r.m.s. value of the pulse waveform on the h.t. rail was low enough not to exceed the rating of the safety resistors. Thus in a set festooned with perhaps more safety components than any other monochrome chassis the only protection against such pulses is a transistor (e.g. the original field output transistors in this particular case) shorting and blowing the mains fuse. I must add however that when all the offending and offended components were replaced a really excellent picture was obtained.

On a rather different point, the implications of local authority cuts on the TV trade may not at first be obvious but when recently installing a set in a council house I re-encountered an old problem. When building new or modernising old houses the council install a length of coaxial cable between a socket in the loft and one in the living room, the idea being that you simply plug in the set at one end and the loft aerial or an outside one with the wire pushed through under the tiles at the other. Very admirable you're thinking. Well, it may stop those unsightly downleads draping down the house, but think of the loss in those connections at u.h.f. and, even worse, the situation when the coaxial cable is not of the best quality but is the stuff we call high loss ... the stuff we used with Band I aerials but only grudgingly on Band III. This may work with a good aerial up top and a new set with a high gain tuner below, but just try it with a TV125 or similar set using a valve tuner and with a standard ten-element aerial on the roof. The solution? Put an MBM46 on the roof, or install a good downlead direct from the aerial to the set – and isn't this what would have happened without the council's thoughtful intervention! – **N. Lyons** *(Normanton, Yorks.).*

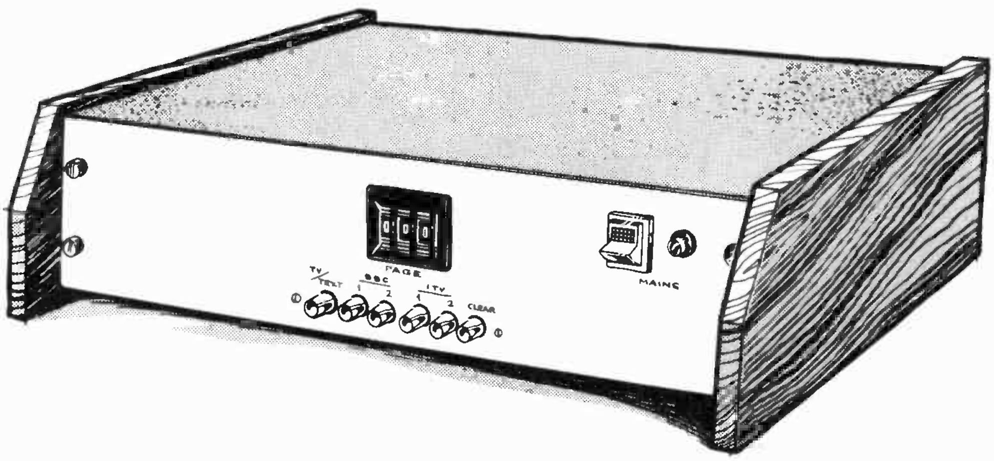
HINTS FOR BEGINNERS

I've been a *Television* addict for three years now and do a lot of repair work. I used to build transistor radios, etc., at school, and found I had a knack for tracing faults – or maybe it was persistence. Anyway, when I read a local rental firm's advertisement for staff with a year's experience my heart jumped. But six weeks after I posted my application I was turned down – for lack of experience! I was upset, but my brother said it's their loss not yours. Be that as it may, I'd like to pass on a couple of safety tips for your younger readers just starting off on the Magic Box. (1) Check plug connections on customers sets before starting work – six out of ten are usually wrongly wired. (2) Try and work on a rubber mat in your workshop: it can save your life if some bodger has been at the set before you. (3) If you start out with a fairly cheap meter try fitting a 2A fuse in the positive lead – it may well save you a pound or two. – **E. Ford** *(Gorebridge).*

in next months issue

TELEVISION

The "TV" TELETEXT DECODER



Have you seen Ceefax/Oracle yet? By building the *Television* Teletext decoder you could soon be watching these services in your own home. It's designed to work with any 625-line receiver, either monochrome or colour, and has the advantage that you don't need to modify your domestic TV set in any way – just plug the decoder's output into the aerial socket. A Teletext decoder is complex, but to make assembly easy this design uses plug-in printed boards and a mother board, while the very latest receiver techniques are used in order to simplify alignment. The unit has its own mains power supply.

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DIAL-A-LINE

TV LINE SELECTOR

J. N. BARACLOUGH

A DELAY timebase is an extremely useful addition to an oscilloscope when examining television waveforms, particularly the vertical interval test signals and teletext lines. Unfortunately, delayed timebase oscilloscopes are often too expensive for the experimenter.

The unit described in this article produces a pulse which can be used to externally trigger the timebase of a standard oscilloscope. The timing of the pulse can be adjusted to coincide with any line of the television frame from line 1 through to line 625. The line selector is also compatible with the 525 system.

Operation

The line selector operates on the principle of counting lines from line 1 of the television frame and detecting the coincidence between the count and a number set on the front panel dial switches. Line 1 is where the leading edge of the first broad pulse of the field sync occurs at the same time as a line sync. This is detected and used to load the number 1 into a counter. The counter is incremented by 1 on each line until it is reloaded again at the start of the next frame. This enables the line selector to be used on either 625 or 525 line television systems.

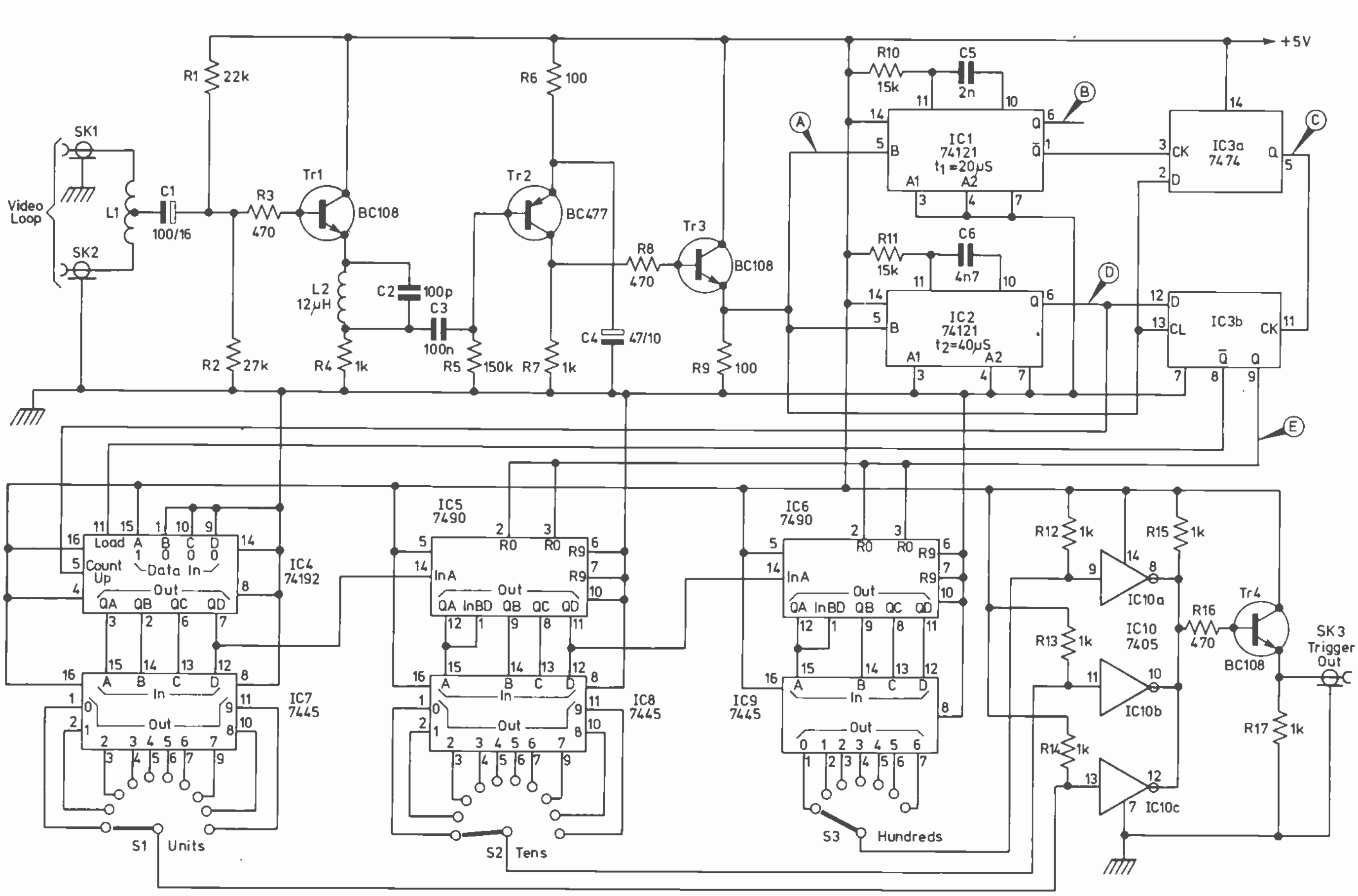


Fig. 1: Circuit diagram of the Line Selector. Four 0·1µF 10V ceramic disc decoupling capacitors are not shown on this diagram – see Fig. 4.

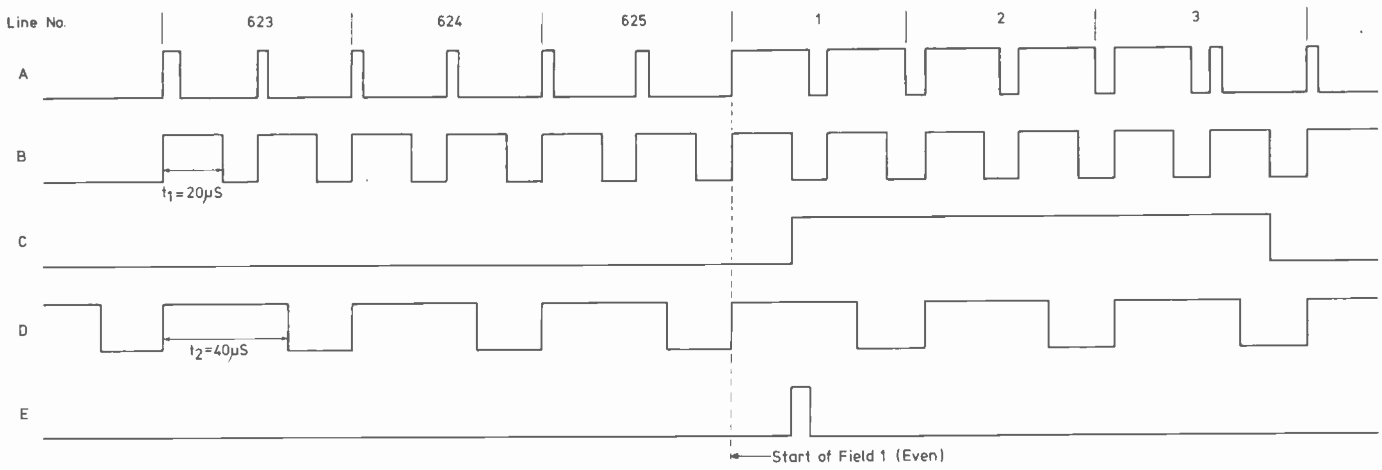


Fig. 2(a): Timing diagram showing waveforms at the start of an even field (Field 1).

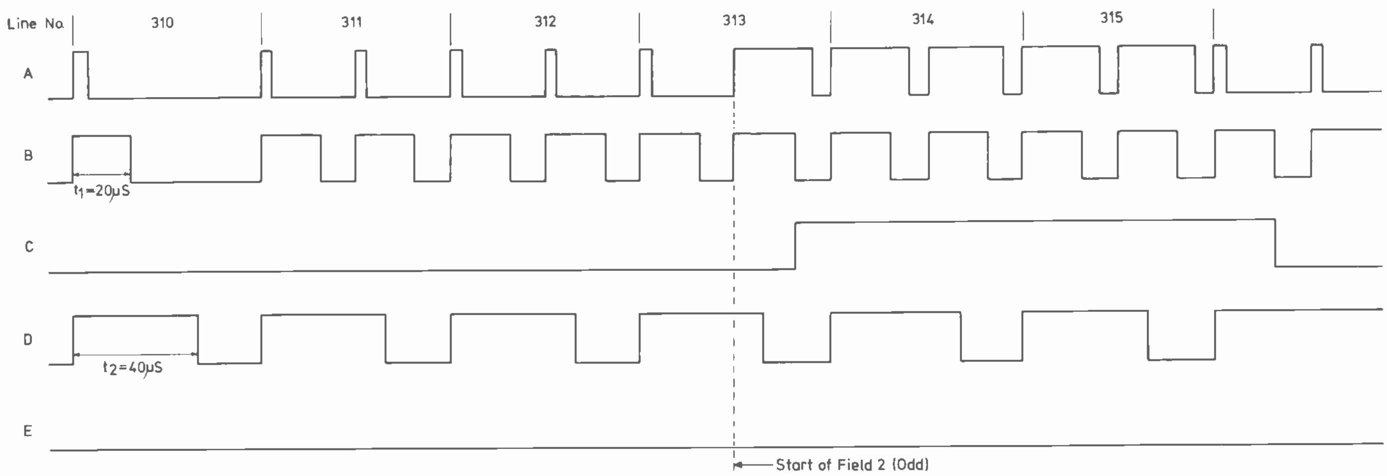


Fig. 2(b): Timing diagram showing waveforms at the start of an odd field (Field 2).

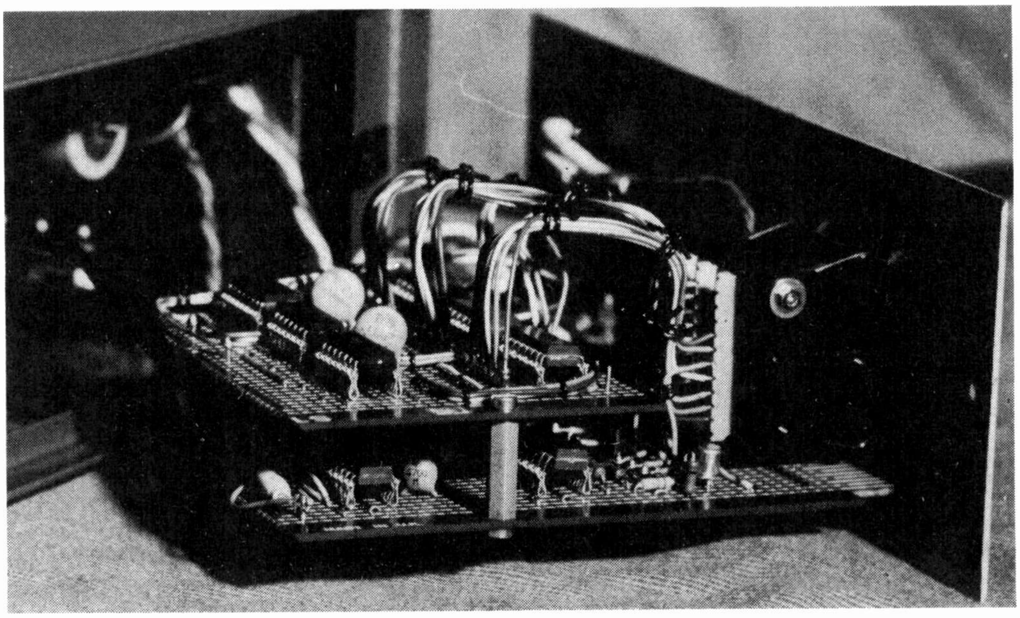


Fig. 3: The complete unit removed from its case to show the method of construction.

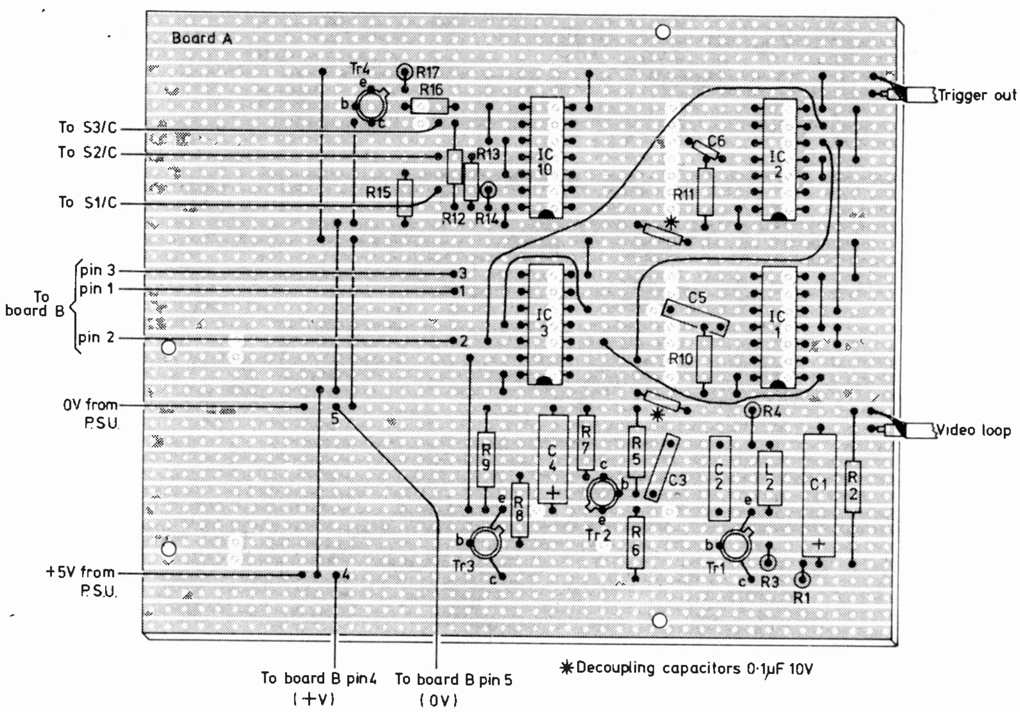


Fig. 4(a): Component layout and Veroboard cutting details for Board A, carrying the sync separator and output circuitry.

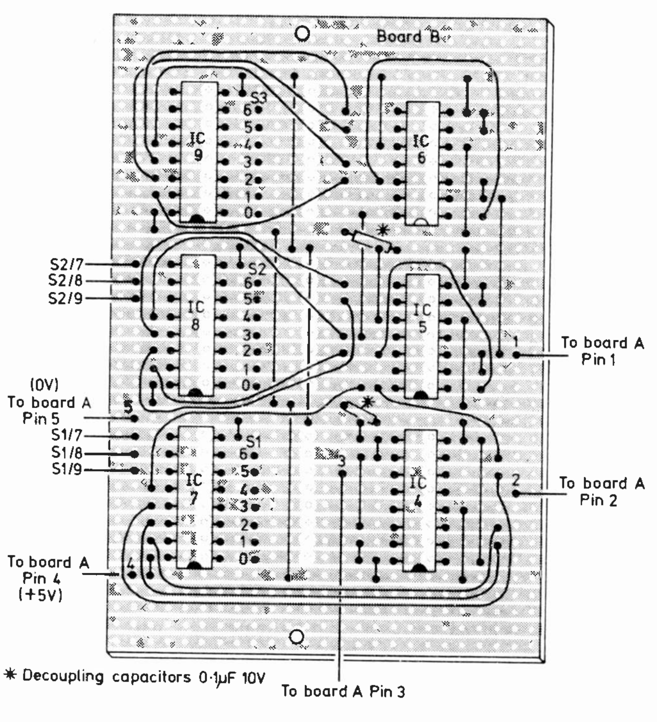


Fig. 4(b): Component layout and Veroboard cutting details for Board B, carrying the counters and decoders.

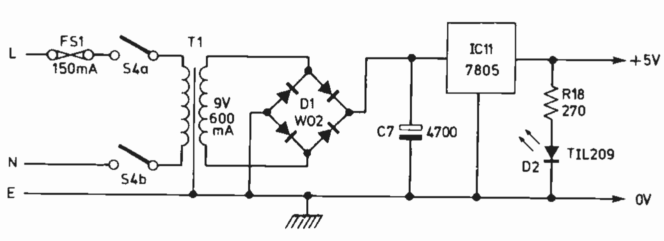


Fig 5: Circuit of a suitable power supply.

The comparison of the counter outputs with the dial switches uses binary-to-decimal decoder/drivers and decade switches. Although this may be a slightly more expensive solution than the conventional method of using exclusive-OR gates and inventers it certainly uses less integrated circuits and thus saves on printed circuit board space.

Circuit Description

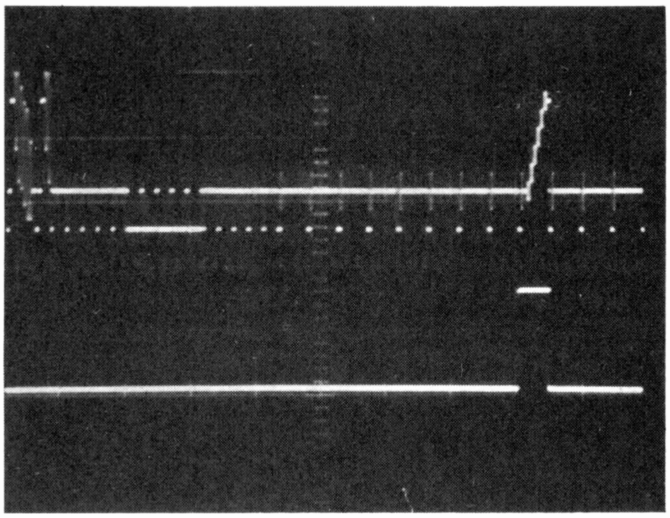
A nominal 1 volt peak-to-peak video signal is fed into sync separator Tr2 via emitter-follower Tr1. The filter circuit of L2 and C2 prevents any colour burst or subcarrier on the signal from interfering with the operation of Tr2. IC1 and IC2 are both monostables triggered from the positive-going edges of the inverted mixed syncs (waveform A), with time periods of 20µs and 40µs respectively (waveforms B and D). These times do not need to be accurate as long as the following relationships hold:

$$t1 < 32\mu s,$$
$$t2 > 32\mu s, \text{ and}$$
$$t2 < t1 + 32\mu s.$$

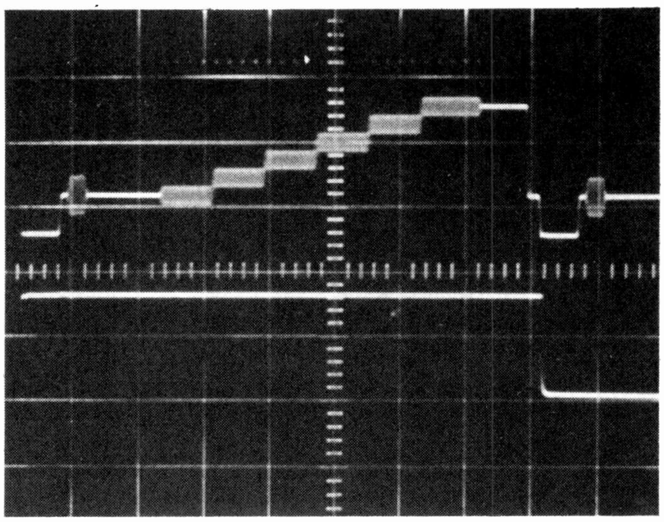
The $\bar{Q}$ output of IC1 (1/1) is fed to the clock input of a D type flip-flop (3/3) the D input (3/2) being fed with inverted mixed syncs. The Q output of this flip-flop (3/5) will go high when the clock occurs during the broad pulses and will go low again when these pulses have passed thus separating the field syncs (waveform C).

