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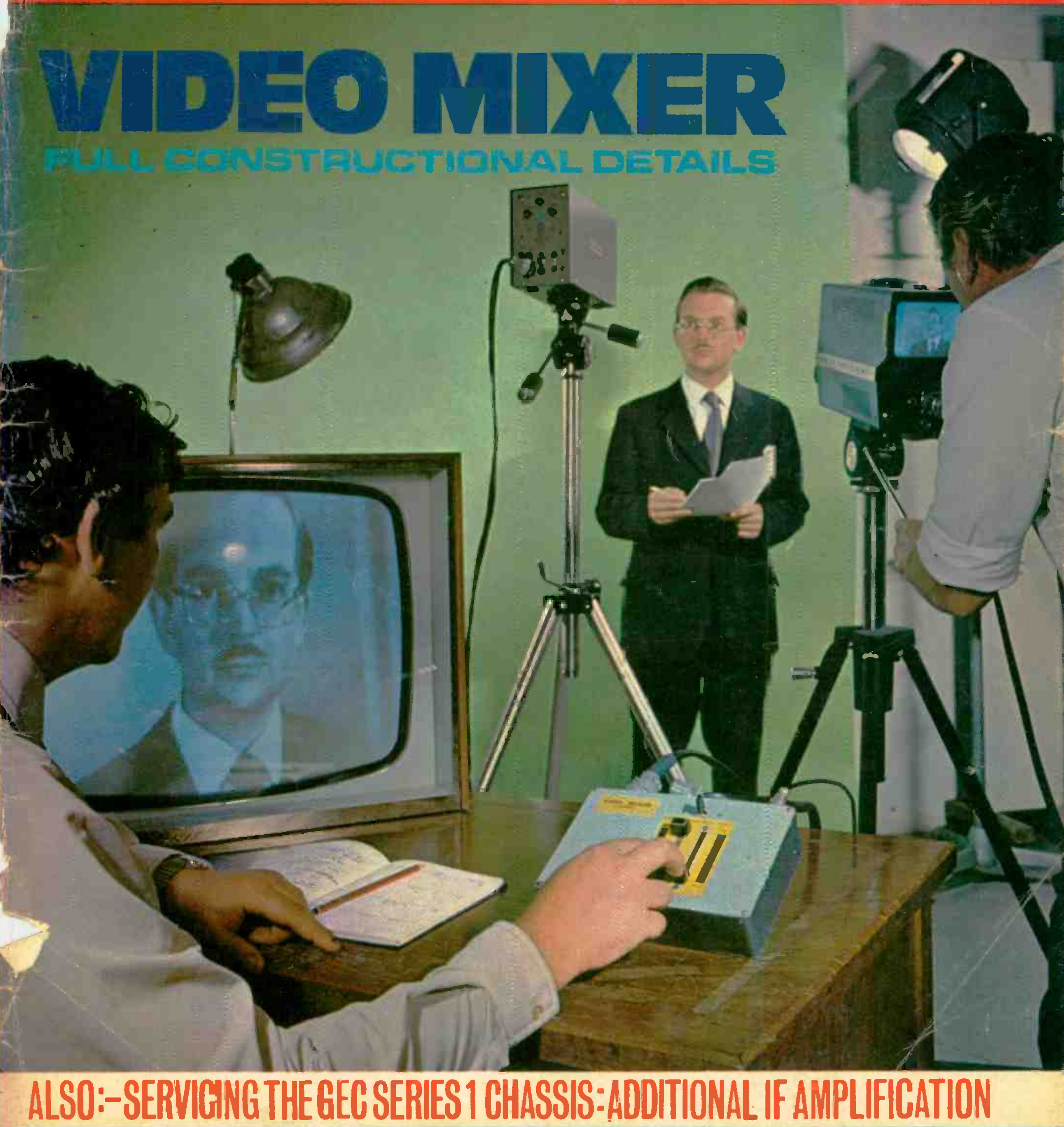

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TELEVISION

VOL 24 No 2
ISSUE 278

SERVICING·CONSTRUCTION·COLOUR·DEVELOPMENTS

DECEMBER 1973

DEVIOUS ROUTE

Have you purchased any good semiconductors lately? For those who may think this a music-hall joke line, it is not intended that way. The fact is we often don't know by what method or route semiconductors come into our hands. We pay our money and receive the goods. How many really care beyond checking that a "fair" market price has been paid? In all innocence, however, you may not be buying what you think you are, and this is increasingly the case in all parts of the world.

In America cases have been reported of employees of large manufacturers setting up "black market" operations for private gain through what is called "back door selling". This is particularly so where there is a shortage of popular components. Unfortunately "industrial diseases" like this tend to spread, and the UK which is dependent to some extent on imported devices has become infected.

Another trouble arises when devices classified as "sub-standard" leave the factory back door as scrap but get recycled or remarked with specified type numbers and turn up classified as "good". Worse still, such devices can get mixed up with genuine standard stock. How such operations work is not too clear but such stocks can find their way into almost any outlet, be it a large equipment manufacturer or a small high street shop. The ethics of this kind of operation are very clear; the victims, however, are usually completely oblivious unless full acceptance testing is carried out.

Discrete transistors are nominally classified within wide gain spreads which can conceal such subtle features as noisy operation or relatively high leakage currents. We have even heard of cases where a device is electrically satisfactory but two of the lead