The rising edge of this field pulse goes to the clock input of another D type flip-flop (3/11) which has the Q output of IC2 (2/6) on its D input. The Q output of this flip-flop (3/9) will only go high during the field sync corresponding to the start of the first field. This flip-flop is cleared (3/13) by the first serration in the field sync thus producing a pulse approximately 7µs wide during line 1. This is used to load the counter (waveform E). The waveforms are shown in Fig. 2.

The counter (i.c.s 4, 5 and 6) is quite conventional and does not require any description. For economic reasons one 74192 and two 7490 decade counters were used as only the first stage needs to be programmable. The counter chain



Oscilloscope trace showing the trigger output timed to coincide with a vertical interval test signal on line 14.



The trace of line 14 expanded and triggered from the output of the unit.

input (4/5) is fed from the Q output of the line separator (2/6) which will increment the counters at the start of each line.

I.c.s 7, 8 and 9 decode the BCD outputs of the counters to decimal form, the active outputs being low. The outputs from the wipers of the three decade switches are all inverted by IC10 (10/13, 11 and 9) and the inverted outputs (10/12, 10 and 8) are connected in the OR mode to produce a positive pulse which is one line long and occurs when the counter outputs correspond to the switch settings.

Tr4 is connected as an emitter-follower to give a low output impedance.

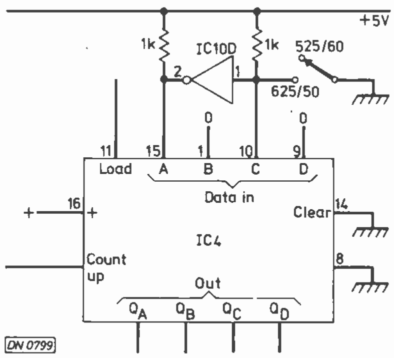
Construction

The circuit was constructed on conventional i.c. bread board in two layers, the lower board containing the line, field and frame pulse separators and the upper the counters and decoders. Fig. 3 is a photograph of the complete unit with the front panel removed to show the construction. Layouts of the two boards are shown in Fig. 4.

The complete unit consumes about 400mA from a 5V power supply which should be well regulated. A suitable circuit in shown in Fig. 5.

The line selector has proved extremely useful for examining various parts of the television waveform but some difficulty was experienced with one or two oscilloscopes which lacked brightness. This was overcome by feeding the output of the unit to the Z-modulation input of the oscilloscope as well as to the external trigger input.

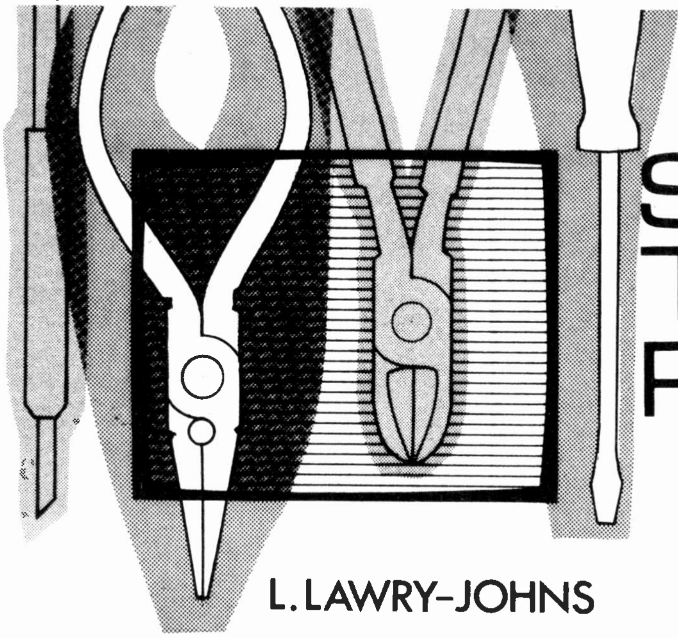
Fig. 6: Details of modification to Fig. 1 for dual standard operation.



525-line Operation

In the 525-line, 60-field system, the field starts with the leading edge of the first equalising pulse of the pre-field group, although the line timings are almost the same as the 625/50 system. Because of the difference between the systems, the load pulse generated by IC3b occurs during the middle of line 4 and thus IC4 must be loaded with a count of 4 (0100) on this line. The pulse timings of IC1 and IC2 do not need to be changed at all.

The circuit in Fig. 6 shows how a spare inverter from IC10 could be used in order to make the unit so that it can operate on either 525/60 or 625/50 systems. ■



SERVICING TELEVISION RECEIVERS

PROBLEMS WITH PORTABLES

L. LAWRY-JOHNS

WE SEEM to be getting more portable sets than ever in the workshop. If it's happening to us it must be pretty general and we therefore make no apology for deserting from our usual approach and making this article a review of the more common portables that have presented us with a fair share of headaches over the last (say) ten years. There were quite a few portables around before then, but they are less likely to be met now. For example we encounter very few Perdio portables nowadays.

Staff

The majority of portables now seem to originate in the far east, and in this connection we have to record sadly the passing of our cat Trog who you remember used to sit on the bench and unerringly point out the items we couldn't find on Japanese circuit diagrams. This was one of her habits. Another was always to walk slowly across a road, thus giving the traffic plenty of time to see her and pull up to allow her to cross. It was this faith in humans that proved her undoing. One morning a car could not or did not stop and Trog is no longer with us. Sadly missed.

We have now been adopted by another female cat, but Spock hardly seems to know a resistor from a capacitor so we have to plod on without her help. You may wonder if our collie Ben is still helping. Yes, as part of the test routine he still manages to trip up customers carrying TV sets.

Thorn 980 Chassis

So where were we? Portables, that's it. We must include in this round up the earlier Thorn v.h.f. only valved models which are still very much around. Known as the 980 series, they included such models as the HMV 2634, Ferguson 3639 and Ultra 6641. The 981 was the 16in. version. We did in fact give most of the relevant details in the December 1967 and January 1968 issues, but for the benefit of newer readers we will point out the weak spots again and perhaps add a few, starting with the tuner unit.

This is a simple turret employing a PC97 (forget it, it just doesn't cause trouble) r.f. amplifier followed by a PCF805 (30C18) which occasionally does. The valve usually stops oscillating (triode section) and a new one will often put things right – but not always. Up inside the wall of the tuner is a 5·6kΩ resistor which has a habit of changing value to give the same effect.

Mainly however the complaints here are due to poor switch contacts and a polish up of the biscuit studs need be the only action. Sometimes it is necessary to ease up the contact bar of springs to improve contact, and this should be done very gently with a broad bladed screwdriver.

The i.f. stages are fairly trouble free except for the occasional valve failure, sometimes in the form of a short that burns out the associated feed resistor. A burnt out feed resistor can also be caused by a shorted decoupling capacitor, so one has to proceed with a little caution. Poor reception can be caused by the 39kΩ screen grid feed resistor to pin 8 of the EF183 first i.f. amplifier changing value, but this of course would be shown up by the voltage checks one always makes, doesn't one?

Poor Sync

The real villain of the piece lurks in the video stage. One of the most common faults on these sets is poor sync. The complaint is that the picture cannot be locked, either when the set is first switched on or after a period.

One does the usual things like checking the sync separator and its associated components or the line sync diodes if the field sync does not seem to be so severely affected as the line sync, but it is not until the video stage is examined and the cathode voltage is measured and found to be high that the true offender is located and stands revealed as the upstanding bias stabilising resistor behind the EF80 video amplifier. It should be 39kΩ but is probably more like 10kΩ and falling with every passing hour. We usually fit a 47kΩ 2W type in this position and for good measure check the 10kΩ anode load resistor to the left. This is often more like 5kΩ. The replacement of both resistors (where faulty) can make a dramatic difference to the performance (I thought your set was finished, just look at it now!).

The Timebases

The other point to bear in mind with these sets is the fact that the line oscillator and output stage are fed from different h.t. points, so if the HT1 line is open (due to R114) there will be severe overheating of the PL81A and PY801

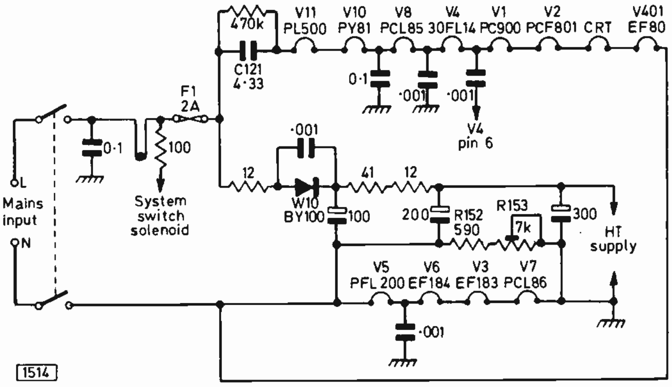


Fig. 1: The unusual valve heater supply arrangement used in early versions of the Thorn 960 chassis. There are two separate chains. V11, V10, V8, V4, V1, V2, the c.r.t. and V401 are fed by the capacitor dropper C121, the chain being connected across the mains supply in the conventional manner. The second chain, V5, V6, V3 and V7, is connected in series with the earthy side of the h.t. supply. These valves do not come on therefore until the others begin to draw h.t. current. One side effect of this arrangement is a prolonged warm-up period. The second chain in effect forms part of the smoothing circuit: R153 should be adjusted for 300mA through the chain. The main problem is when V5, V6, V3 or V7 have an open-circuit heater: there is then a raster but no sound or vision and R152, R153 get rather hot under the collar. In later versions of this chassis a conventional single series heater chain fed by a diode dropper was used.

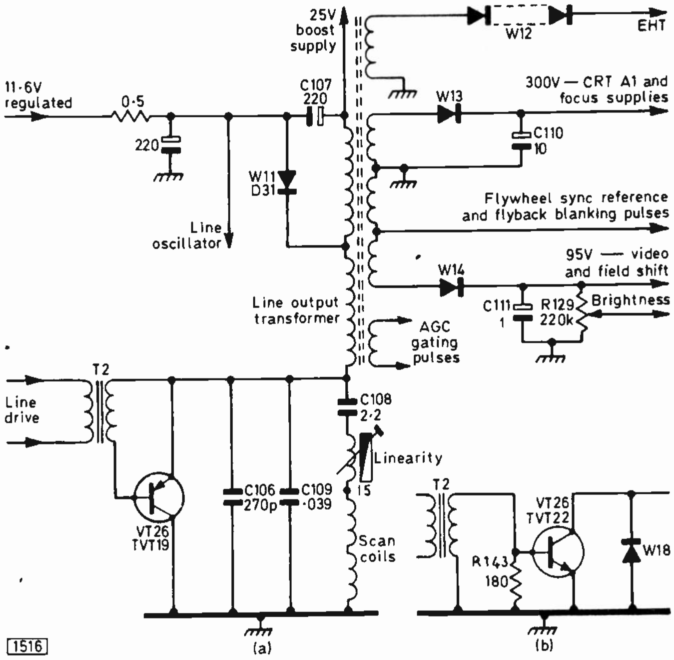


Fig. 3: (a) Line output stage with pnp line output transistor used in the Thorn 1590/1591 chassis. (b) Modification in later versions using an R2461 npn line output transistor. More recently still a BU124 transistor has been used in this position: R143 is in this case 82Ω.

line output stage valves. The same thing happens when the line oscillator's feed resistor R46 (5·6kΩ) goes high. The 6/30L2 line oscillator valve is less often at fault.

The field timebase circuitry is worth looking at before delving too deeply as there is no cathode bias for the output pentode, grid bias being obtained from the heater line as in the 1400 chassis.

The field timebase valve is a 30PL14 and no attempt at using any other (except perhaps a 30PL13) should be made. Although a PCL82 has the same base connections it has a different rating and characteristics.

All in all, nice little sets and not too much trouble.

Thorn 960 Chassis

About this time, Thorn brought out a dual standard semi-portable employing a 16in. tube and a chassis developed from the 950 series. Known as the 960 series, these models gave a lot of trouble and the earlier versions used a most irritating heater circuit (Fig. 1) designed to reduce cabinet heat by eliminating the mains dropper. This was done by supplying some heaters through a series capacitor: when these valves warmed up, the resulting h.t. current was used to power the other valve heaters. This led to an extended warm up period and a nice old crop of unusual faults. Full details can be found in the 1968 and 1969 issues which dealt with 900 and 950 chassis and their variants, and most models now encountered will be found to have a full mains dropper and a single heater chain.

A point worth noting however is that the main electrolytics were rearranged on later receivers, the 100μF h.t. reservoir capacitor C112 becoming a smallish component bolted on the right side of the flywheel sync subchassis. This seems to regularly dry up, causing severe hum on the line, i.e. pulling, etc.

It is also in the nature of things that the line output stage dissipates a lot of heat and is half way up the right side of the chassis, tending to upset the PCL86 sound output valve which is at the top right. Brittle wiring and component failure combined with difficult accessibility all go to make the lot of the repairer a tricky one.

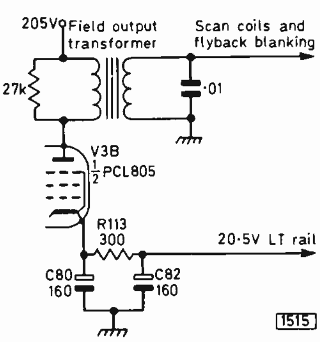


Fig. 2: The l.t. supply for the transistors in the Thorn 1580 hybrid portable chassis is obtained from the cathode of the field output pentode. Thus field collapse due to failure of the h.t. supply to the anode of V3B will remove the sound as well.

Thorn 1580 Chassis

The next mains portable from the Thorn stable to see the light of day was the 1580 series (Models 3805, 4805 etc.) which used a hybrid chassis. Five valves, with a series capacitor as a dropper, take care of the line and field (this time a PCL805) timebases and the audio circuit, transistors being used in all other stages.

The voltage supplies for the transistors come from the cathode circuit of the field output pentode, so a collapsed field could also knock off the sound signals. See Fig. 2.

Common faults mainly concern the h.t. supplies, where it will be found that the wire-wound resistors are apt to go open-circuit. For example, no sound is often the result of the 8.2kΩ (R134) resistor failing, while a white line across the screen (field collapse) with no sound signals could well be due to the 1·4kΩ (R135) resistor which feeds the field timebase.

A dead set with a nastily blackened fuse (F1, 1·6A) will often denote a shorted mains filter capacitor (C87) or perhaps a shorted h.t. rectifier diode W9.

Tuner troubles are mainly confined to mechanical defects which are easily remedied and need little description.

Full details will be found in the June and July issues, 1973.

MORE NEXT MONTH

TEST REPORT

The Philips SIM212 Signal Injector

E. Trundle

THE Philips SIM212 is a pocket-size signal injector intended for fault-tracing in all types of domestic receiving equipment. It is electrically similar to the previous model, but has a redesigned shape to give better accessibility and an unobstructed view of the injection point.

The SIM212 consists basically of a 300Hz multivibrator whose output can be injected directly or used to modulate a second oscillator whose frequency can be switched to intercarrier (6MHz) or colour subcarrier (4·43MHz) at will. Both the 300Hz and the h.f. signals are rich in harmonics, and in true signal-injector style throbbing harmonics reach the very pinnacle of the u.h.f. band!

The h.f. and l.f. signals are controlled amplitude-wise by a thumbwheel attenuator, while a spring-loaded button forms the on-off switch, conserving the life of the PP3 battery. At full output the instrument is capable of producing audible sound from a standard 3Ω loudspeaker at one end of the spectrum, and a healthy sound and vision disturbance on channel 68 at the other. The SIM212 is protected against reversed battery connection by a diode wired across it, and to prevent damage from high voltages coming back via the probe (field output valve anode waveforms for instance) zener diode protection is incorporated.

The usefulness of this type of equipment has been hotly debated for as long as we can remember. . . . It is significant that when we showed the gadget to a colleague, he scratched his head, muttered that it looked vaguely familiar, and disappeared in the direction of his van, to return a few minutes later clutching a similar injector – in fact, Philips' previous model. The battery was flat, and it transpired that the injector hadn't been used for months! It must be added, however, that a colour-bar generator and oscilloscope also live in that van.

We tested the SIM212 on several makes of colour and monochrome TV receiver as well as on radio and audio equipment. Like the proverbial curate's egg, the verdict was that it is good in parts.

By and large the idea of using high harmonics for testing high-frequency circuits is not a very good one, and the more complex the equipment the more misleading the test is likely to be. To enlarge on this, let us assume that we are injecting a signal into a television receiver's u.h.f. tuner at r.f. We are depending on very high harmonics of the 4·43 or 6MHz oscillator, and these are fairly weak. The harmonics falling in the i.f. passband (30-40MHz) are much stronger, and breakthrough of these causes misleading results. Even when injecting into the i.f. strip of a radio or TV receiver, differing circuit impedances can lead to wrong conclusions, apart from the circuit loading or damping effect of the probe's coupling components. Another problem is stray radiation, even at the minimum setting of the output amplitude control. This occurs because the oscillator is still running at full tilt, and the probe and earthing clip-lead tend to act as a radiating loop, or aerial. All in all we were happier using the instrument on fundamental frequency, and found applications for it in the sound, video, decoder and field timebase departments.

Decoder Testing

The instrument came into its own in the decoder section of colour receivers. One of the most common faults is the no colour symptom, and if the colour-killer is overridden without any effect the question "where do we go from here?" is a difficult one if an oscilloscope and bar generator are not available. Plainly, either the chroma amplifier has failed or the locally generated subcarrier is not reaching the chroma demodulators. With the SIM212 switched to 4·43MHz, it can be used in the normal way to inject a signal into the chroma amplifier stages or alternatively to double for the crystal oscillator by providing a signal to "light up" the synchronous detectors. In either case the result is a series of horizontal bars of random floating colour. After the detectors, the 300Hz output can be used up to the final RGB or colour-difference output stages.

Other Tests

The 6MHz (intercarrier sound) output was more useful in sets of the older type with separate discrete component intercarrier sound channels: modern i.c. channels with quadrature detectors and efficient limiter stages are less amenable to testing with the SIM212. Similarly, video circuits in valved and dual-standard TV sets responded happily, whereas their modern counterparts tended to take violent objection to this rather raucous waveform, with syncs, scans and black level flying in all directions.

Lack of field scan is at first sight an unlikely situation in which to use a signal injector, and so it is in many cases! The traditional triode-pentode timebase however often stops oscillating because the positive feedback loop is broken, say due to an open-circuit coupling or feedback capacitor. D.C. voltages, especially on the triode, go awry under these circumstances because the lack of oscillation destroys and auto-bias conditions. Thus diagnosis can be difficult. Both the triode and the pentode are able to amplify however, and the 300Hz signal from the SIM212 produces a vertical scan of sorts when injected into the "live" section of the timebase and can save much time in substituting components in this sort of "open loop" situation.

Field collapse in semiconductor field scan circuits can also be tackled in this way, treating the circuit rather like an audio amplifier.

In any field timebase, full scan should not be attempted with the 300Hz signal: a slight "opening up" of the scan is sufficient indication that a stage is amplifying.

Conclusion

The value of this instrument depends on the user and the availability of more orthodox test equipment. For the home hobbyist, first line field serviceman and the man who likes to keep his hand in and maintain his own equipment it could prove a boon, and a case could be made out for its use by the professional technician for quick go/no go checks without rigging up more sophisticated gear. Certainly it's simple and convenient to use, and many of our readers who make use of the query service could put the SIM212 to good use.

Becoming a "Service Specialist"

G. R. Wilding

THE issues of *Television* regularly contain features on every technical aspect of TV servicing, mentioning common and unusual faults on receivers generally and on particular chassis. All very interesting to those involved. There is another side to this intriguing business however, the commercial one. Let's see in particular what opportunities exist for those wishing to become "service specialists".

The opportunities can in fact be very good, and represent an ideal starting point for the knowledgeable service engineer who wants to have a go on his own without going to the expense and long term commitment of opening a shop. While having business premises would naturally provide some immediate passing trade, it also implies having staff, be it only one, while at first you should aim to make and promote direct personal contacts. Without business premises your only means of getting yourself known is via advertisements – local newspapers are undoubtedly the best bet – and you will have to complete repairs in the customer's home since few people, especially in large cities, will want a complete stranger contacted through a small ad to take their set away for repair. This being so, capitalise on the fact. Stress "TV Repairs in Your Home". This should give you a flying start, dispel suspicions, and give you a considerable advantage over shop competitors many of whom in fact are not really interested in extra service work. Once customers find that you give prompt, skilled service the word rapidly spreads.

Stock Required

A good stock in trade is necessary of course, but in total it needn't amount to a very large expenditure. A complete range of valves, with timebase ones duplicated, is of course necessary, as also is as large a variety of wirewound power resistors as you can get, including complete droppers for colour sets, and a wide selection of capacitors including 1kV working types for the boost circuit, disc type 8 and 12kV capacitors and low-voltage electrolytics.

With one or two exceptions multi-unit h.t. electrolytics give so little trouble that they are not worth carrying as spares – and anyway they are used in such a variety of types that you would need a very large stock to cover all eventualities.

A tripler for each popular colour chassis is a must however, as is a comprehensive range of fuses, resistors and the more popular transistors, diodes and thyristors. The importance of fitting exactly the right type of fuse, particularly in colour sets, can't be too strongly emphasised, for even with a minor fault the power fed through an oversized fuse can easily cause an expensive burn up. Presets, on/off mains switches and the more popular i.c.s complete the basic stock.

I never carry line output transformers around with me "on chance". They are so easily damaged, or get damp, in the car boot that I find it far better to leave any I have at home until they are needed. Surprising though it may seem, line output transformer replacement is required on very few of my calls.

Panels

Similarly I never take colour receiver panels around with me unless I am going to a set that might need one. This is particularly so when I am called to see a set fitted with the Thorn 3000/3500 chassis: in such cases I always take with me a power supply and a line output panel. When you get trouble in either of these panels it's best to fit a replacement rather than to spend time diagnosing the fault and replacing defective components on site – unless the trouble is quite obvious, i.e. an open-circuit wirewound resistor or burnt out component. Clearing some of the faults that occur on these panels can involve much unplugging, testing and plugging in again. The point here is that to some customers this suggests that you have no knowledge of the set. Further, if you should study the service manual to check up on relevant voltages, well many customers will be quite convinced that you don't know what you're doing.

Since a fair proportion of colour receiver calls will be to sets fitted with the Thorn 3000/3500 chassis – not that they are particularly troublesome, but simply because there are so many of them around and so many are elderly – it is most desirable to have one of these sets yourself, even with a poor tube, to act as a test rig.

Customer Relations

Customers don't generally mind panel replacement, even though it may be more expensive, as long as they get quick service. They also always appreciate final optimum adjustment of the focus, grey-scale and convergence controls.

Snags

Apart from intermittent faults, one of the biggest snags with "service in the home" is the rare occasion when a replacement for a defective line output transformer or other expensive component has to be ordered from the manufacturer, importer or a specialist supplier. It might take several days or even a couple of weeks for the component to turn up. If you are a stranger to the customer you can't very well ask even for part payment in advance, and there is always the risk that the customer may tire of waiting and, seeing what appears to be a good offer in a local shop, trade his set in against a new one. You're then left with an expensive item you'll probably never need. In such cases the best approach is to leave the customer with a decent loan set while taking his set to the workshop. Most people realise that whilst your aim is to complete every repair in the home there are cases where this is not practical. I find too that most people realise what is a reasonable charge for coming to their home and carrying out a repair in a skilful and expeditious manner.

Selling Reconditioned Sets

Certainly the newly established service specialist won't find himself on call every working hour. To maintain income there's a very simple and sure remedy. That is to buy and overhaul good used receivers. There is always a demand for them. Bear in mind however that as a trader you must be willing and able to provide after sales service no matter at what price you sell the sets. This means that it's in your own interest to ensure that they are fault free. Apart from undermining customers' confidence, a defective set will involve trouble and time and make the transaction uneconomic. If anything is at all suspect, put it right before you sell the set.

Speaking from personal experience I find that selling reconditioned sets is at least as profitable as selling new ones, and has the great advantages that less capital is tied up while payment is universally "on the spot". By and large there is probably more profit and fewer service calls with £100 worth of monochrome sets than £100 worth of colour ones.

The Changing Scene

For a variety of reasons, not least the growth of discount houses, an increasing number of viewers now seem to be buying rather than renting their TV receivers. This means that the TV trade scene could well become more like its American counterpart, where there are retailers and quite separate service shops.

The increasing complexity of some models, with unusual power supply arrangements, ultrasonic and now infra-red remote control systems and so on, suggests that the future work load won't decrease. When plug-in printed boards first appeared the demise of the skilled service engineer was confidently anticipated in some quarters. Even for the rental companies however panel changing wasn't the answer to all problems.

In fact I'd say that from all angles the prospects for the service specialist seem better than ever. ■

Modifications to the Philips N1500 VCR

John de Rivaz BSc (Eng)

Extended Playing Time

THE videocassette recorders sold on the domestic market can record television programmes when the viewer is otherwise engaged: if he is unable to operate the machine at the time of the broadcast, the timer switch provided will activate the machine at the required moment. The longest playing cassette lasts for only 60 minutes however, and even if a manufacturer was to introduce a cassette with thinner tape so that it operates for a longer time the time switch mechanism would be unable to take advantage of the extended playing time since it cannot be set for periods much longer than an hour.

VCRs are available on the secondhand market for about half the list price however, so it's possible to buy two machines for the price of one new one. Assuming that the cost of one new machine is not extravagent, then this procedure is not extravagent either! Actually, considering the absence of integrated circuitry within the machines I would doubt whether the manufacturers make much profit on the machines currently being sold. Philips are no doubt taking the sensible course of temporarily subsidising the market so as to get their standard accepted.

Having purchased two machines, the viewer can set the time switch on the second so that it comes on an hour after the first one. A simple modification to the second machine and the construction of a linking unit however makes the second machine start up exactly when the first one has finished up its tape.

The circuit of the link unit is shown in Fig. 1. It is assumed that the two VCRs have their chassis connected by means of the aerial system. A supply of + 12V is available at the "TV" outlet of these machines. This supply appears whilst the VCR is actually being used, not when it is just plugged in waiting to be used. Thus it appears when the machine is switched on by the time switch to make a recording, and ceases when the machine switches itself off – either because it has run out of tape or upon instruction from the time switch. If the long pulse produced by the switching of this power source is differentiated, a negative pulse appears when the machine switches off. In the circuit (Fig. 1), the negative pulse is inverted by Tr1 and is used to trigger a thyristor (Thy1) which is connected in parallel with the timer contacts in the second VCR.

The pulse from the first VCR is first fed to a potential divider consisting of a 1kΩ and a 10kΩ resistor. This was found to be necessary to eliminate spurious responses, especially when the first VCR is switched on. The 50μF electrolytic capacitor differentiates the pulse, and the negative edge triggers the thyristor via the pnp transistor Tr1. In the prototype a BC212L transistor was used along with an unmarked "surplus" thyristor. Almost any thyristor manufactured would have sufficient voltage hold-off, but selection may be necessary to ensure that it will latch on to the current taken by the time circuit in the VCR (though it's considered unlikely that anyone would through choice use a high-current thyristor!). Provided the transistor is a pnp one the choice of type is again largely a matter of what is to hand.

The circuit was constructed on a small piece of Veroboard and housed in a disused medicine container 7cm long

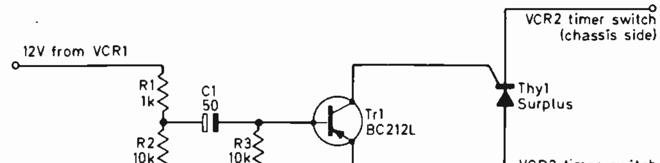


Fig. 1: Circuit of the link unit which switches the second VCR on after the first VCR has switched off

by 4cm in diameter. One wire is connected to a DIN connector for the +12V from VCR1, the other two being wired to a DIN connector for VCR2.

VCR2 has to be modified to accept the DIN connector from the auxiliary circuit. Remove the top cover and locate the two wires connected to the timer just behind the "push to set" button. A test meter connected across these wires will indicate which is positive. This is the wire that goes to the thyristor's anode. The negative wire is also connected to the VCR chassis when the machine is set as for timer operation *without* pressing the timeswitch button. These two wires are either connected to unused pins on either of the two DIN sockets provided by the manufacturer (after removing the existing wires and carefully insulating of course), or they can be connected to a further DIN socket installed in the position provided by the manufacturer next to the other two.

When all is set up, the equipment is operated as follows. Set VCR1 as usual for the start of the programme. Connect the link unit to both machines, and set up VCR2 as follows. Select the channel required. Press the record and play keys. If the programme to be recorded does not last a full two hours, set VCR1 for a time less than one hour, VCR2 recording the final hour. It is not possible to record for any time less than that set by the amount of tape available on VCR2.

Running-time Meter

A running-time meter connected to the VCR will provide data indicating when the machine needs cleaning, lubricating and parts replaced. The Sangamo Weston S477 hour meter just fits into the machine. Its supply is taken from the supply to the head disc motor. Therefore it counts the hours for as long as the head disc is turning.

Fig. 2 shows where the hour meter can be fitted to the top cover. After unpacking the hour meter, check its size and use the fastening spring as a template to mark out the hole required in the top cover. Before making the hole check carefully that there aren't any manufacturer's modifications to either the hour meter or the VCR you have such that it won't fit in that position. Make the hole by burning away the plastic using a hot soldering iron with a fine bit. The meter must be a tight fit in the hole. Make the connection to the two terminals of the motor found by experiment with a test meter to be connected to a potential of 240V a.c. Allow sufficient wire so that the top cover can be opened out for inspection without disconnecting the meter.

The Sangamo Weston miniature S477 hour meter is available from Electroplan Ltd., PO Box 19, Orchard Road, Royston, Herts. SG8 5HH at £6.20.

Metering the Servo System

A miniature meter is provided on the VCR. It can be connected to indicate the audio voltage being recorded or, when the machine is in the record mode, to show whether a video signal is being received. As in most cases the audio is recorded in the "auto" mode, level indication is superfluous. The video indication is also seldom used – with a colour programme, which most are, a lamp indicates that a programme is being received.

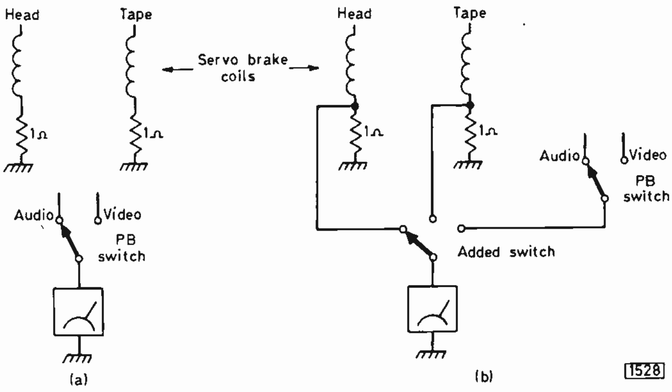


Fig. 3: An extra switch enables the miniature meter provided on the VCR to be used to monitor the servo system.

If the machine is not cleaned regularly, or parts that need replacing are not replaced – particularly the lacing cord – mechanical faults can develop during recording and these can make the particular programme unusable on replay. With high quality audio recorders, "off tape" monitoring is provided as an absolute check of the system. This is difficult, or at any rate rather impractical, with video recording, using mechanical scanning of the tape.

Faults that develop are often mechanical and show up as unusual variations in the servo current in the brake coils. Philips have thoughtfully provided 1Ω resistors in the chassis ends of the brake coil circuits to monitor the currents, and it turns out that these resistors make suitable shunts so that the existing meter can be used to monitor the currents (see Fig. 3). A single-pole multiway switch can be added to connect the meter to either the existing circuit, the head servo, or the tape servo. Variations in tape tension show as head servo current alterations, so this is the one usually monitored. The tape servo is a useful check for capstan slip and associated problems when a tape is replayed, but has little application during recording since a fault serious enough to alter the capstan speed would probably make itself known long before it was discovered by this means.

In my machines I use a screwdriver operated switch fitted to a bracket on the main chassis at the rear and on the left-hand side. It is left in the "head servo" position, and adjusted to monitor the tape servo or the signal circuits if required.

The central contact of the extra switch is connected to the wire which originally went to the central contact of the indicator switch fitted by the makers. The three positions are then connected to the indicator switch and the chassis end of the two brake coils respectively. The arrangement is shown in Fig. 3. Care should be taken to secure all wiring so that it does not come into contact with any moving parts. Finally, drill a hole in the top cover to allow access to the screwdriver operated switch. There is a position for the hole already marked. Presumably, in some models a socket was present in this position. An ordinary three-way switch with a knob could of course be used, but it was felt that there was nowhere it could be positioned without either making removal of the covers more difficult and/or looking unsightly. The switch I used is simply one of suitably small dimensions with the shaft cut down and a slot for the screwdriver cut in it by means of a hacksaw. ■

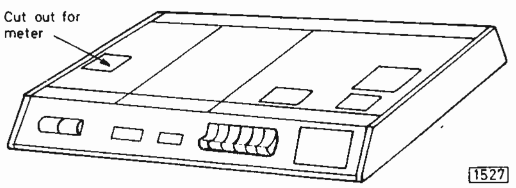


Fig. 2: Showing where the running-time meter can be mounted in the top cover of the VCR.

Servicing the Rank Z179 110° Colour Chassis

John Coombes

THE Rank Z179 was one of the very few colour chassis produced in the UK to be fitted with a 110° delta gun tube. It has a single transistor line output stage with a diode modulator to provide EW pincushion distortion correction and uses a TBA920 line oscillator/sync separator i.c. The field output stage consists of a BD183 transistor operating as a class A amplifier. The scan and convergence circuits in fact are basically the Mullard Phase II arrangement. On the signal side the decoder and RGB output stages are basically as in the later versions of the A823 90° chassis, with the two i.c. (SL918/SL901B) decoder. There are two i.c.s and a transistor in the i.f. strip, a further i.c. taking care of the intercarrier sound department. The thyristor regulated power supply is similar to that used in the A823 chassis, but incorporates a circuit breaker and a slow-start circuit to limit the initial switch-on current surge. Overvoltage protection is provided by a crowbar thyristor which monitors the conditions in the line output stage: when it conducts, the circuit breaker goes open-circuit.

Crowbar Thyristor

One of the most common faults in fact is the BT109 crowbar thyristor (4THY1) becoming defective. A quick check is to remove the link in the crowbar thyristor's control circuit (see Fig. 1). Then set the "set e.h.t." potentiometer 4RV18 in the power supply to minimum and switch the set on. Very slowly increase the setting of 4RV18 until the correct h.t. voltage (187V) is reached. If the circuit breaker opens during this process 4THY1 is probably faulty. To finally prove this disable 4THY1 by disconnecting the blue/white lead: if the trip does not operate when the set is switched on again replace the BT109.

Power Supply

Another common fault is for the set to be dead due to the circuit breaker itself going open-circuit. If this is so, resetting the button will fail to restore results. Some circuit breakers can lead the service engineer a merry dance however. This is where resetting the button restores results but the set may then work for only a couple of minutes or for days. In the former case a faulty circuit breaker is likely, but the latter case may involve extra visits if this possibility is not appreciated.

No set is complete without a mains filter capacitor across the mains input. In this chassis it's 8C1 ($1{\cdot}5\mu$F). No results can be due to it going short-circuit and blowing the mains fuse 8FS1 (5AT).

I have come across a few cases where the power supply thyristor 4THY3 (BT106) has gone open-circuit, causing no results due to no h.t. I have not come across a case of this thyristor going short-circuit however and in this respect the chassis has proved to be very reliable.

The power supply circuit is shown in Fig. 2.

Line Timebase

As usual in this type of chassis, the l.t. supplies are obtained from the line output stage – from the EW modulator diodes in fact. Thus failure of the line output stage means no sound or raster. Failure of the fusible resistor 4R25 ($1{\cdot}5$kΩ) which feeds the line driver transistor or failure of the TBA920 to oscillate can cause this condition.

The e.h.t. tripler (Z712) causes trouble as do all triplers. They can go open-circuit – usually due to one of the diodes in the tray breaking down – thus causing no e.h.t. Alternatively, sometimes one of the capacitors in the tray goes short-circuit, resulting in tripler overheating and line output stage overloading. In either case a new tripler is the only way of restoring the e.h.t. and a normal picture.

In cases of no results due to lack of e.h.t. the following procedure is suggested. Check that the h.t. is present and correct, then check that the e.h.t. overwinding on the line output transformer is intact – you should get a d.c. resistance reading of 160Ω between the connections. If these points are in order, suspect the tripler.

Note that the c.r.t. heaters are fed from a winding on the line output transformer. So failure of the line timebase means that the heaters will not light up.

Blank Raster

Another common fault is a blank raster due to the synchronous detector i.c. in the i.f. strip. This is 2SIC2, type SC9503P. This i.c. can also be responsible for intermittent loss of vision, in which case spraying freezer on it will momentarily restore the vision signal.

No Sound

No sound is a fairly common fault and is usually due to something simple like an open-circuit speaker coil or a dry-joint on the sound output transistor 3VT1 (type BD181). The transistor itself can go short-circuit to cause this fault. Intermittent sound may be due to the TBA750 intercarrier sound i.c. 2SIC3.

The Decoder

On the whole the decoder is very reliable. The main cause of no colour is the chrominance and burst processing i.c. 3SIC2 (SL918). On rare occasions it can be responsible for intermittent loss of colour. Another cause of loss of

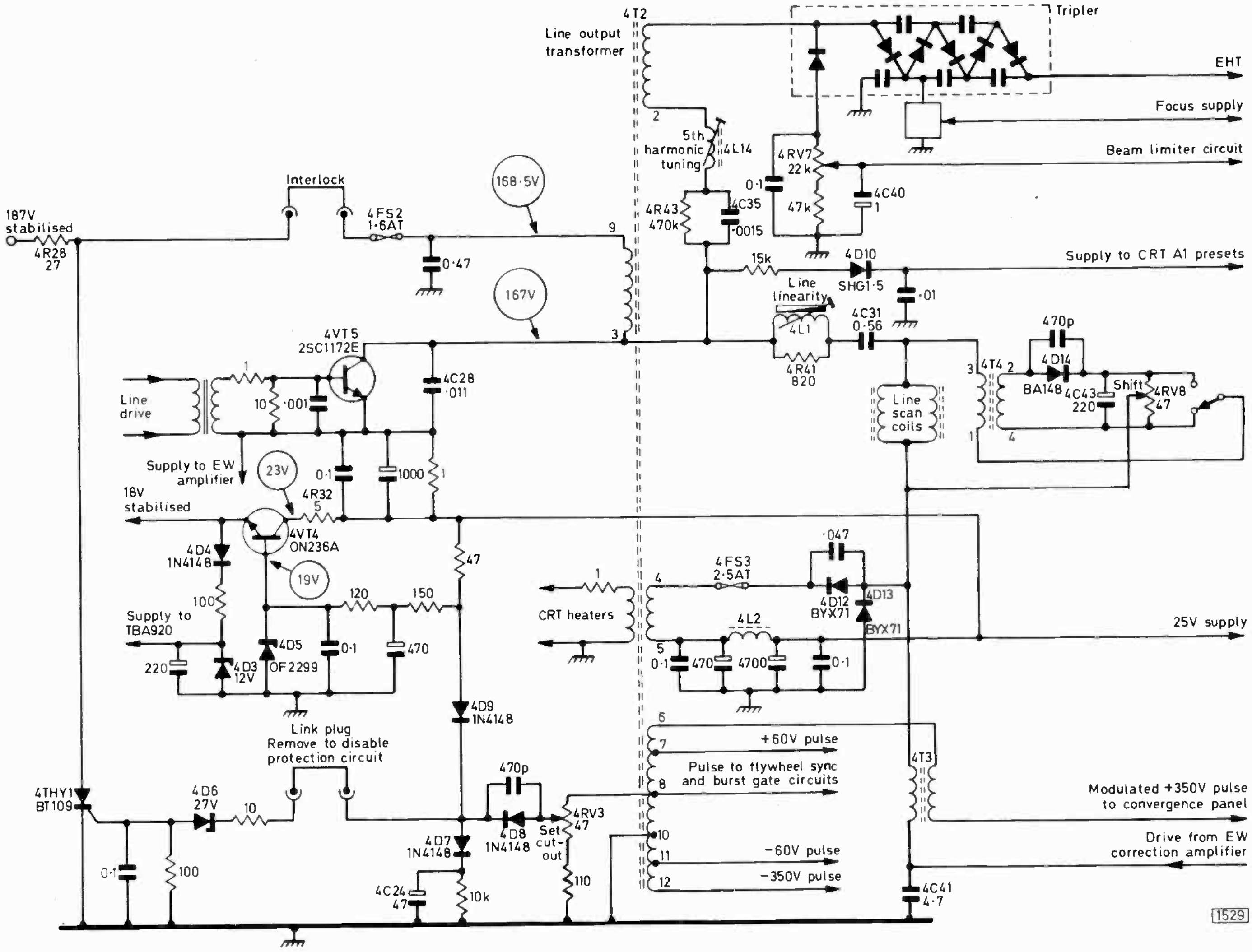


Fig. 1: Circuit of the line output stage, including the thyristor (4THY1) crowbar trip.

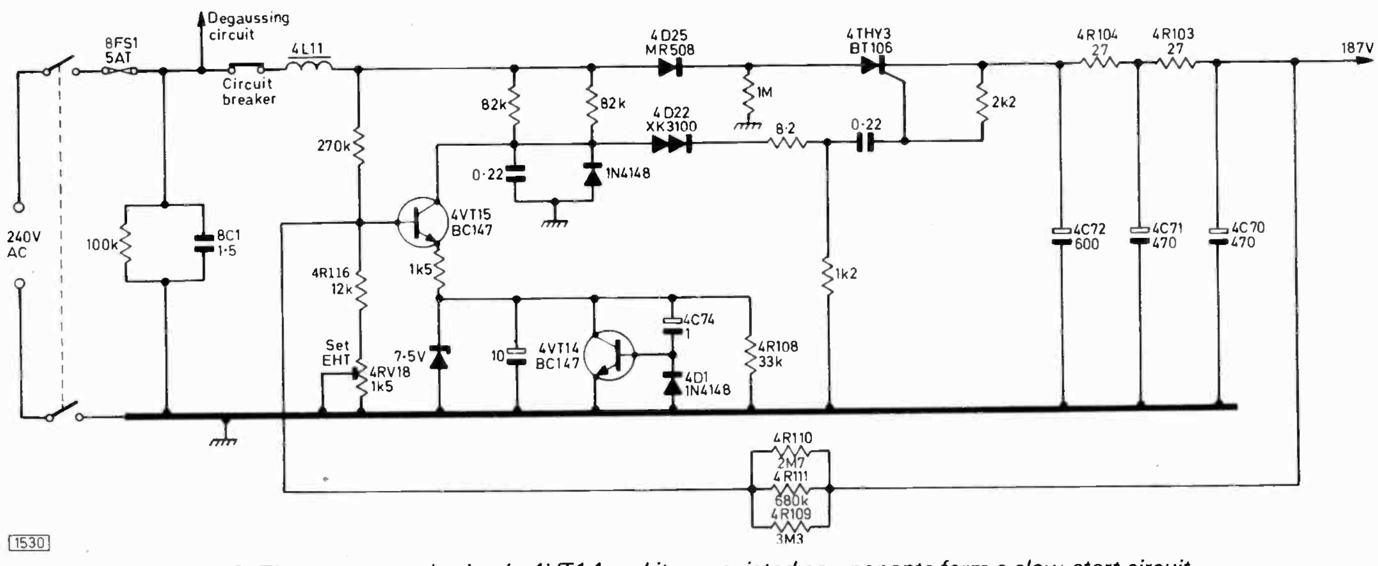


Fig. 2: The power supply circuit. 4VT14 and its associated components form a slow-start circuit.

colour is the second chrominance amplifier transistor 3VT8 (BF179) which often goes open-circuit – base to collector or base to emitter.

The second integrated circuit in the decoder, 3SIC3 (SL901B), provides demodulation and signal matrixing. It causes the same troubles as in the Z584 decoder panel which I dealt with in the March 1976 issue. In addition, it can be responsible for an all red, blue or green raster, either permanently or intermittently. In the latter case spraying the i.c. with freezer will momentarily clear the fault.

The loss of one colour is generally due to the appropriate output transistor going open-circuit – 3VT16 red, 3VT17 green, 3VT18 blue. The type is BF337. The driver transistors can also be responsible. These are 3VT13 red,

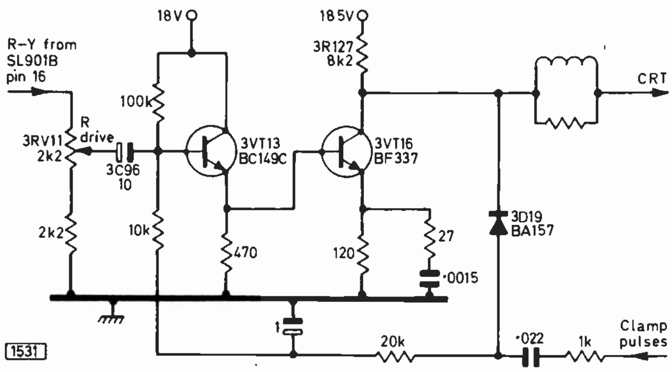


Fig. 3: One of the three RGB drive circuits.

3VT14 green and 3VT15 blue, type BC149C. Sometimes both transistors in a channel go open-circuit. See Fig. 3.

If any of these transistors goes short-circuit the result is an all red, green or blue raster. Another cause of this fault is when one of the clamp diodes goes short-circuit. The diodes are 3D19 red, 3D20 green and 3D21 blue, type ITT2002 or BA157.

Loss of one colour can also be due to the electrolytic coupling capacitors at the input to the R, G and B channels. These are 3C96 red, 3C97 green and 3C99 blue, all 10μF. A quick check is to tap a good 10μF electrolytic across the suspected one.

While on this panel, an unusual case of lack of contrast was traced to a defective luminance delay line – with a leak from winding to screen.

Field Timebase Faults

Field collapse is a common complaint on this chassis. I have often found the cause to be failure (open-circuit) of one of the EW modulator diodes 4D12 and 4D13 (type BYX71) in the line output circuit. The result is no l.t. supplies – so no sound either. There are several other common causes of field collapse however. First, the rectifier diode 4D18 (1N4148) which provides the separate supply for the field oscillator/charging circuit can go open-circuit – it's fed from the pulse winding on the line output transformer incidentally. Secondly the field amplifier bias rectifier 4D17 (BA148) goes short-circuit. And thirdly the silicon controlled switch field oscillator 4THY2 (BR101) can go open- or short-circuit. The field timebase circuit is shown in Fig. 4.

Reduced field scan is generally due to the field oscillator supply rectifier's reservoir capacitor 4C60 (0·22μF) which very often becomes leaky. The fault can also be due to the feedback capacitor 4C52 (64μF) however, though in this case there is usually a linearity fault as well – foldover at the top of the picture. 4C52 can go open- or short-circuit: the result on the scan is the same however.

Reduced field scan accompanied by overall poor linearity occurs when the field scan coupling capacitor 4C57 (1,000μF) goes open-circuit – the signal return path is then via 4R83 and 4RV13 instead of via 4C57. This capacitor can also go short-circuit. The result then is a field shift fault. This trouble can also be due to the field shift control 4RV13 (220Ω) going open-circuit, but more often it's the electrolytic that's at fault.

The field oscillator supply's smoothing electrolytic is 4C46 (220μF). This has a tendency to go short-circuit, causing excessive field scan.

Back to the Line Timebase

We have already commented on the EW modulator diodes in the line output stage going open-circuit. 4D13

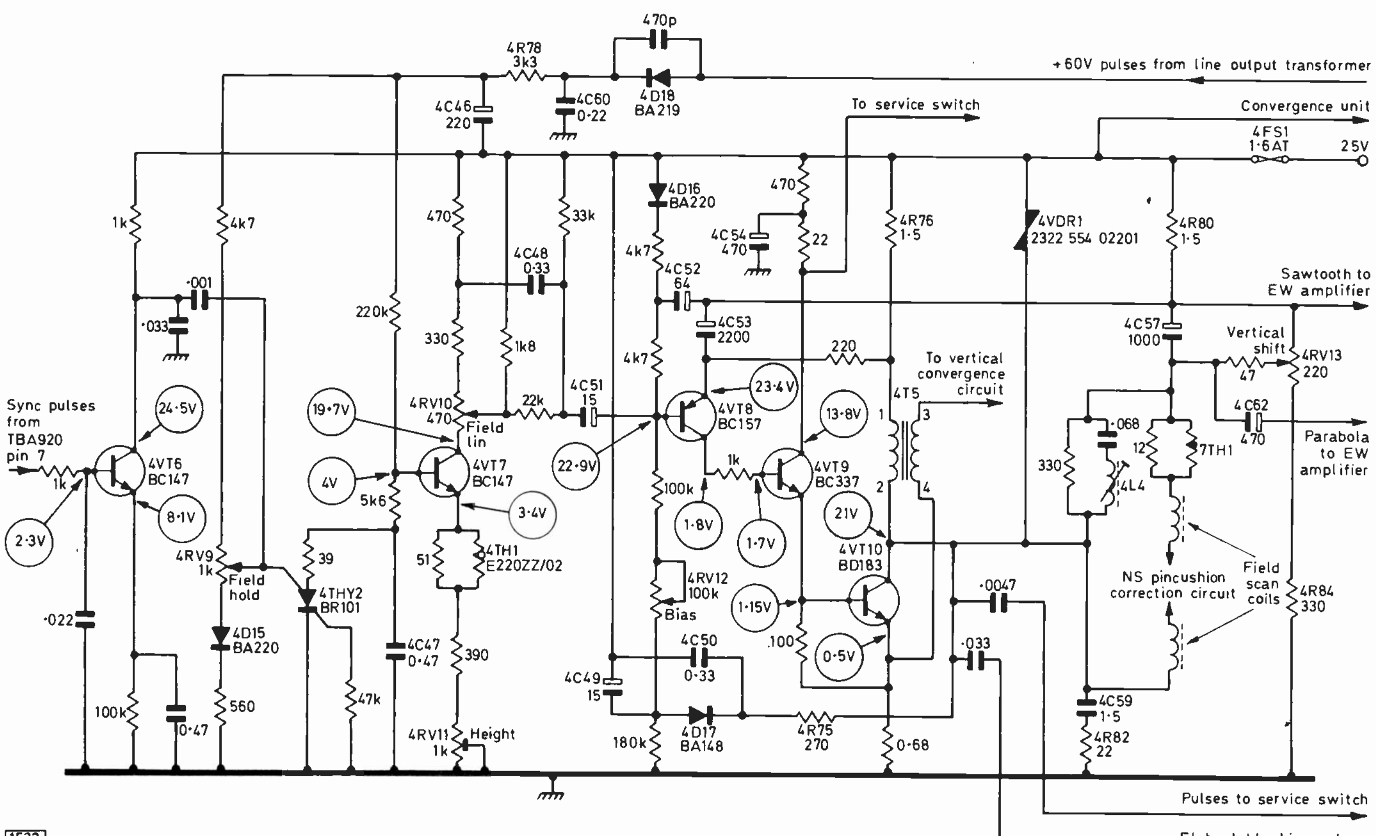


Fig. 4: Complete field timebase circuit.

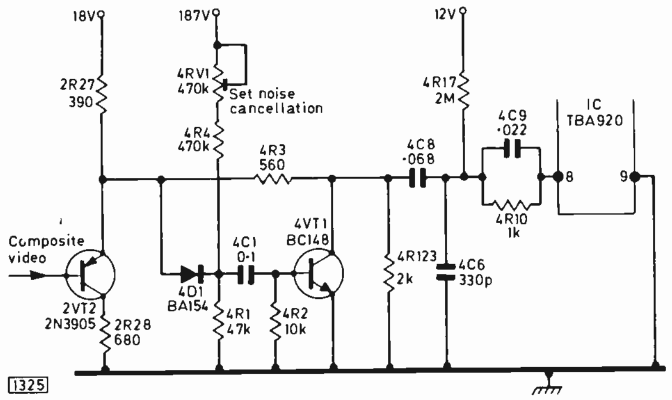


Fig. 5: The sync noise-canceller circuit – 4VT1 and its associated components – can cause loss of sync.

(BXY71) can also go short-circuit. The result then is excessive line scan. Another cause of this fault is when 4C35 (1,500pF) goes open-circuit. The capacitor is part of the e.h.t. system.

The line oscillator/sync separator i.c. 4SIC1 (TBA920) has in my experience been responsible for two faults, first no line sync (check the voltages on the pins), secondly no line oscillation and in consequence no results. A common cause of lack of line sync however is when 4D4 (1N4148) goes open-circuit. This diode is part of the line oscillator start up circuit, required because the line oscillator is powered from the line output stage once the set has come into full operation.

Lack of Sync

Several components can cause lack of both line and field sync. These are all in the noise-cancelling circuit (see Fig. 5). The transistor 4VT1 (BC148) can go open- or short-circuit to give this condition, the associated diode 4D1 (BA154) can go short-circuit, while the noise-canceller preset control 4RV1 can go open-circuit. Check 4RV1 where the fault is intermittent – the track may have a hair-line crack. The coupling capacitor 4C1 (0·1μF) in this circuit can also be responsible for the no sync symptom when it goes short-circuit.

No field sync has been traced to two components. First the field sync pulse amplifier transistor 4VT6 (BC147) can go open- or short-circuit. Secondly the integrating capacitor 4C78 (0·033μF) in its collector circuit can also go either short- or open-circuit.

Flyback Lines on Screen

The beam limiting and flyback blanking arrangement is another circuit which this chassis shares with the 90° A823 series chassis. Either one or both of the transistors involved is suspect in the event of flyback lines on the screen. They can go open- or short-circuit. The transistors are 6VT1 (BC171) and 6VT2 (BC117).

Horizontal Shift Circuit

Occasionally the horizontal shift circuit gives trouble. The control (4VR8, 47Ω) or the rectifier (4D14, BA148) can go open-circuit.

Field Servicing

When servicing in the field a lot of faults can be tracked down using a good e.h.t. meter and a good multimeter. If the e.h.t. is found to be high – it should be 25kV – the fault or faults will generally be on the output side of the line output transformer or in the beam limiter circuit. If the e.h.t. is low check the line output transistor and the e.h.t. circuit. If the h.t. line (187V) drops below 180V there is likely to be excessive e.h.t.

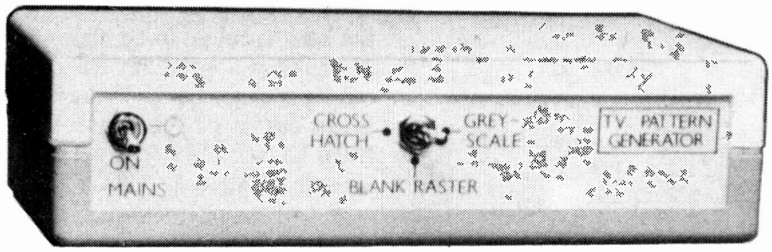
Cut-out Adjustment

The overvoltage/cut-out adjustment is very important and it's always worth checking that this is set correctly. First set the e.h.t. to 25kV by means of the set e.h.t. control 4RV18 in the power supply. Set the cut-out control 4RV3 fully clockwise (viewed from the component side of the panel) and temporarily connect a 470kΩ skeleton preset in series with an 82kΩ resistor in series across 4R116 – which is in series with the set e.h.t. control. Monitor the e.h.t. and adjust the skeleton preset until the e.h.t. reaches 28·5kV. Finally adjust 4RV3 slowly until the circuit breaker operates. Switch off, remove the skeleton preset and its series resistor and reset the circuit breaker button. The set should then operate normally. If the cut-out operates there is a fault in the receiver. Check the h.t. which should be 187V – at 4R103.

Warning!

Both the e.h.t. and the h.t. are set by 4RV18 but it is much safer to adjust this control for the correct e.h.t. voltage. Do not assume that with the h.t. line at 187V the e.h.t. is correct. Incorrect adjustment can ruin the tripler or the line output transformer. When the line output transformer is faulty the circuit breaker usually operates. ■

TV PATTERN GENERATOR



P.J.STONARD

PART 2

We regret that, due to pressure on editorial space, Figs. 4 and 5 which show waveforms produced at various points in the Pattern Generator, have had to be held over until next month.

FROM the photographs, it will be seen that the unit comprises a large printed circuit board carrying the majority of components, a smaller board on which the u.h.f. modulator is built, and the front and rear panels. There are thus three areas of construction.

UHF Modulator Unit

The modulator is a self-contained sub-assembly contained in a small screened enclosure of tinplate. Most of the components are mounted on the printed board (see Fig. 6), though those operating at u.h.f. are stood off to reduce capacitance effects, which could prevent operation. The modulator is probably the best place to start construction, when complete it can be tested with a TV receiver and later fitted to the main board. It is advisable to follow the order of construction given here, as some of the components become rather inaccessible in the later stages.

The first step in construction should be to make the tinplate screen shown in Fig. 7. The prototype was made from material 0·1mm thick. That used for tin cans is generally thinner but can be used without any problems. If a food can is used, any plastic lining should be removed. The printed board should be fitted to the screening box so it is approximately 2mm up from the bottom edge, so allowing the component leads to clear the main board. The modulator board is fixed by running a fillet of solder around the perimeter. A large iron should be used, taking care not to overheat the board.

The next step is to mount the coaxial output socket, SK1, by soldering its fixing lugs to the tinplate box. If the resistor used for R4 is physically large, it may be necessary to crop the centre pin of the socket to a length of about 6mm from the seating plane to allow the necessary space for the layout.

Inductors

The Lecher bar inductor, L2, should next be made. The shape required is shown in Fig. 8, and the material is 0·1mm thick brass or copper shim. Before bending, tin both sides of the material, wiping off excess solder with a rag. This will prevent subsequent corrosion. The printed board is not marked for mounting, but a rough guide is given by the photographs. The area under the mounting foot should first be tinned and the foot of L2 then sweated down.

The output coupling line L3 is formed from one lead of matching resistor R4, as shown in Fig. 9. The other end of R4 goes to the output socket SK1, and is fashioned into a loop to suit. When fitted, L3 runs alongside L2 and spaced about 2mm from it. The earthy end of L3 is soldered on top of the foot of L2. To prevent everything falling apart at this stage the joint SK1/R4 should be made first. Complete this stage of the assembly by connecting the tuning capacitor C3 between the end of L2 and the printed board ground plane.

Fixing Points

The modulator assembly is secured to the main board by the four pins bringing in Video, *V*CC, and 0V (two pins). These pins should be added to the board next, those for 0V being soldered on both sides of the board.

All of the remaining passive components except C2 can now be fitted. Two components, C1 and R2, share the same printed board holes, and should be fitted as shown in Fig. 10. The decoupling inductor L1 is formed from 22 s.w.g. insulated copper wire, wound onto a ferrite bead as shown in Fig. 11. Capacitor C2 is added between L2 and L1, leaving L1 leadout wire about 5mm long for eventual connection to Tr1 collector.

The last components to be fitted are the three transistors. Check Tr2 and Tr3 carefully before fitting, one is *npn*, the other *pnp*. The leads of Tr1 should be formed as shown in Fig. 12 before anchoring the device by soldering its Screen connection to the wall of the box. Next solder the Base lead under the board, so that the transistor can is about 3mm above the ground plane. The Emitter lead goes to the free end of R3 and the Collector lead is joined to the lead from C2/L1.

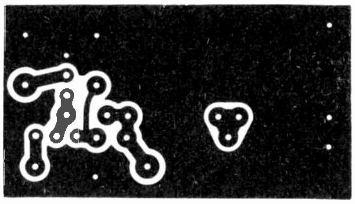
This completes construction. When checked for bad joints and solder splashes, the modulator may be tested independently of the remainder of the unit.

Testing the Modulator

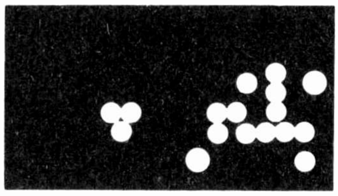
Connect a coaxial lead from SK1 to the aerial socket of a domestic television receiver (u.h.f., of course) and switch on the set. Select a spare channel and advance the brightness control to show a noisy display. Apply 9V from a suitable battery to the modulator, including a milliammeter in the positive lead. A current of about 30mA should be indicated. Slowly tune the set from the low frequency end, disabling the a.f.c. if possible. When the frequency of the modulator carrier is reached, the noise will vanish and a white raster will be displayed instead. Apply a finger to the modulator video input pin to inject a signal consisting of 50Hz plus noise. A hum bar and an r.f. interference pattern (herring-bone) should be displayed.

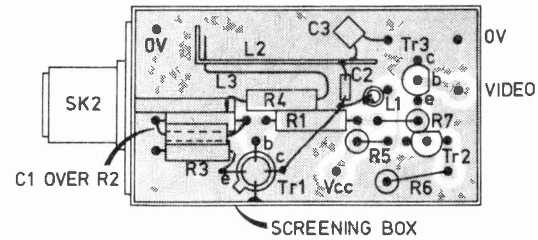
It may be found that the modulator output frequency is very close to a local channel. To shift the frequency the length of L2 or the value of C3 should be changed slightly.

(a)



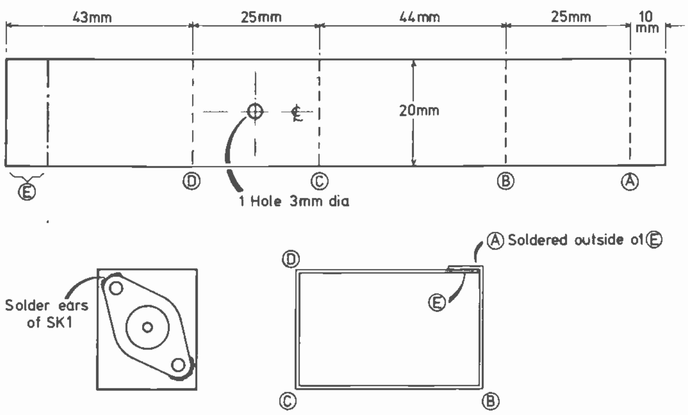
(b)





(c)

Fig. 6: U.H.F. Modulator printed board. (a) Print pattern, underside of board. (b) Print pattern, topside of board. (c) Component layout. All are shown full size.



Note:- Dimensions do not include bending allowance

Fig. 7: Bending and drilling details for the u.h.f. modulator screening box.

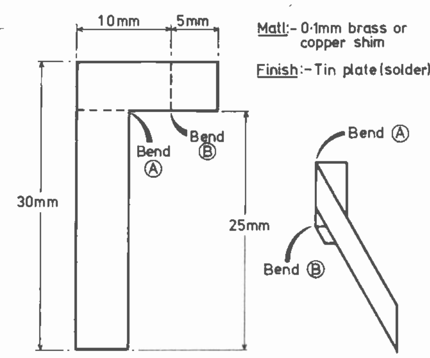


Fig. 8: Bending details for the Lecher bar 12.

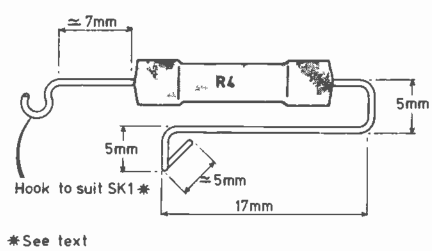


Fig. 9. Bending details for L3/R4.

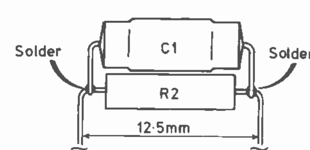


Fig. 10: Mounting arrangement for C1/R2.

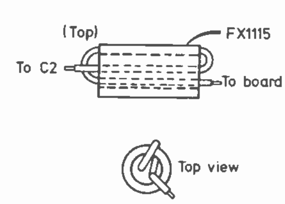


Fig. 11: Winding details for L1.

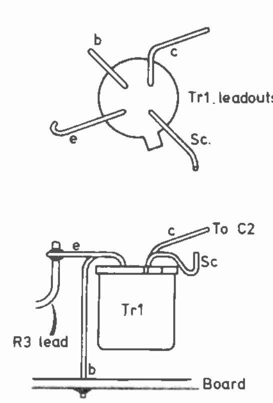
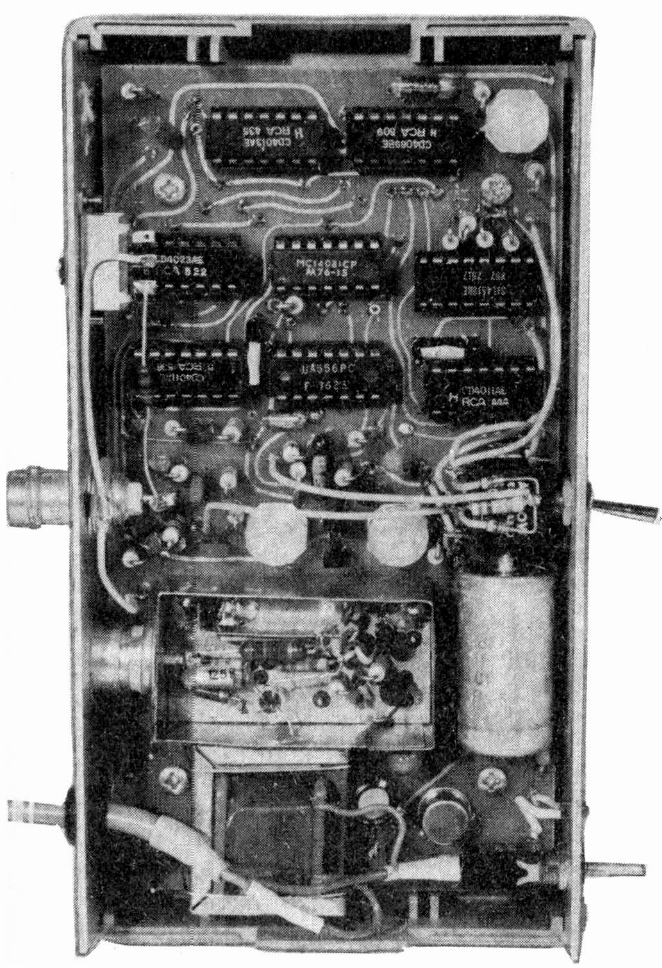


Fig. 12: Leadout indentification and bending details for Tr1.



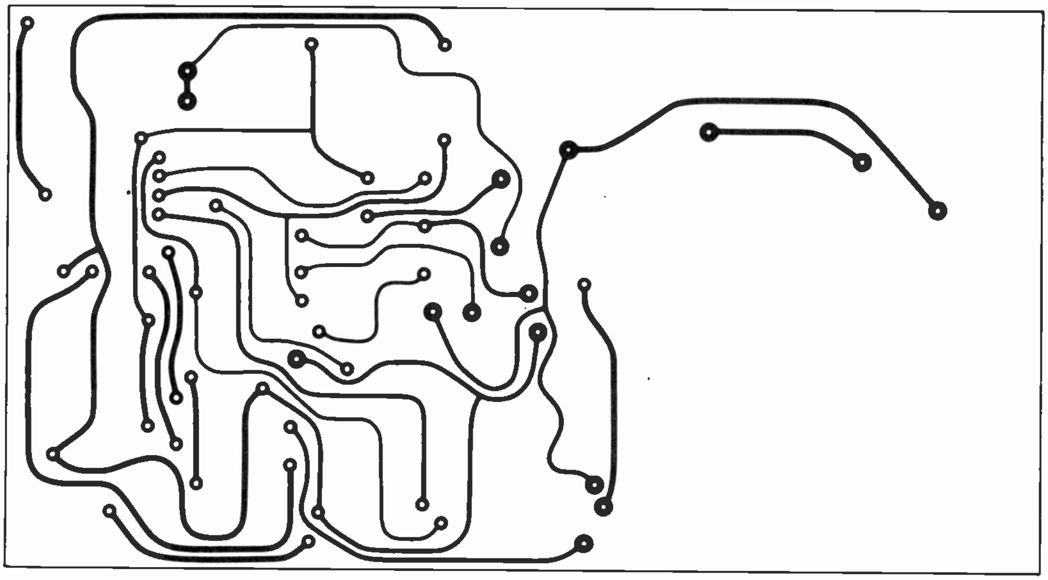


Fig. 13(a): Main printed board, topside track pattern, shown full size.

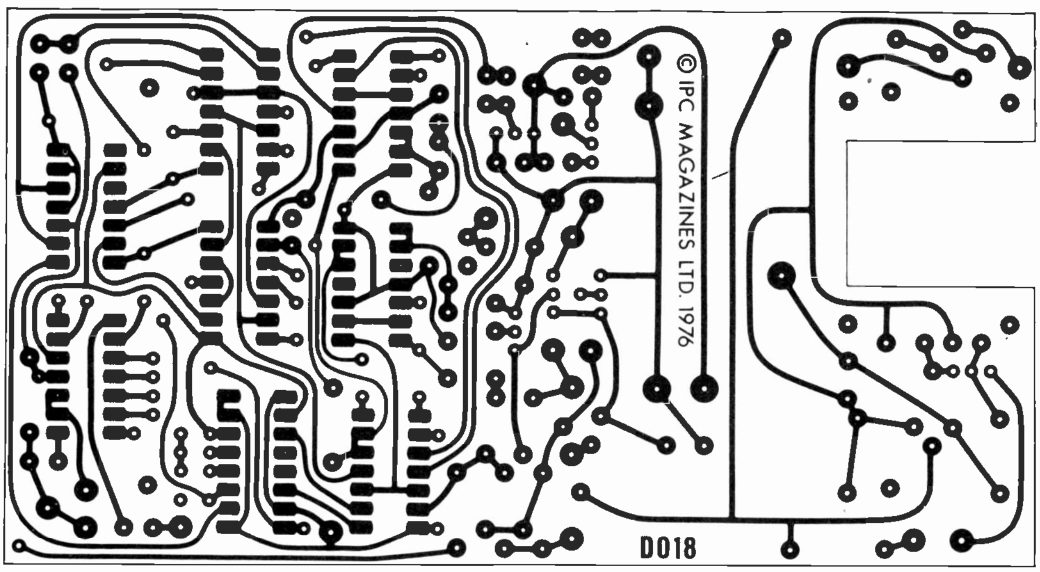
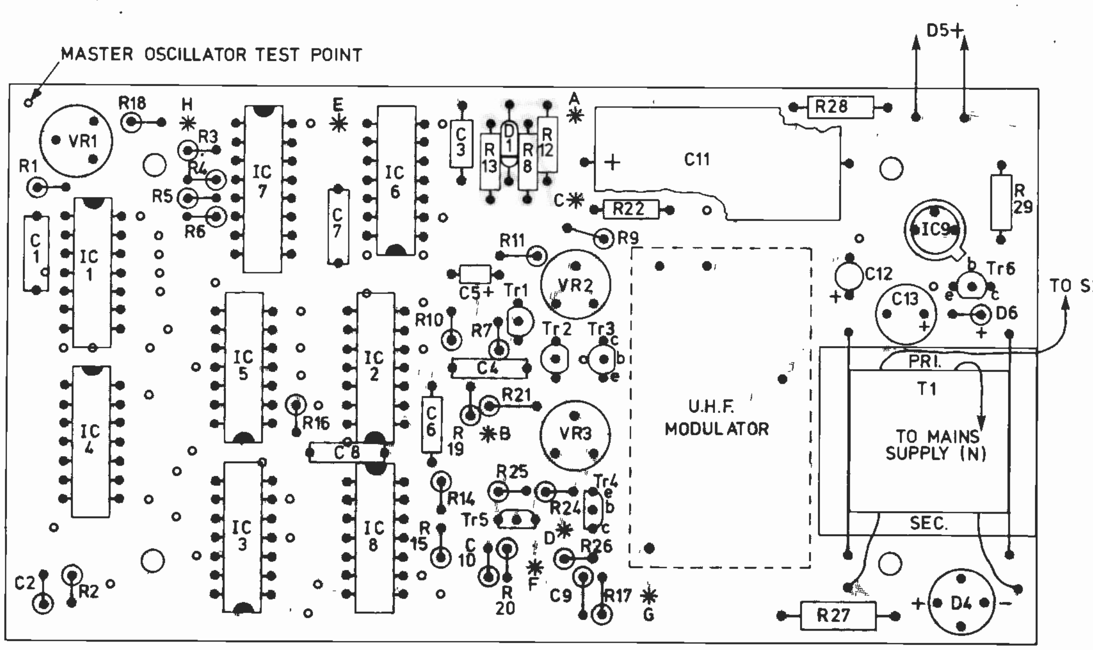


Fig. 13(b): Main printed board, underside track pattern, shown full size.



o DENOTES WIRE LINKS THROUGH P.C. BOARD

Fig. 13(c): Main printed board, component lay-out.

Main Board Assembly

Compared with the Modulator Board, building up the main board (Fig. 13) is a fairly straightforward operation and only a few guide-lines will be given. The first step is to fit the links which connect the two sides of the board. There are 44 of these (excluding those component leads which are soldered both sides of the board), 22 s.w.g. tinned copper wire being a suitable material. Ensure that every link is properly soldered on both sides of the board – a faulty connection can prove an elusive fault later on. It is advisable to use a printed board pin for the master oscillator test point, to provide a better anchor for test leads. The twelve pins which will carry the external connections should also be fitted now.

The next stage is to mount all the resistors (except R23 which is mounted on S1) and the preset resistors, followed by all the capacitors except C11, and the bridge rectifier.

The majority of the integrated circuits used are CMOS types, and though these can be mounted directly on the board, the use of sockets is strongly recommended. These should be fitted next, taking care to get the orientation marks the right way round for future reference. The discrete semiconductors can now be added, together with IC9, the regulator, which should sit about 2mm above the board, preferably on a pad.

The u.h.f. modulator and C11 should now be fitted, followed by the mains transformer, T1. The mounting feet on the latter should be removed or folded back, as it is fixed to the board by loops of 22 s.w.g. tinned copper wire across the lamination stack. The primary connections are taken directly to S2 and the mains lead, and are not terminated on the printed board. Finally spend a few minutes checking that all polarised devices such as semiconductors and capacitors are fitted the right way round.

Front and Rear Panels

The front and rear panels are supplied with the case, and these should be drilled as shown in Fig. 14 and lettered with Letraset, etc. Switches S1 and S2 can then be mounted, plus D1, D3 and R23 which are fixed to S1. The l.e.d. D5 is arranged simply to push into the hole in the panel, without the use of a mounting clip. Place the boards and panels in the bottom half of the case and make the connections between S1 and the board. The wires to pins E and H

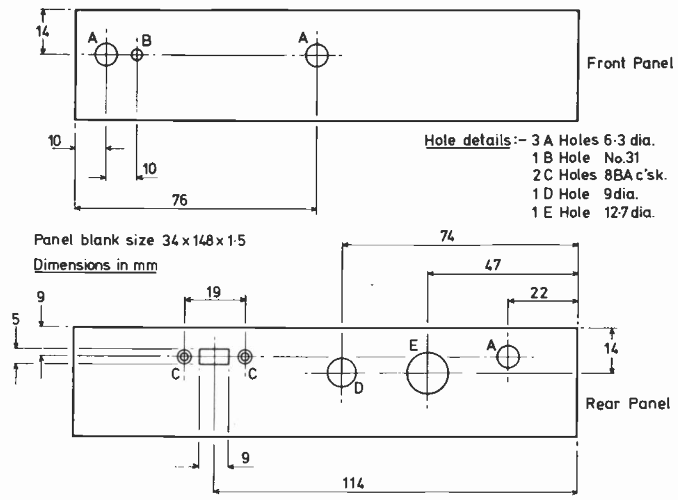


Fig. 14: Drilling details for the front and rear panels.

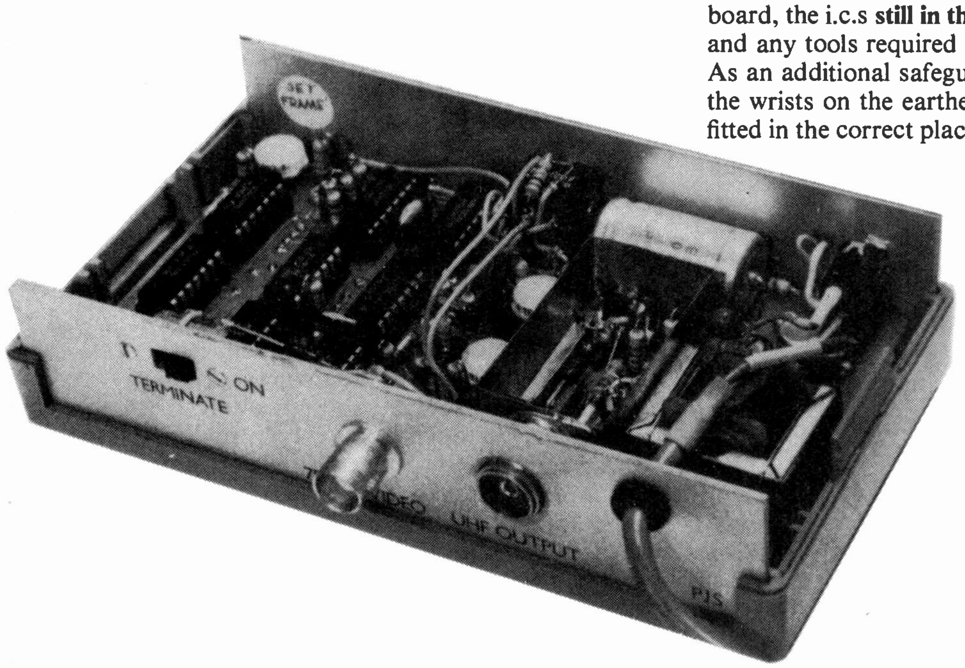
should be dressed clear of IC6 and IC7. If an s.p.d.t. switch has been used for S2, the unused contact should be cropped off.

Before inserting the i.c.s a few checks may be made. Temporarily wire the 75Ω terminating resistor R8 (Modulator) across points F and G. Connect the mains supply and operate S2. Without the load of the i.c.s the voltage across C11 will be about 25V. Measuring the CMOS supply at pins 14 and 7 of the socket for IC1 should give a reading of 9·4V ±10%, while across pins G and F a figure of approximately 0·3V is correct. Remove the test meter, switch off and check that C11 is fully discharged before removing R8.

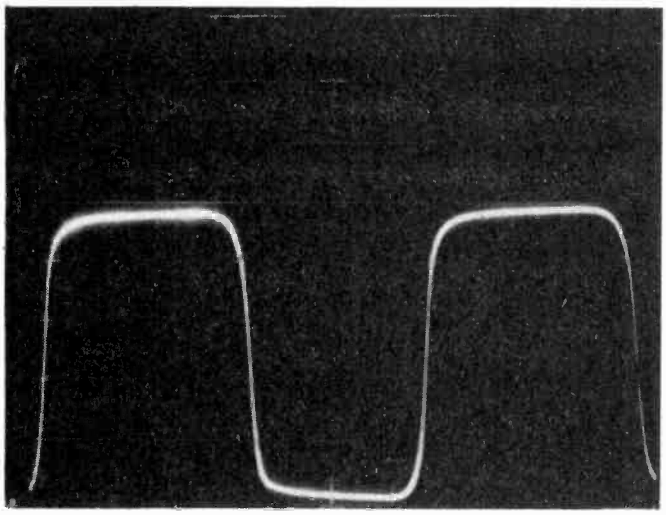
When finally fitted, the rear panel switch S3 partially covers IC3. To enable IC3 to be fitted the rear panel is swung out of the way. Tags F and G are soldered last.

Fitting the I.C.s

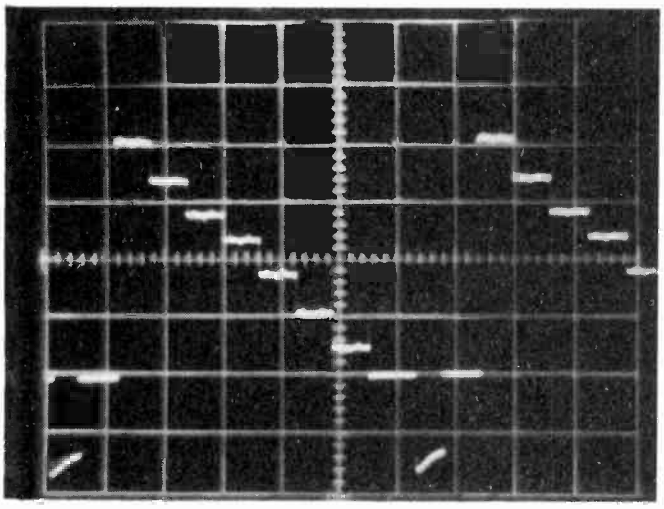
The next operation is inserting the remaining i.c.s. For the CMOS chips (all except IC2) the following procedure is recommended. The work area should be covered with a metal sheet such as a tray or tin lid and this should be earthed to a mains socket. Place the partially completed board, the i.c.s **still in their protective conductive packaging,** and any tools required (e.g. DIL insertion tool) on the tray. As an additional safeguard earth your own body by resting the wrists on the earthed area. Make sure that the i.c.s are fitted in the correct places, and the right way round.



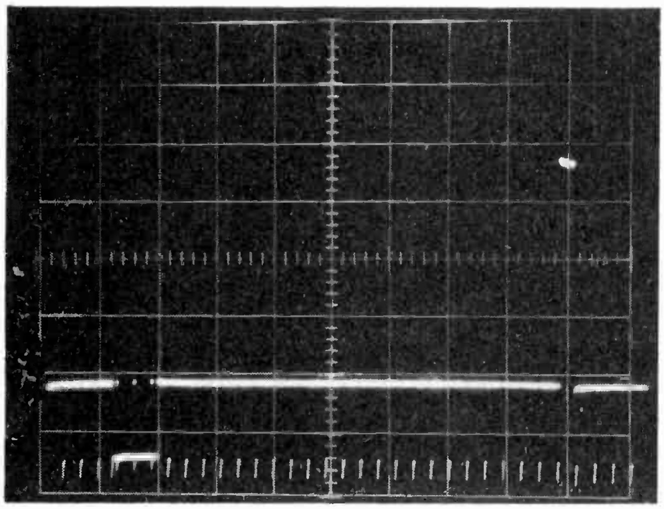
A rear view of the Pattern Generator with top cover removed.



Master clock output at pin 4, IC1b. Horizontal scale 500ns/div, vertical scale 2V/div.



Grey-scale output waveform. Horizontal scale 10μs/div, vertical scale 200mV/div.



Frame sync pulse waveform. Horizontal scale 200μs/div, vertical scale 200mV/div.

Final Adjustments and Setting Up

In the first part of this series, it was pointed out that an oscilloscope would be used to adjust the presets, but this is by no means necessary to produce a working product. For alignment without test equipment proceed as follows.

Connect a correctly working domestic television receiver to the u.h.f. output socket via a coaxial lead. Set the brightness and contrast controls to about mid-travel and select the spare channel used earlier for the modulator tests. Terminate the video output with 75Ω by operating S3.

Turn VR1, the "Set Line" control, and VR2, the "Set Frame" control, fully clockwise. Turn VR3, the "Set Step Wedge" control, fully anti-clockwise. Select Blank Raster with S1 and turn on the generator. If the appearance of the TV screen does not change, retune to a higher frequency (the modulator is now receiving 12V instead of 9V and will have increased frequency slightly). Some signs of activity will now be displayed, and the tuning should be adjusted for the strongest signal.

Slowly adjust VR1 to stabilise the horizontals. A negative picture may now occur, producing a black raster with a white bar at the right-hand side. If so, adjust the receiver tuning to produce a fully white but rolling picture. Trim VR2 until the rolling stops and a fully white raster is seen.

Next, select the Crosshatch with S1. The familiar pattern should now be seen. Inspect the top of the picture, if the vertical lines appear to bend at the top, reset VR1 to straighten them.

Select Grey-scale, whereupon a blank grey raster should be displayed. Slowly rotate VR3, which should first produce a white bar on the left-hand side of the screen, the remainder becoming black. Continue to rotate VR3 until the last grey-scale bar (second from right) is **just** visible. Reset the receiver controls for optimum performance. Add the fixing screws and case lid, the pattern generator is now complete.

Oscilloscope Alignment

For oscilloscope alignment, the following procedure can be substituted for that given above. First monitor the output of the master oscillator at the test point mentioned previously. Set VR1 to produce pulses of 1·6μs every 3·2μs. Transfer the probe to pin 9 of IC2b and adjust VR2 to set the frame period to 20·0ms.

Examine the waveform at the video output socket, ensuring that a 75Ω termination is in circuit. Set the oscilloscope timebase to 10μs/div. Using the front porch as a reference, measure the height of the peak white on Blank Raster. For a 1V video signal, peak white is 0·7V above blanking level, any serious deviation from this (greater than 10 per cent) can be corrected by adjustment of R24's value.

Select Grey-scale and set VR3 to produce a staircase running from peak white to black level with equal steps. If the amplitude of the first bar (peak white) is not 0·7V above the last bar an adjustment to the value of R22 will be required. If a monitor is available, connect it to the video output socket and observe the picture.

When a dual or delaying timebase oscilloscope is available, the frame sync pulse may be examined in detail. It was explained in Part 1 that the position of the frame sync pulse is set by the first positive output from the gated astable IC8d, IC8a. As the pulse is gated out by a *CR* network the timing must be correct. The values for C7 and R16 are selected for the mid-time value, but the random selection of components may lead to the frame sync pulse width being out of specification. ■

The Art of Alignment

Part 3: Continental Strips and Sound IFs

Harold Peters

IMAGINE a TV set that selects its channel digitally, by channel number, and which has a fully integrated i.f. strip with surface wave bandpass filter, sync demodulation with full a.f.c., a gyrator (active filter) leading to a chroma lock decoder. Such a set would never need aligning, and that's the way things are going. Before we reach that stage however there'll be a lot more alignment to do. In this part we'll be considering the sound i.f. section, including i.c.s. In the final instalment we'll go on to decoder alignment theory and synchronous vision demodulation – which has most of us foxed – and for amusement only we'll touch upon video sweeps, composite sweeps, and group delay.

Continental Standards

Before we do any of these things however let's round off the i.f. alignment process by considering the differences between the European system (CCIR) and our own – for the benefit of those who need to convert sets from one system to another.

The basic difference is that the CCIR sound spacing is 5·5MHz from vision. They also use v.h.f. predominantly. On v.h.f. the channels are spaced 7MHz apart but on u.h.f. the spacing is 8MHz, the same as ours. In fact on u.h.f. the channel numbers and vision carrier frequencies are common to both systems. There is no European channel 1. Band I starts at ch.2 and ends at ch.4. Band III embraces channels 5-12 and overlaps ours at both ends. Some European networks end at ch.65, and if sets from these parts are imported into the UK they can give problems in the group C/D areas.

The vestigal sideband roll-off is 0·75 MHz on both v.h.f. and u.h.f., while the "no man's land" between sound and the next vision channel is 0·75MHz on v.h.f., 1·75MHz on u.h.f. The standard vision i.f. is 38·9MHz, which makes the adjacent sound trap 38·9 + 0·75 + 0·75 = 40·4MHz on v.h.f. and 38·9 + 0·75 + 1·75 = 41·4MHz on u.h.f. The sound i.f. is 38·9 – 5·5 = 33·4MHz. The colour subcarrier i.f. comes at 34·47MHz, and the adjacent vision trap at 31·9MHz (on u.h.f. this is 30·9MHz but nobody bothers).

Realigning for Standards Conversion

In Fig. 1 these are shown with the UK i.f. ghosted in alongside. You can see that because midband is 37MHz in both cases it is a simple matter to align from one system to the other. Most tuned circuits will swing across by adjustment, with the possible exception of the 6MHz UK intercarrier i.f., which may not tune right down to 5·5MHz. The other way (5·5 to 6MHz) can be accommodated by changing dust cores for brass if the need arises.

The owner of a sweep generator and display unit may be tempted to broaden or narrow the i.f. response curve – depending on which way he is going – and if there are bandpass transformers in the strip he should expect the coupling differences to give a trough due to overcoupling as he narrows the bandwidth, or an incurable tilt, with the vision carrier dropping, as he widens it.

On colour sets the 5·5MHz post-detector trap must be retuned to 6MHz to minimise sound-chroma beat on European sets coming here. Conversion either way involves no other chrominance adjustment, as the subcarriers are the same.

The man with only a trimming tool has less of a problem. He must rest content to limit adjustments to retuning the intercarrier sound strip for maximum undistorted output with minimum buzz. Progressive attenuation of the signal will enable accurate alignment to be carried out without the a.m. limiter masking the signal peaks. The 6MHz/5·5MHz sound trap will need retuning as well on colour sets. This is done for minimum sound-chroma beat, with the station a little off tune to enhance the effect. So much for European i.f.s.

Sound IF Alignment

The principles involved in aligning the 6MHz intercarrier sound circuits are identical to those applicable to aligning 10·7MHz strips in f.m. radios. The test gear needed is a 6MHz signal generator capable of being modulated to 30% a.m., and deviated to 50kHz f.m. 400Hz or 1000Hz are the usual inbuilt tones. There should be minimum a.m. on f.m. and vice versa, and the 6MHz carrier should be frequently checked against a crystal during alignment

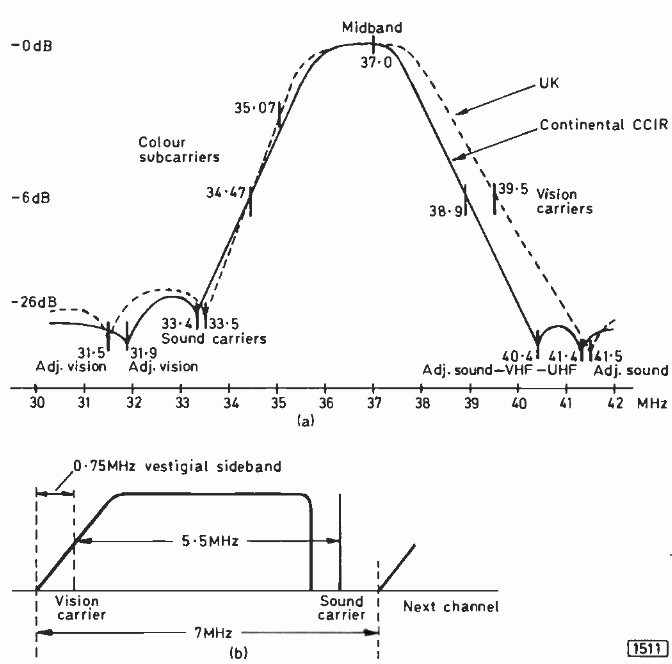


Fig. 1: (a) Comparison between the Continental and UK i.f. responses. (b) CCIR channel arrangement on v.h.f.

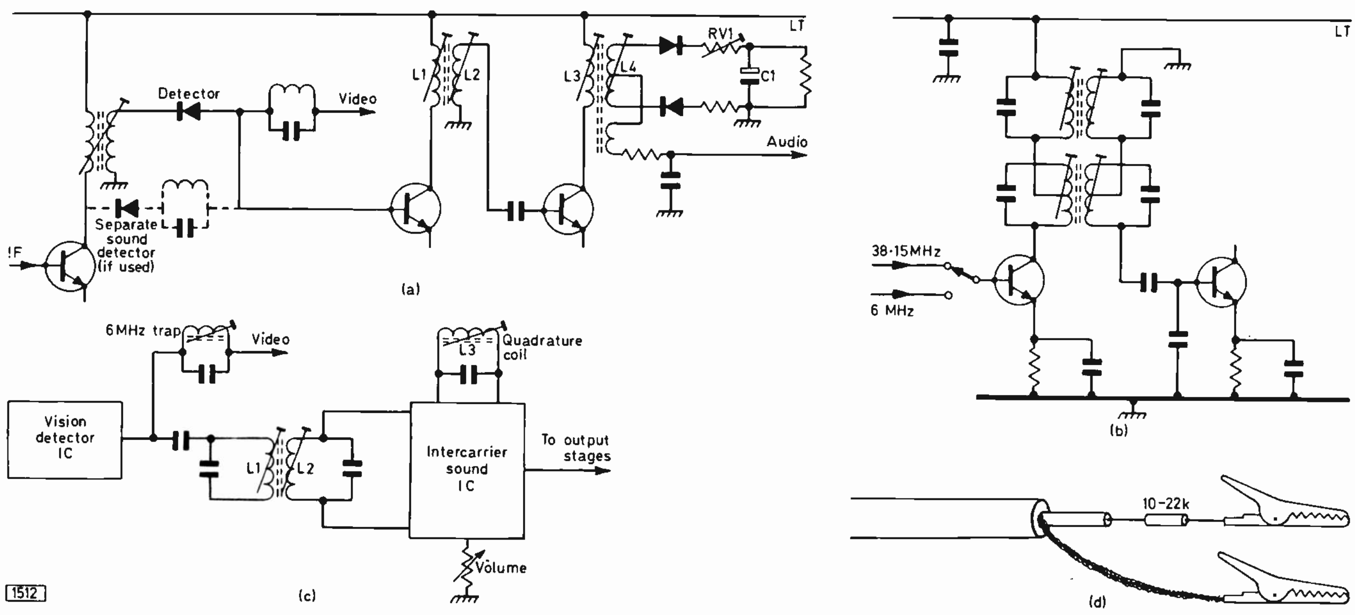


Fig. 2: Aligning intercarrier sound strips. (a) Typical arrangement with discrete components and a ratio detector circuit to provide demodulation. (b) Arrangement of the tuned circuits in a dual-standard sound i.f. stage – the higher frequency (405/38.15MHz) circuits are closest to the collectors. (c) Single-standard strip using i.c.s for vision demodulation and the intercarrier sound stages. (d) Signal generator probe.

sessions. The same display scope can be used as for i.f. work.

Inject the signal just after the vision detector, or the separate sound detector as appropriate. Ground the base (grid) of the previous stage to prevent spurious i.f. signals entering. A stand-off resistor of 10-22kΩ should be fitted to the generator probe to minimise loading effects. Another way of doing this is to inject the signal at the base of the preceding stage and move the short one stage down. This can upset some strips so no hard and fast rule can be laid down.

Displaying the Output

The display should be connected at the detected output. In the case of i.c.s the earliest opportunity is invariably after the volume control which should be set at maximum. What friends you have left will usually subscribe to kit you out with a loudspeaker dummy load. No special probe is needed for the signal take off, but a blocking capacitor is useful if there is d.c. at the take off point. If the demodulator is a ratio detector, a meter connected across its limiter electrolytic makes one of the best tuning aids technology has ever provided free.

Ratio Detector Circuits

There are still many sets around that use a ratio detector to demodulate the 6MHz f.m. sound. Fig. 3(a) shows the rudiments of this type of intercarrier sound channel. The method of tuning is simple.

Inject the 6MHz signal via the stand off probe at the vision or separate sound detector output, select f.m. deviated to 50kHz by a 400 or 1000Hz tone, set RV1 mid-way, and display the detected a.f. output on the 'scope. Adjust L1, L2, L3 and L4 for maximum undistorted output, reducing the input progressively to prevent limiting from masking the tuning. Repeat until no improvement results. Then select a 30% a.m. tone and adjust RV1 for minimum output. If this cannot be obtained, revert RV1 to midway, tune L4 for minimum a.m. and try RV1 again. RV1 is usually labelled the "buzz" control since it balances out any a.m. left after limiting.

Alternative Arrangements

Because TV i.c.s and duplicated services arrived at roughly the same time the average single-standard set has a sound i.c. while the average dual-standard set has a ratio detector. The dual-standard sound i.f. strip has to accommodate the 38·15MHz 405-line a.m. sound as well as the 6MHz f.m. intercarrier sound. Apart from the input and the detector output circuits the two signals travel through the sound i.f. strip unswitched. The 6MHz coils present a low reactance at 38·15MHz while the 38·15MHz coils present a low reactance at 6MHz. So for economy a common decoupling capacitor of high value is used.

Dealing with Dual-Standard Sets

If you are aligning a dual-standard strip for no other reason than fault finding it will pay to bridge a good one across each of the decoupling capacitors in turn, for they are a common source of trouble. Foil capacitors becoming inductive can decouple the f.m. signal but leave the a.m. signal weak or unstable. Ceramics can crack, leaving the a.m. signal satisfactory but spoiling the performance on f.m.

The 38·15MHz coils are usually aligned at the same time as the vision i.f. circuits, simply by transferring the display lead from the vision to the sound detector. The trace is peaked on the 38·15MHz marker and since the trace is very spiky X-expansion may be needed to permit a symmetrical alignment to be carried out.

Aligning IC Channels

Alignment of intercarrier sounds i.c.s – see Fig. 2(c) – can present some difficulty to the uninitiated simply because the colossal loop gain produces a.m. limiting with very little signal input. Alignment connections are as for ratio detector alignment, namely 6MHz injected via the stand-off resistor at the video output of the detector chip. Bias off the vision i.f. channel to inhibit noise, and display the a.f. output at the i.c. pin going to the output stages. Inject a 50kHz deviated signal at 6MHz and tune the quadrature coil L3 for maximum undistorted sound. Reduce the input until the trace distorts or goes ragged, then align the input circuit L1 and L2 for maximum clean signal. If the i.c.'s gain produces limiting so that a definite maximum cannot clearly be seen, change to 30% a.m. and tune for minimum trace as this is usually a more precise indication – see Fig. 3(d). Check that the alignment holds good over wide ranges of input signal level.

Looking at the 6MHz Signal

A fault finding tip: with a good oscilloscope you can see the 6MHz intercarrier sound signal all the way from the vision detector to the i.c. input, using a × 10 probe.

Adjustment in the Field

If you are a bench engineer with a large hinterland the above methods are essential. They will permit the set to go anywhere and perform well. Faced with a "one off" situation – a set in the field – it is often possible to achieve good results with a minimum of equipment. If the vision i.f. strip is in good order you can rely on the broadcast for a stable 6MHz signal of good quality. Whatever a.m. you get will be picture buzz at field rate.

With ratio detectors a meter across the limiter electrolytic – C1 in Fig. 2(a) – will indicate tuning maximum. Peak all the coils, then tune L4 for maximum undistorted sound and RV1 for minimum buzz.

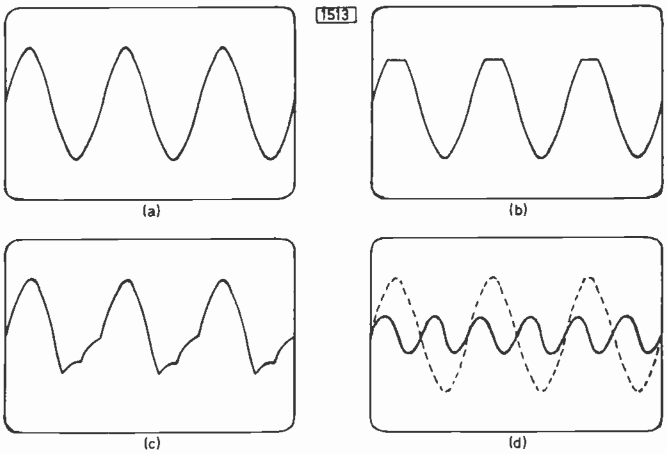


Fig. 3: Ouput waveforms from an intercarrier sound i.c. (a) Clean maximum sinewave. (b) Clipping due to the quadrature coil being off tune. (c) Distortion due to the quadrature coil being off tune. (d) Minimum a.m. tuning method – the off tune condition is shown by the broken line. Note that there are twice the number of peaks visible in the minimum a.m. condition.

With i.c.s you tune the quadrature coil L3 for maximum undistorted sound or, if it's flatly tuned, halfway between the two points where distortion creeps in. Then reduce the signal until the sound is noisy and tune L1 and L2 for maximum sound, rechecking L3. Restore normal signal and check for buzz. There is not a lot you can do if buzz is present, except put the alignment back to square one and try again. If buzz still persists you have a fault finding job on your hands.

CONTINUED NEXT MONTH

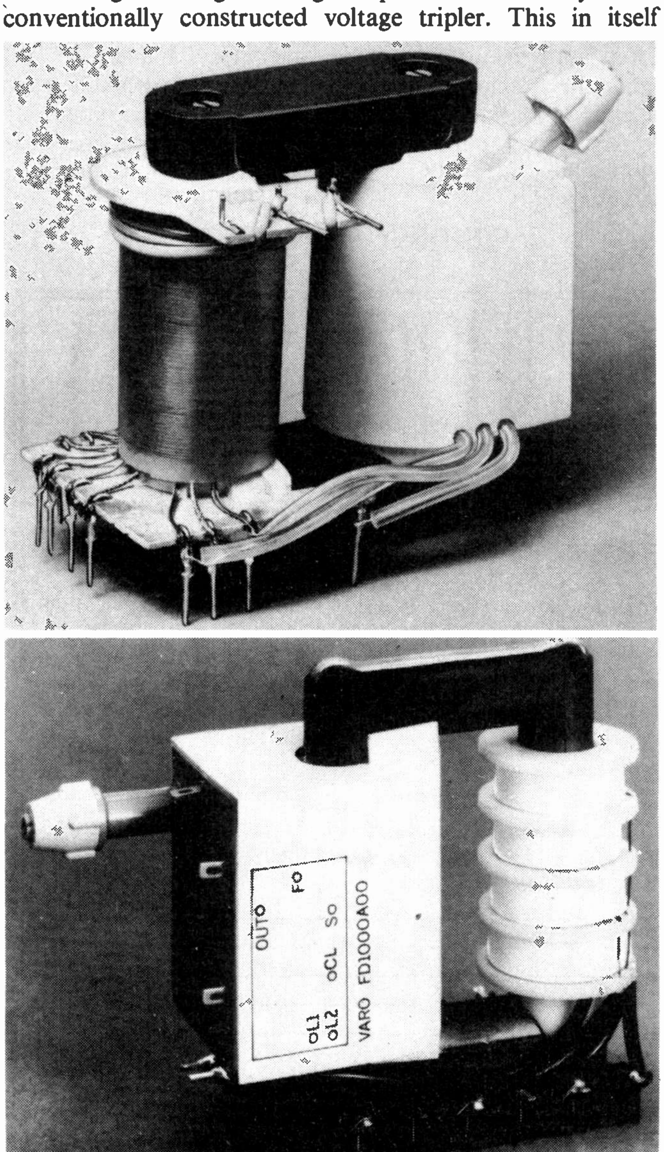
The Diode Split LOPT

Luke Theodossiou

THE idea of incorporating the e.h.t. rectifier into the line output transformer is not new. As we mentioned in an earlier *Television*, it was first patented in 1966 by E. K. Cole Ltd. of Southend. What is new is that the e.h.t. tripler itself has now been integrated into a new type of line output transformer. Extensive testing has indicated that the life expectancy of this unit is excellent.

Construction

The new transformer makes use of the interlayer capacitances between a number of secondary windings, thus eliminating the high voltage capacitors necessary in a conventionally constructed voltage tripler. This in itself leads to greater inherent reliability since these high voltage capacitors are largely responsible for tripler failures.



Two examples of the d.s.t. The one at the top is the Mullard AT2076/15. The other device is very similar but manufactured by Varo Semiconductor.

In practical designs, the primary winding and the auxiliary windings – which provide the l.t., reference flyback pulses, h.t. for the video output stages, etc. – are located on one leg of the core, the secondary windings, with the e.h.t. rectifier diodes and a link winding, being on the other leg. The link winding is connected in parallel with the primary winding and serves to eliminate the high leakage inductance that would otherwise exist between the primary and the secondaries as they are on opposite legs of the core. Fig. 1 shows the circuit diagram of a basic d.s.t.

Each of the secondaries has the same number of turns, so each secondary layer will have only a d.c. potential difference between each coil and no a.c. potential difference. This approach makes the interlayer insulation much easier. The diodes are connected as shown in Fig. 2, and a d.c. voltage is obtained whose value is the sum of the rectified a.c. voltages per layer. To obtain an output of about 25kV, four secondary layers and four diodes are used, each carrying a peak flyback voltage of around 7kV.

Practical Circuit

Mullard have designated their first d.s.t. type AT2076/15. This device was specifically designed for use in 20AX receiver designs. A practical line output stage based on the Mullard device is shown in Fig. 3, using the BU208A line output transistor and a diode modulator for EW raster correction.

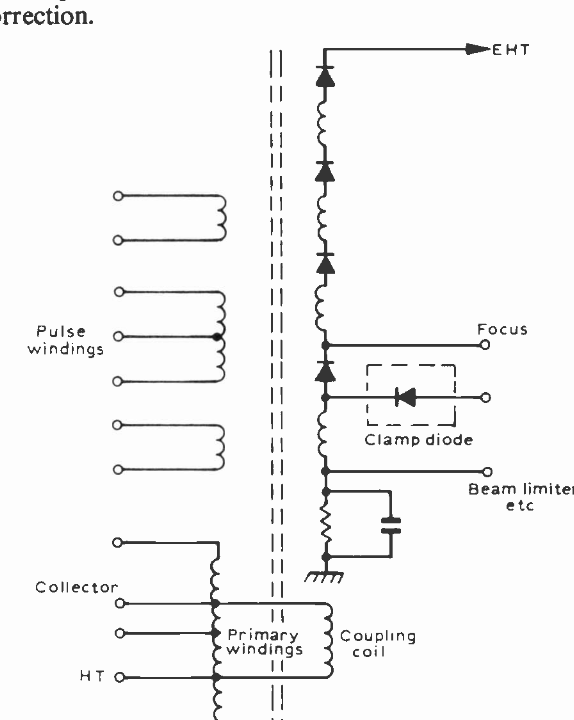


Fig. 1: Circuit diagram of a typical diode split l.o.p.t.

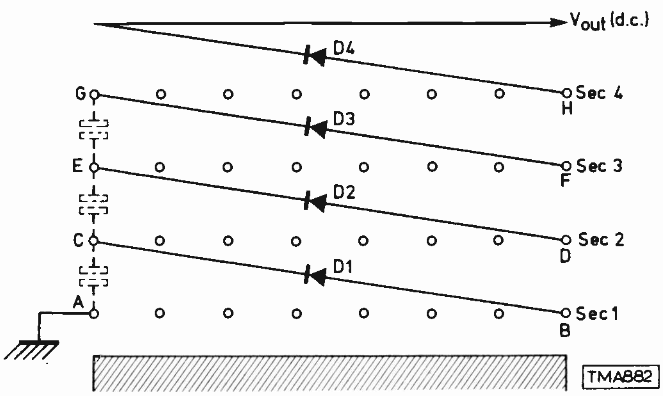


Fig. 2: Connection of the diodes between the layers on the e.h.t. overwind.

Unlike most recent designs, the EW modulator is of the high-level type, i.e. linked to the primary instead of to a secondary winding on the line output transformer. Since the 20AX tube's first anodes require a lower voltage than conventional tubes the BY184 first anode supply rectifier is fed direct from the collector of the line output transistor, thus reducing the loading on the transformer. As usual, pulses from the line output transformer are rectified to provide the video supply, but in this design the "cold" end of the winding is returned to the main h.t. line, enabling the winding to be reduced in size. Where a lower supply is required the rectifier (BY210-600) can be fed from pin 10 instead of pin 8.

Cost Advantages

Due to the lower manufacturing costs when compared to using a separate line output transformer and e.h.t. tripler, the d.s.t. is likely to offer the setmaker a price advantage. Also, storage and buying problems are reduced by half. Another point in its favour is the reduction in assembly time, again because one is dealing with one rather than two components. Diode split transformers are already in use in a number of continental sets and are currently undergoing evaluation trials with British setmakers for incorporation in the next generation of receivers which we are likely to be meeting later on this year.

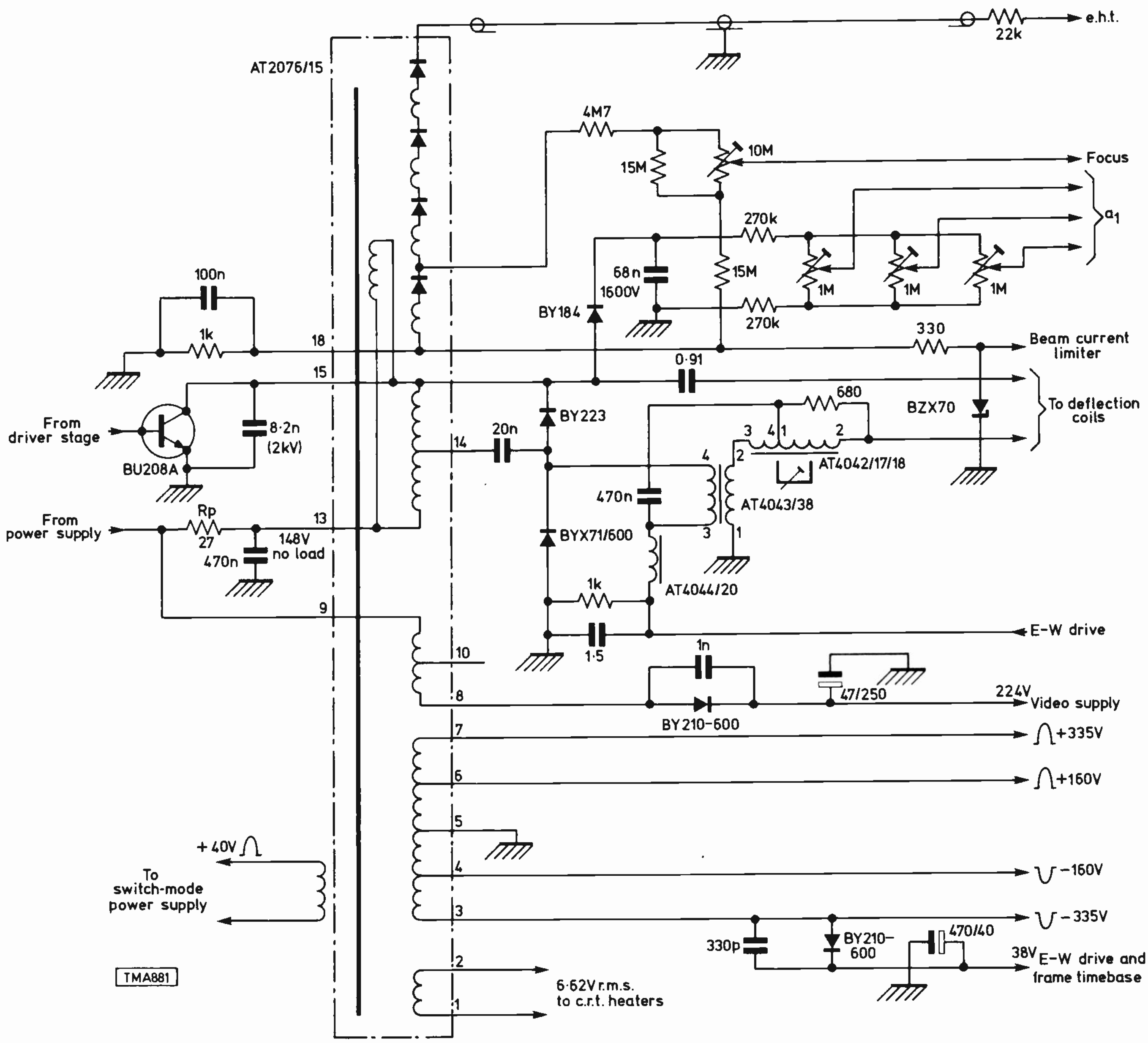


Fig. 3: Circuit proposed by Mullard Ltd. for use with their diode split transformers. This one is designed to drive the scan coils of 20AX tubes.

Service Notebook

G.R.WILDING

Cumulative Faults

Quite often the breakdown of a single valve or other component can cause a succession of other failures. Here are a few recent examples we have encountered.

The first set was a dual-standard Ekco monochrome receiver which gave neither sound nor picture due to an open-circuit mains input fuse. As we could find no short across either the mains input or the h.t. supply we fitted a new fuse and switched on. Sound soon developed, but the anode of the PY801 boost diode then began to glow and we noticed that the PL36 line output valve had a milky look due to a crack around its base. Both were changed but we could draw only the slightest of sparks from the anode of the PL36. Then, on removing the e.h.t. rectifier, a normal arc could be obtained. Replacing the e.h.t. rectifier restored a good picture and it was clear that the original one must have had an internal short as a result of which the PL36 and PY801 had been excessively loaded, the glass envelope of the former cracking due to the excessive heat dissipation.

The second case was a single-standard Pye hybrid colour receiver in which the line output transformer had arced across and burnt out before the h.t. supply fuse blew. On fitting a replacement transformer and fuse we noticed that the envelope of the PY500A boost diode was dimpled inwards where the arcing and heat had actually softened the glass. This was replaced therefore and after checking that there were no shorts and that all leads were well clear of the PY500A and the PL509 line output valve we switched on.

Slight sparking was noticed on the back of the line timebase/power supply printed panel (Pye 697 chassis), due it was discovered to the 5·6Ω surge limiter resistor breaking down. This was replaced therefore, and ample h.t. then appeared at the anode of the PL509. Only the smallest of arcs could be drawn from this point however. The valve was found to be running cool, so it seemed that its screen grid feed resistor was probably open-circuit. This turned out to be the case and after a replacement was fitted a good picture was obtained – after some preset adjustments for optimum definition, convergence etc.

Within about ten minutes however the main h.t. fuse blew, and the BY127 h.t. rectifier was found to be completely short-circuit. These rectifiers and others of the same general type are very robust and seldom go short-circuit. In this case it was likely that the combination of the arcing and the excessive heat from the original line output transformer had proved too much.

Incidentally, when removing the line output transformer from these sets remember that after unsoldering the tags and the four mounting brackets the whole unit must be lifted *up* slightly before trying to pull it out and clear. This is obvious if the replacement is already to hand because of the shape of the brackets. Otherwise however considerable frustration and also possible damage to the panel can occur when trying to extract the transformer after repeatedly checking the unsoldering.

Finally, on two occasions recently we have had the fault no sound in Decca 30 series colour sets due to a faulty component causing other components and the PCL82 audio valve to break down.

In the first case the PCL82 triode-pentode was found to be quite cool. Both anode circuits are fed by a common 1·8kΩ feed resistor which was open-circuit. We next took a look at the pentode section's 390Ω cathode bias resistor, and as expected this was burnt, with reduced value. The likelihood was either that the resistor had fallen in value damaging the valve through the resultant excessive current, or that the valve had been slightly soft producing excess current which burnt the cathode resistor. The two resistors and the valve were replaced, restoring the sound, but within ten minutes distortion developed and got rapidly worse. The cause of all this trouble turned out to be a leaky 0·1μF coupling capacitor between the triode anode and the pentode control grid. It was necessary to change both this and the cathode bias resistor which had already fallen in value.

In the second case the PCL82 was again cool but this time its pentode cathode bias resistor had burnt out. We changed this, the valve and the coupling capacitor and normal sound was restored. Within minutes however there was a crackle and the sound went off. Voltage checks revealed that there was only a flicker of voltage at the anode of the pentode, due to a break in the sound output transformer primary winding. So the final cumulative effect this time was a damaged transformer. A replacement gave lasting normal results.

Field Hold Problem

The field hold control on a Bush Model TV161 gave positive lock with considerable tolerance each side of the optimum setting. Despite this it was necessary to readjust the control several times during an evening. An over-advanced contrast control causes weak field hold on these sets – and in fact many's the service call for occasional picture slip solely to make this adjustment. It didn't work in this case however, and a new PCL805 field timebase valve and interlace diode failed to give any improvement. Although there was no suggestion of bottom cramping, the fault was eventually cured by replacing the output pentode's 500μF cathode decoupling capacitor.

No Sound, No Screen Illumination

The owner of a Pye colour receiver fitted with the 697 chassis reported that the sound and all screen illumination had suddenly gone. On trying the set again later however both had momentarily reappeared. On inspection we found that although no sound signal was present there was a pronounced speaker hiss, indicating that the i.f. and audio stages were in order and that the trouble was probably lack of l.t. to the tuner. Failure of the raster to appear even though there was ample e.h.t. was probably connected with this.

On removing the back we noticed that there are two high-wattage resistors on the varicap tuner panel, clearly there to drop the voltage. There was zero voltage at both ends of

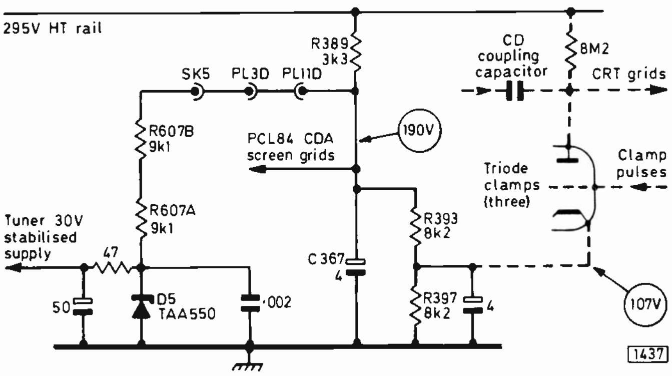


Fig. 1: When R389, which feeds the screen grids of the PCL84 colour-difference output pentodes, went open-circuit the symptoms were more complex than expected. Since the varicap tuner's stabilised supply is obtained from the same point there was no sound either. And since the clamping potential for the c.r.t. grid circuits also comes from this point, via the potential divider R393/R397, the c.r.t. grids were at d.c. levels below that required to sustain beam current, thus blacking out the screen.

these resistors however, confirming our supposition that the lack of sound was due to lack of supply to the tuner. On looking up the circuit we found that these resistors (see Fig. 1) are R607A and R607B, which together with the zener diode D5 provide the tuner's stabilised 30V supply. The 190V feed to these resistors is obtained from the junction of R389/C367 on the colour-difference amplifier panel – these components also supply the screen grids of the PCL84 colour-difference output valves. The supply route to the varicap tuner panel is via plugs SK5 and PL3D on the i.f. panel. These proved to be in order, the loss of voltage turning out to be due to R389 being open-circuit. The electrolytic (C367) was checked for leakage but was found to be o.k., and on replacing R389 normal sound and vision were restored.

Until the circuit was closely examined it was difficult to see why the missing 190V supply had blacked out the raster – the luminance output stage and the beam limiting circuit were in no way affected while the colour-difference output stages are a.c. coupled to the c.r.t. grids. The cathodes of the clamp triodes however are fed from the same source – from the junction of R393/R397. There is normally about 107V at this point, but since R389 was open-circuit current flowed through R397 only when the clamp triodes were saturated by the clamp pulses. In consequence the mean voltage at this point was very low and the colour-difference coupling capacitors were being charged to this proportionately very low figure during the flyback (clamping) period, thus biasing the c.r.t. guns beyond cut-off.

Focus Trouble

After replacing the power supply panel – due to dried up electrolytics and a faulty thyristor – in a Murphy Model CV2212 (Rank 90° solid-state colour chassis) it was evident that the picture definition was poor due to poor focusing. We tried adjusting the focus control, but the setting seemed to be indefinite, due maybe to dust on the v.d.r. element with which the slider makes contact or to one of the 4·7MΩ series resistors at each end of the focus control being defective. We were about to investigate further in this area when severe arcing suddenly developed on the c.r.t. base panel – in fact across the spark gap associated with the focus supply. On switching off and checking this we found it completely useless, so a replacement was fitted. After cleaning up the base panel we switched the set on and found that the focusing gradually built up to a good level and then deteriorated, in a regular manner, at about four second intervals. We then noticed that the 100kΩ resistor feeding the c.r.t. focus electrode was somewhat discoloured, and on changing this first class and adjustable focus was obtained. It seems that the resistor was responsible for the indefinite focus, having gone virtually open-circuit following the arcing across the spark gap.

No Picture

An Hitachi CAP160 colour set was brought to us with the complaint no picture. This was found to be due to lack of e.h.t., in turn due to the line output transistor not working (it was cold). There was ample h.t. at its collector, but zero base voltage instead of the slight negative voltage that should have been recorded here. The absence of this voltage could have been caused by the transistor's base-emitter junction being open- or short-circuit – since the potential is developed by its diode action on the input – or by lack of drive. The base-emitter junction is, as usual, shunted by the low-resistance secondary winding of the driver transformer, plus a miniature choke, so couldn't be tested without unsoldering – and even then simple resistance tests aren't really conclusive. On taking voltage measurements in the driver stage we found that instead of the usual small negative base voltage to be expected during normal operation. there was a small positive potential. This again suggested lack of drive so suspicion fell on the line oscillator. As shown in Fig. 2, this consists of a pnp transistor in a

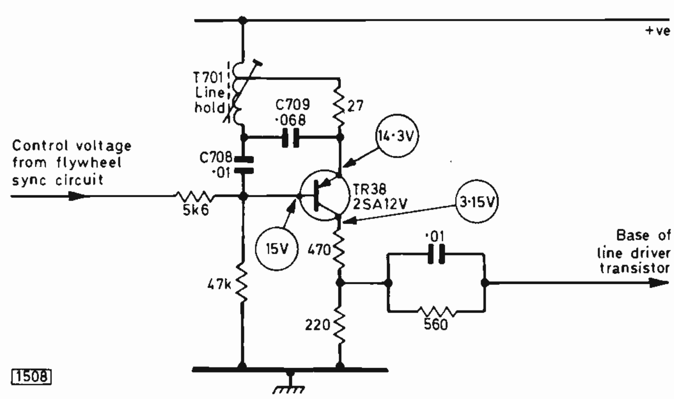


Fig. 2: Line blocking oscillator circuit used in the Hitachi colour Models CAP160 and CEP180.

blocking oscillator configuration using a tapped coil instead of a double-wound transformer. Here we found that instead of the 0·7V reverse base-emitter bias that should have been recorded the junction was actually forward biased, while the collector voltage was above the correct figure. This suggested that the stage wasn't oscillating, though the transistor was conducting and therefore probably all right. The most likely cause of the trouble was that one of the two capacitors in the stage was defective, and on replacing C708 and switching on normal results were restored, the hold being solid with no need to adjust the coil.

Portable with Small Picture

A mains/battery portable fitted with the Thorn 1590 chassis was brought in with the complaint that the picture was small. In fact there was a $\frac{1}{4}$in. gap all round and clearly the l.t. rail was low. On removing the back we found that the series regulator transistor was cold. It was clear therefore that power was being fed to the set via its shunt resistor – R99, 10Ω in this chassis. The first suspect was the regulator transistor itself but before testing it we decided to check the voltages in the circuit, beginning with the error sensing/regulator driver transistor. Its base is fed, as usual, by a potential divider connected across the stabilised l.t. rail, but there was zero base voltage instead of 5V. We next checked the voltages at each end of the preset "set HT volts" control in this potential divider network and discovered that while l.t. was present at one end there was no reading at the other, despite its being returned to chassis via a 120Ω resistor. There was clearly a break in the preset's track, and this proved to be the case. A replacement control restored a normal sized picture.

Blank Screen, No Sound

There was no raster or sound on a Pye colour receiver fitted with the 697 chassis, although the valves were lighting up normally and a healthy spark could be obtained at the anode of the PL509 line output valve. A further test showed that there was ample e.h.t. being delivered to the tube. The tripler was in order therefore and it was assumed that the loss of picture and sound were due to a single cause. A start had to be made somewhere, so we checked the c.r.t. cathode voltages. These were found to be at approximately the h.t. rail potential, thus biasing the tube past cut-off. Going back to the anode of the PL802 luminance output valve we discovered that the voltage was 295V instead of 216V. The valve was clearly not conductive, though there was ample screen grid voltage. On contacting the control grid pin a comparatively high negative voltage was recorded, and this did not vary as the brightness control was adjusted.

As in many other hybrid sets which use colour-difference tube drive, the signal is a.c. coupled to the control grid of the luminance output pentode, a d.c. restorer diode, following the coupling capacitor, being returned to the slider of the brightness control. Brightness control is thus effected by altering the d.c. restoration potential at the control grid of the luminance output pentode. The brightness control itself is connected between positive and negative 20V l.t. rails, the slider normally varying between almost –20V and a slight fraction of a volt positive. The trouble was due to absence of the +20V rail, this also explaining the loss of sound.

The positive and negative 20V l.t. rails – plus several others – are obtained from a bridge rectifier (D51) which is mounted upright at the extreme bottom right-hand corner of the line timebase printed panel. We found that the extreme corner of this panel had been forced back at some time, producing a crack across the print – in particular across the positive output from the bridge rectifier unit. This had probably occurred when the hinged panel had on some previous occasion been lowered to gain access to the inside. On removing a screw from each side of the main panel, and another which secures the tripler to the bottom of the chassis, the panel can be lowered to make component replacements easy. On connecting a jumper lead from the rectifier unit to the positive supply print, normal sound and picture were restored.

Korting Hybrid Colour Chassis

One of these sets was brought along with normal sound but no raster. The most likely possibilities were no e.h.t. or no field output – since a feature of this chassis is a protective circuit which cuts off the c.r.t. in the event of field collapse, thus avoiding damage to the tube caused by a bright

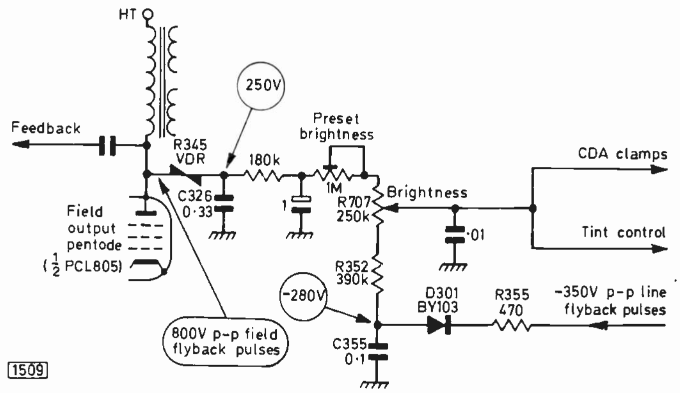


Fig. 3: The brightness control in Korting hybrid colour sets is strung between positive and negative potentials, the former being obtained by rectifying the field flyback pulses. Thus field collapse also blacks out the screen, protecting the c.r.t.

horizontal white line. The spark at the anode of the PL509 line output valve was much smaller than usual, so it seemed that the trouble was almost certainly insufficient or zero e.h.t. A new PL509 failed to improve matters, and on disconnecting the tube anode cap no corona was observed and only a very small arc could be obtained. We then noticed that the tripler was quite warm in one place – a sure indication of failure – and after removing it a more than ample spark could be obtained from the PL509's anode.

On subsequently obtaining and fitting a new tripler the picture took much longer than normal to appear and was then of poor brightness. We noticed that while the valves were glowing normally the three c.r.t. cathodes were below normal temperature, suggesting a dry-joint on the mains transformer or the c.r.t. base connector. Resoldering all suspect connections failed to improve the tube's heater voltage however and after running for a few minutes the heaters went out due to their 2A supply fuse going open-circuit. On fitting a replacement fuse the picture appeared in the normal time but the brilliance was excessive, the main brightness control having no effect. The tube heaters were now glowing normally and it appeared that previously their supply fuse must have been "high resistance" – at the soldering connection between one end of the fuse wire and the end cap (with a heater current of 0·9A, even one or two ohms will seriously curtail the required supply).

The brightness control circuit used in these receivers is most unusual and is bound up with the safety feature previously mentioned. Fig. 3 shows the arrangement. The 800V peak-to-peak field flyback pulses are rectified by the v.d.r. R345 to produce 250V across C326, while –350V peak-to-peak line flyback pulses are rectified by D301 to produce –280V across C355. The brightness control, which operates on the colour-difference output stage clamps and is linked to the tint control, is connected in a resistor network between these two potentials. Clearly if the field collapses there will be no flyback pulses, no positive voltage will be developed across C326, and a negative voltage will be fed by the brightness control to the CDA clamps, blacking out the picture through their effect on the c.r.t. grids.

In this particular case the voltage at each end of the brightness control was almost the same, so that it had virtually no effect on picture brilliance which remained near peak. The cause was no negative potential across C355 of course, and the first suspect was naturally the diode. This turned out to be in order however, the trouble being due to R355 having gone open-circuit. On replacing this resistor and making a few adjustments to the presets a first class picture was obtained.

LONG-DISTANCE TELEVISION

ROGER BUNNEY

TRADITIONALLY, November is the month of fog – and enhanced Tropospheric conditions in the UK! This year of 1976 saw neither fog nor any significant Tropospheric reception however. Indeed only rain seems to have been abundant in Southern Hampshire of late, and as I type these lines on the morning of November 29th there is heavy rain and blustering wind outside – with a promise of gusts up to 85m.p.h. Fortunately there has been a certain amount of reception to keep the month alive, mainly via Sporadic E though not at the levels of last summer. The month featured some SpE, Trops and Meteor Shower (MS) signals – plus the rare event of Auroral reception.

My log for the month is as follows:

1/11/76 DFF (East Germany) ch. E4 (MS).
3/11/76 DFF E4; TVP (Poland) R1; NRK (Norway) E2 – all MS.
5/11/76 DFF E4; NRK E4; SR (Sweden) E2; WG (West Germany) E2 – all MS.
7/11/76 DFF E4 – MS.
8/11/76 DFF E4; TVP R1 – both MS.
12/11/76 DFF E4; SR E3; WG E2 – all MS.
13/11/76 WG E4; SR E4; TVP R1 – all MS – plus mystery pattern on ch. E4.
14/11/76 DFF E4; Swiss E3 – both MS; NRK E2; TSS (USSR) R1 – both SpE.
15/11/76 DFF E4; CST (Czechoslovakia) R1 – both MS; TSS R1 – SpE.
16/11/76 DFF E4 – MS.
17/11/76 DFF E4 – MS; unidentified programme on ch. E2 (thought to be SR or NRK) via SpE.
18/11/76 WG E2 – MS.
20/11/76 DFF E4; DR (Denmark) E3; TVP R1 – all MS.
21/11/76 DFF E4; WG E2 – both MS.
22/11/76 CST R1; NRK E4 – both MS.
24/11/76 DFF E4; NRK E4; SR E4; JRT (Yugoslavia) E3 – all MS.
25/11/76 DFF E4; SR E3, 4 – all MS; improved Tropospherics (with WG Band III/u.h.f.).
27/11/76 MTV (Hungary) R1; RAI (Italy) IB – both MS; NRK E2, E3 – all SpE.

In addition, increased MS was noted around the Leonids Shower time (17th). The Aurora was logged by Clive Athowe (Norwich) on the evening of November 11th, producing signals from NRK, SR and RUV (Iceland). The signals were typical unstable types, though RUV produced very strong signals to the north west after 2330. The Tropospherics improved on the 18th-21st, towards the south and east, signals from East Germany reaching Anglia at u.h.f. while Hugh Cocks (Devon) received DR and NRK in Band III. The 25th saw improved Trops at Romsey, with several West German stations at both v.h.f./u.h.f. Unfortunately I was involved in changing tuners – from the Mullard ELC1043 to the "05" improved version. On switching on, the channel positions had changed and some time had to be spent in recalibration. On the 13th, a mystery test pattern consisting of small black squares (chessboard) was logged on ch. E4 at 1450GMT. Although its origin is unknown I strongly suspect JRT: any ideas? Generally, November has been an unusually rewarding month compared to previous years, particularly with respect to Sporadic E – good signs possibly for an active mid/late December SpE period.

On the 4th I erected a temporary two-element wideband Band I aerial on the mast at 32ft, in order to minimise the interference from the Cossor computer installation at the local brewery close by. As of this date there has been no reduction in the interference despite various written approaches to the manufacturers, so the wideband (48-105MHz, high-level) interference continues. Following my original letter at the end of September an engineer experimented with silver foil screening, but although a reduction in interference was measured no modifications have been incorporated. I feel that by the time this column is read some action will have been initiated however. The new array does allow reception to continue but with its inherent limitations, i.e. fixed to the east and with no amplifier at the masthead.

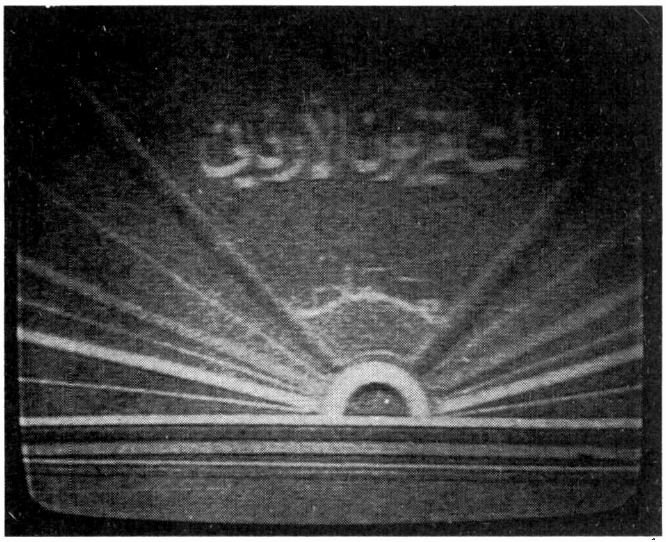
Meteor Shower Dates for 1977

We are greatly indebted to the BAA and to Keith Hamer (Derby) for the following 1977 MS dates (peak days):

Quadrantids	January 3rd at 1600.
Lyrids	April 22nd at 2400.
Lyrids	15/16th June.
May Aquarids	5th May.
Delta Aquarids	27/28 July.
Perseids	August 12th at 1200.
Orionids	21st October.
Taurids	8th November.
Leonids	November 17th at 1300.
Gemenids	14th December.
Ursids	22nd December.

News Items

USSR/India: A report indicates that the Russian authorities have offered India the use of a broadcast satellite to allow continuation of the successful ATS SITE experiment. Although no frequencies are mentioned, the 714MHz Statsionar T satellite must be borne in mind, always assuming that the receivers can be retuned from their designed for frequency (860MHz). India is continuing with the expansion of its terrestrial transmitter network, and plans to have its own satellite for TV broadcasting towards the end of this decade.



The rising sun, as seen at programme start on Jordan TV. Received in Hungary, 1976, on ch. E3.

Saudi Arabia: SECAM colour programmes are now being transmitted following a six month installation and testing period. Five colour studios have been equipped at Riyadh, Jeddah, Damman, Kassim and Medina, with an extra transmitter at Damman.

Subscription Reminder

The subscription for the 21st edition of the *List of Television Stations, European Broadcasting Area* is now due. Incredibly, no increase this year. At 400 Belgian Francs (approximately £7.00) we can thoroughly recommend this publication with its six bimonthly supplements and map as the most accurate transmitter list available – essential to all enthusiasts! Available from the European Broadcasting Union, Technical Centre, 32 Avenue Albert Lancaster, 1180 Bruxelles, Belgium.

In Brief

An additional 10kW AIR transmitter is in operation at Madras. . . . Additional transmitters and the start of PAL colour is anticipated during the 1976-1980 Malaysian five year plan. . . . The 2kW transmitter at Pointe-Noire in the Congo has been increased to 10kW. . . . Sri Lanka is contemplating establishing a TV service with assistance from Yugoslavia . . . the Sarajevo TV network in Yugoslavia will start a second TV network, in colour, during the next five years, with separate facilities and networks. Already the Mt. Bjelasnica transmitter for Sarajevo-2 is in operation, covering a wide area of Bosnia. The new Rijeka TV network (mono) is now in operation. It's able to network, which may well mean a new caption to be seen from JRT via SpE!

The Koran, again from Jordan TV. This usually precedes the start of programmes.

Rumanian Television

Peter Vaarkamp (Lunteren, Holland) recently wrote to the TVR authorities at Bucharest for information on their TV service. It seems that the Bucharest ch. R2 transmitter normally radiates the *TVR-2* programme – except when TVR-2 programmes are not available, TVR-1 programmes then being radiated. The list of transmitters indicates that the ch. R2 outlet carries only TVR-2 material. The seven main transmitters which could be received in the UK during an SpE opening are as follows: Bucharest ch. R2 100kW (TVR1/2); Oradea R3 120kW; Semenic R3 15kW (vertical); Suceava R4 100kW; Bucharest R4 75 kW; Birlad R5 50kW (vertical); Gheorghieni R5 50kW. Programme timings (average) are as follows, all times GMT.

First programme

Sunday	06.30-20.30 (station identification 06.20-06.30)
Monday	14.00-20.30 (station identification 13.50-14.00)
Tuesday-Friday	08.00-11.30 (station identification 07.50-08.00 and 13.50-14.00)
Wednesday-Thursday	14.00-20.30 (station identification 07.00-11.00 and 13.50-14.00)
Saturday	09.00-21.00 (station identification 08.50-09.00)

Second programme

Sunday	08.00-09.30 and 18.00-20.30
Monday-Friday	15.00-17.20 and 18.00-20.30 (station identification 14.50-15.00)
Tuesday Thursday	18.00-20.30
Saturday	–

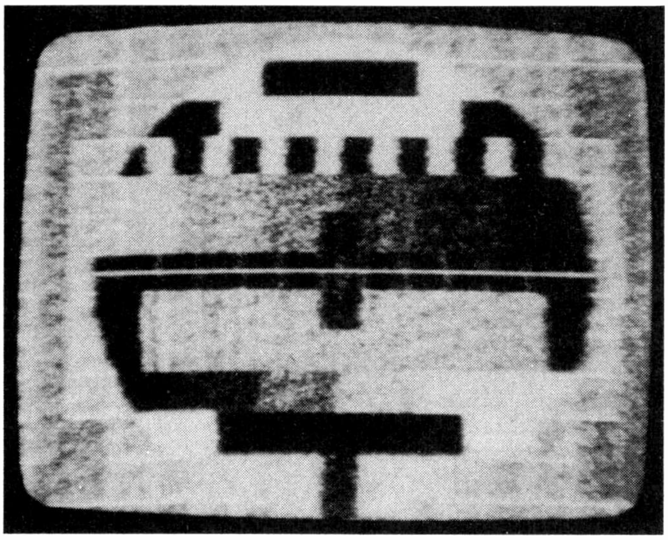
Belgian Television

As previously reported, changes are to be made in the Belgian service – the establishment of a second network and alterations to the transmission standard. One startling development is that the ch. E2 outlet has been dropped, the Ruislede/Aalter 100kW transmitter being no longer listed. Dare we hope that this is an omission?

From our Correspondents . . .

Peter Vaarkamp (Holland) has written on various matters. First, RUV (Iceland) has been seen using the PM5544 pattern on ch. E3 with the indentification "RUV" at the bottom. At the same time the E4 outlet was noted with the usual electronic pattern. A new ch. E60 transmitter has been built at Aetos, Greece for the Yened network. Finally, current work being carried out in West Germany on the Schoksberg Mountain near Puttlingen-Kollerback/Riegelsburg is for a new high-powered transmitter which will increase the ZDF/ARD3 coverage in the Saarland from 77/72% to 92%.

The Sporadic E season in Australia seems to be well under way. Anthony Mann (Applecross, WA) has sent us an impressive shot of the ch. E2 outlet at Sempah received on October 21st for almost three hours. Both this and an E3



A Malaysian signal on ch. E2, received in Australia at some 3,000 miles via Trans-Equatorial Skip (Anthony Mann).

transmission received for a shorter period displayed a blank PM5544 pattern interspersed with cartoons!

Ryn Muntjewerff (Holland) has sent us shots of his new mast – the earlier one collapsed during bad weather. The new installation consists of the following from the top down to the rotor. Doubled MBM88s for group C/D, B and A, two wideband Band III arrays and an eight-element f.m. aerial, made by Jaybeam, Wisi and Fuba respectively. Elsewhere are mounted a nine-element log-periodic Band I aerial, a vertical ch. E4 aerial and a horizontal ch. IC array. Altogether a most impressive system: the results obtained certainly match the aerials employed.

VHF Propagation via the F2 Layer

The duration of the sunspot cycle is approximately eleven years, during which time the sunspot count rises to a very high figure relative to the minimum. As the sunspot activity increases, so the maximum usable frequency (m.u.f.) for F2 layer propagation rises – due to the increased radiation from the sun. The increased m.u.f. usually reveals itself to short-wave listeners when the h.f. broadcast and amateur bands, which are normally very quiet with little sunspot activity (except when Sporadic E conditions are present during the summer months), start to fill with signals.

At the present time we are on the ascending slope of a new cycle (Cycle 21). Thus towards the end of the decade we should be experiencing greatly increased m.u.f.s. It's impossible to give an exact forecast of the intensity the next peak will reach of course, but there are indications that the next period will be more active than the last, all time low cycle.

Very few of the present UK DX-TV enthusiasts were active during the record breaking Cycle 19 in the late fifties when, at the peak, the m.u.f. on the east/west North Atlantic path rose to 60MHz, giving TV reception in both directions. Conditions were so good during the late fifties that the ch. B1 Crystal Palace signal was received at one time or another virtually world-wide. During the last cycle (20) however the conditions were such that propagation of low v.h.f. signals was only just possible. Examples of such signals are the North American paging stations, various v.h.f. mobile transmitters in similar areas, and regular morning reception of Russian communications and scatter signals. The North American paging stations operate, with a few exceptions, in the 35 and 38MHz bands and are easily recognizable since the transmissions consist of a voice or CW identification interspersed with messages for subscribers. One of the most easily received stations is KIY508, Orlando, Florida on 35.22MHz. Of the stations received during the last sunspot peak I think the best catches were WWA335 San Juan, Puerto Rico and KKI445 Houston.

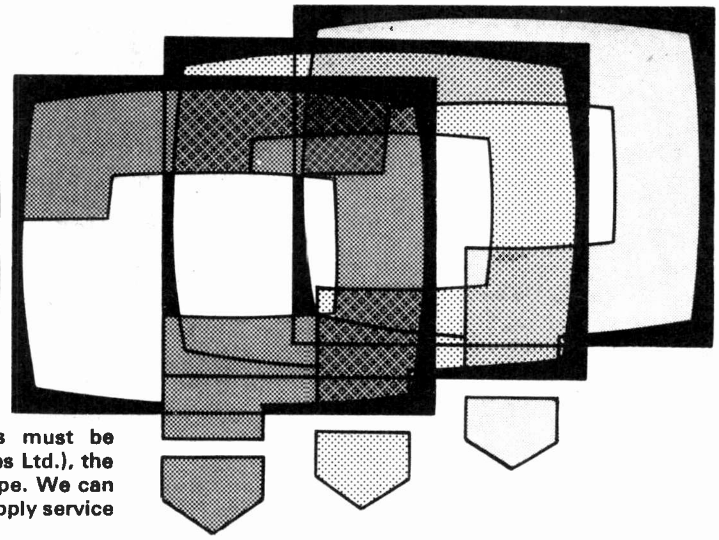
The increased m.u.f. when the sunspot peak occurs is particularly noticeable in winter, since the electron density in the F2 layer is then greater. And since the phenomenon depends on the sun's radiation it occurs during daylight, particularly at noon. The F2 layer is the highest one in the Ionosphere, at some 200 miles during winter daylight, so a reflected incident signal will appear at some distance – the skip distance in fact is commonly 2,000 miles upwards for single-hop signals. If (hopefully) the sunspot activity this time rises to a very high level there is a good chance of multi-hop signals – that's how the ch. B1 signal arrived in Australia last time.

With the increasing number of stations operating in Band I on the African continent there are good possibilities of receiving signals from this area in the UK. In fact reception along a north/south path is more likely since the m.u.f. will be high the whole way – the east/west path is generally critical, necessitating a peak at noon at the mid-point along the path for reception to be possible. The time during which a signal can be received along an east/west path is less therefore but can be calculated for a particular transmitter/receiving site. Ferdinand Dombrowski, who was very active in the late fifties at Milwaukee, received Crystal Palace on many occasions. The signal would appear just before 0900 local time, and remain for about half an hour before receding into the noise. During the last sunspot maximum I had the exasperating experience on two occasions of receiving a line sawtooth for over ninety minutes without any form of identification before the signal faded out. It had the typical F2 propagation characteristics of multiple images and smearing, and I strongly suspect that the signals were from either Nigeria or Ghana since they came from a southerly direction. Another effect occurs in the F2 layer when sunspot activity is high. From dusk onwards the layer "breaks up into blobs" as the single night time F layer forms. Whilst the dispersal is taking place incident signals may be diffused and reflected. In fact at times signals are reflected at a much higher m.u.f. than during daytime. The effect is known as Trans-Equatorial Skip, or Spread F, and as this suggests the signals involved come from within the Equatorial belt, between $\pm 40°$. This evening propagation tends to be along a north/south line and within the UK there has been reception in Band I from Rhodesia, Ghana and Nigeria.

If sunspot activity increases dramatically during the winter – even if only for a short period – it will pay to observe carefully the low Band I frequencies at noon and dusk with the aerial pointing south. For those with short-wave radio receivers there are several international broadcasters with "Listener Club" type programmes which detail propagation conditions, while monitoring the h.f. end of the short-wave spectrum will give a clue to improving conditions.

Finally a word of warning. *Never* look at the sun directly or through binoculars or a telescope to check for sunspots – your eyes will be damaged. Never use such an instrument even with a filter. You can project the sun on to a card using a telescope, thus giving indirect observation of the sun's surface. But don't ever attempt to sight the telescope with the eye – a moment's glance can and will result in damaged sight.

Your PROBLEMS solved



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GEC C2149

The trouble with this set is a white line stretching across the top of the picture on dark scenes. It's approximately half an inch high. It's not noticeable on a bright picture and sometimes goes on older films, but on a dark picture is really bad.

If C203 which decouples the feed from the brightness control to pin 6 of the TBA560AQ i.c. on panel PC446 is 0·047μF change it to 10μF. Alternatively there could be a fault in the field flyback blanking circuit, in which case try replacing C463 (0·1μF) on the field timebase panel PC467. (GEC C2110 series.)

ULTRA 6818

There is loss of line hold after about an hour's operation. This occurs much sooner if the channel is changed. The hold control has some effect, limiting the number "lines" across the screen to three. Switching the set off for a period restores the picture, which is otherwise excellent. The fault occurs on both mains and battery operation.

There seems to be a heat sensitive component in the line oscillator stage, around VT23 and VT24. Instead of allowing the set to cool down by switching off wait for the fault to occur then try cooling each component in this area individually. Check the flywheel sync discriminator diodes W9/W10 and the four electrolytics C93, C94, C96 and C98 in this way. An aerosol cooling agent such as Freezit, or even switch cleaner, can be used. (Thorn 1591 chassis.)

DECCA CS2213

I have been unable to get a stable picture on this set. The PCF80 sync separator and PCF802 line oscillator valves have been changed and no amount of adjustment of the line oscillator coil helps.

First suspects are the flywheel sync diodes D402/3 – replace with type 1N914, 1N4148, BA148 or BY206 diodes. Next check the line sync coupling capacitor C416 (470pF), the flywheel filter resistor R434 (1·2MΩ), and the integrating and filtering capacitors C420-C422. The capacitors in the line oscillator circuit are also suspect, particularly the feedback coupler C427 (470pF). Another possibility is the electrolytic coupler to the first sync separator stage which is on the decoder panel. This is C213 (2·5μF). (Decca series 10 chassis.)

FERRANTI T1095

There is sound, line whistle, and all the valves light up except for the DY87 e.h.t. rectifier. Also R77 is overheating.

The overheating of R77 has nothing to do with the loss of e.h.t. It's the field output valve's cathode bias resistor and the trouble is probably due to this valve being faulty. For the e.h.t. fault, first lift the DY87's top cap: the valve could be shorted internally. If this is not so lift the PY800 boost diode's top cap. If this action restores some life to the line output stage change the boost capacitor C97 (0·1μF) which could well be short-circuit. Otherwise, the line output transformer could be at fault. (Pye 11U series.)

DECCA CS2611

A very good picture appears after the initial warm up period but on the right-hand side of the screen there is a wave which runs from the bottom to the top of the raster, sometimes very slowly. There is also a horizontal shadow which can be seen very faintly and runs at the same speed.

This is a fairly common complaint on these sets and will be cured by replacing the h.t. reservoir/smoothing electrolytic capacitor block C601/2 (400+400μF). (Decca series 10 chassis.)

BUSH TV315

The brightness control had to be adjusted because the picture got darker. Then both the picture and sound went. On inspection the line output and boost diode valves appear to have been overheating, there is a slight crack in the base of the e.h.t. rectifier's valveholder, and the line output valve's fusible screen grid feed resistor was found to be open-circuit.

The overheating of the PL504 line output valve and its screen grid feed resistor suggest lack of drive from the EF184 line oscillator. Check this valve and the associated components, especially the flywheel sync discriminator diodes 3D6/7, the tuning and feedback capacitors 3C32 and 3C34 respectively, and the 10μF supply decoupling electrolytic 3C31. If the oscillator is running however – proved by –40V or more at pin 1 of the PL504 – suspect the boost capacitor 3C44 or the line output transformer. If the surge limiter resistor 3R67 which is fed from pin 2 of the line output transformer is overheating change the associated l.t. supply rectifier 3D8 (BA148). (Rank A774 chassis.)

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GRUNDIG 5010GB

The trouble is in the thyristor line output stage in this set – the tuning capacitors C516/C518 keep on burning out. As I have not been able to obtain direct replacements I've used 0·22μF ones rated at 1kV, but these regain the picture for only twenty minutes or so. This is turning out to be rather a costly business! Other components in the output circuit have been checked and found to be o.k., but the voltages are incorrect.

The correct value of these resistors is 0·15μF and since they form part of a resonant circuit the use of incorrect replacements is likely to be the cause of the wrong voltages. These capacitors are very critical as to capacitance value and, especially, ripple current rating: ordinary components will not do. It is essential to obtain the correct replacements from the manufacturers.

ALBA T10

After a few minutes the picture pulls over to the left and the field hold becomes critical, the picture flicking upwards a couple of times periodically. Resetting the a.g.c. control seemed to clear the fault, but when the set was switched on again a while later the verticals were found to be bent over slightly to the left, like hum on the picture. This became worse though the picture did not break up horizontally. These bends in the picture are sometimes stationary and sometimes move slowly downwards. Two or three black bars can be seen on a blank raster. As this seems like a hum problem I have checked all the timebase and power supply electrolytics, but without success. There is no hum on the sound.

It seems to us that there is an open-circuit capacitor in the a.g.c. circuit. Unfortunately we cannot pinpoint any particular one. There are several electrolytics here which should be checked – C115 (33μF), C124 (10μF), C114 (4·7μF), C125 (220μF) and C126 (10μF).

BUSH CTV184

The picture is normal when the set is first switched on, but after ten minutes it begins to climb up from the bottom until the bottom of the picture is an inch or so above the lower edge of the tube face. The top and the rest of the picture are not affected in any way. The field output transistors have been replaced – that cured the trouble for a time – but six weeks afterwards the trouble returned.

We suggest you check the field charging capacitors 5C30 and 5C31, and the field driver transistor 5VT10 (AC128). More remote possibilities are 7C5 (400μF) on the convergence panel – it forms the field scan current earth return path via the convergence circuits – and the field output stage bias stabilising thermistor 5TH1 (VA1034). (Rank A823 chassis.)

DEFIANT 9A51

As the set warms up the field hold becomes unstable and cannot be locked by adjusting the control. The PCL85 field timebase valve and the ECH84 sync separator have been replaced, also the PCL85's cathode components.

If you examine the underside of the timebase panel you will see that the components are all numbered. Check resistor 527 (270kΩ) which is in series with the field hold control, and the cross-coupling capacitors 516 and 517 (both 0·01μF). (First Plessey dual-standard Chassis.)

HMV 2704

On switching the set on the picture is excessively bright so that the brightness and contrast controls have to be turned right back, giving a very washed out picture. After about twenty minutes the picture goes very dark and after resetting the brightness and contrast controls the picture is perfect. The sound is unaffected and the picture remains excellent for the rest of the evening after this initial disturbance.

Check the beam limiter transistor VT901 and set up the beam limiter and preset brightness controls as described in the manual. If the problem persists, check the offset pulse generator and adder transistors VT204 and VT205 on the video board, and the associated OA91 diodes W202/3. (Thorn 3000 chassis.)

PYE CT203

The right-hand side of the picture is normal but the left-hand side has a dominant yellow tinge. On checking the guns separately, I find that whilst the red and green rasters can be blanked out by using the contrast and brightness controls when the same is tried with the blue gun the right-hand side of the screen remains illuminated. I've tried swapping over the PCL84 colour-difference output valves but this had no effect.

First check that the CDA panel is well earthed to the metal chassis frame. Then check the blue PCL84's anode circuitry – the load resistors R396 (8·2MΩ) and R392 (12kΩ) and the coupling capacitor C370 (680pF). Print faults such as hair-line cracks and dry-joints are rife on this panel: check for these in the area of the above components. (Pye 697 chassis.)

ELIZABETHAN T12

The raster went on this set but I found that on momentarily bridging the boost diode with a BY127 the picture returned. The picture was perfect for a week or two though the FG2NA boost diode ran very hot. The picture then disappeared and the boost diode was found to be high-resistance. By bridging it again the picture came back but this time I decided to replace it with the BY127. A perfect picture was obtained but the BY127 ran very hot. I've tried various diodes, all with the same result.

Diodes used at line frequency must be designed for that purpose. You could use a Thorn D31 or two BYX70 diodes in parallel. An alternative to the single D31 is the XK3017.

FERGUSON 3711

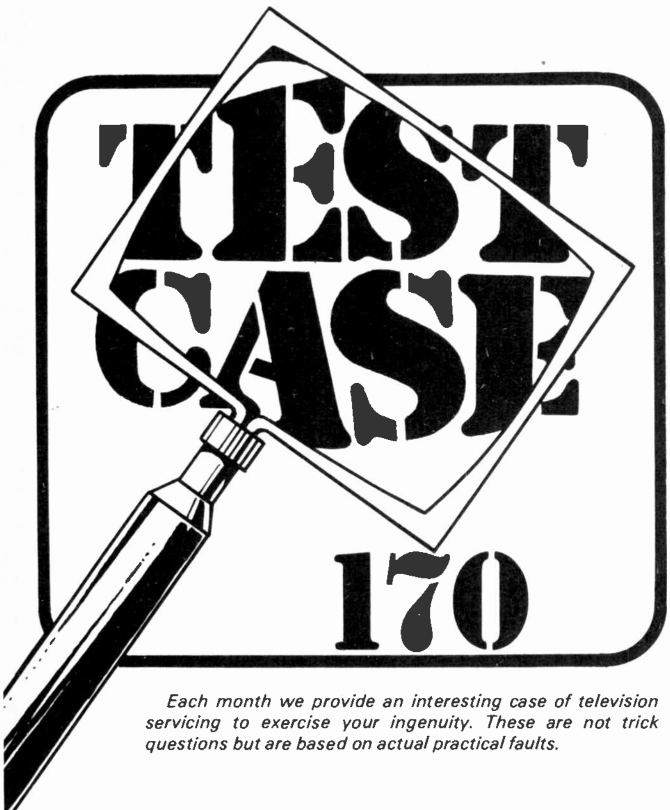
The colour content of the picture intermittently breaks up into wide horizontal bars of desaturated magenta and cyan. The bars remain locked and coincide with the red and blue castellations of the test card. The picture can be restored to normal by depressing the tuning button or by detuning and retuning. The fault is not temperature related since it sometimes appears when the set is first switched on.

The trouble is almost certainly due to a late or mis-shapen burst gating pulse. Check the components around the pulse polarity splitter transistor VT308, especially the two clipper diodes W315/W323 (type OA91) in its base circuit, also the input pulse coupling components R351 (220kΩ) and C334 (82pF). Finally adjust the pulse width control R354 as necessary. This should normally be fully anticlockwise but if there is loss of colour on the left-hand side of the screen it should be turned slightly clockwise for full colour scan. (Thorn 3500 chassis.)

MURPHY V153U

When the set is switched on there is a black band approximately 3-4in. wide down the centre of the screen, with two half pictures either side. This can be rectified by pressing the channel selector but if the controls are touched – particularly the contrast control – the fault returns.

The symptom is known as false lock and is quite common on this chassis. It can usually be cleared by replacing the flywheel sync diode block 3MR1/3 on the right-hand side of the timebase panel. (Bush TV141 series.)



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.

A single-standard Decca Model CTV25 colour set had given a number of years of trouble free service. The picture quality was then reported to have deteriorated badly. As the set was a rather massive console it was decided to investigate the complaint in the viewer's home and if possible to undertake any servicing required to bring the receiver up to par on the spot. Accordingly a full set of valves and other items plus a fair amount of test gear was taken along to the site.

After checking off-air and with signals provided by a portable colour generator it was obvious that the receiver was in trouble in four main areas – misconvergence, poor colour purity, field non-linearity with severe bottom cramping, and badly impaired focus. The field non-linearity was looked at first, and since correct adjustment was outside the range of the height and the top and bottom linearity controls field output valve replacement seemed appropriate. A new PL508 solved this problem, giving full height and excellent linearity after some readjustment of the presets. The bad focus was next looked at. Adjusting the preset focus control, which is accessible through a hole in the screen of the line output section, cleared the blur, but the adjustment was found to be rather critical. There was no astigmatism however.

Routine readjustments restored both the misconvergence and the impaired purity, and after an hour or so the receiver was producing very fine pictures. The viewer was very happy, proclaiming that the set was as good as new!

The following day the viewer was not so happy as the picture had reverted to its previous blurred state. Another trip revealed that the focus had shifted quite a bit, that corrective adjustment was possible but critical, and that when good focus was obtained slow cycles of defocusing occurred. The preset focus control consists of a 10MΩ potentiometer which is fed from the e.h.t. tripler via a 30MΩ resistor. There is a 47MΩ resistor on the earthy side of the potentiometer and a 1MΩ resistor in series with its slider. Since high-value resistors in focus networks commonly give trouble suitable replacements were made up by means of chains of 10MΩ 1W resistors. On connecting these and replacing the 1MΩ resistor in series with the slider the focus adjustment was found to be less critical though slow cycles of vague defocusing still occurred. Clearly something was wrong with the supply. What was the most likely cause? See next month's Television *for the solution and for a further item in the test case series.*

SOLUTION TO TEST CASE 169
Page 163 last month

The flyback blanking transistor in the luminance output pentode's cathode circuit is normally biased on, being switched off momentarily by the flyback blanking pulses to avoid display of the flyback lines on the screen. In addition to the transistor there is a 27Ω resistor (R359) in series between the transistor's collector and the PL802's cathode. No fault could be found with this resistor.

Having eliminated most possible causes of the voltage variation at the PL802's anode and hence at the cathode of the c.r.t., the technician moved to the BC147 blanking transistor's biasing circuit. The base of the transistor is forward biased by a 150kΩ resistor which is connected to the 285V h.t. line. There is also an OA91 diode, connected with its cathode to the transistor's base and its anode to chassis. Its purpose is to protect the transistor's base-emitter junction by clipping the negative-going line and field flyback blanking pulses. The 150kΩ resistor proved to be o.k., the trouble being due to leakage in the diode (D53). Its replacement completely cured the trouble.

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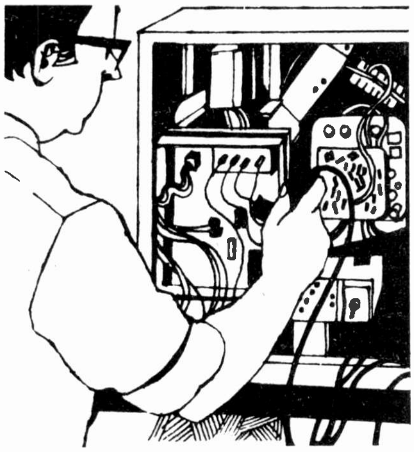

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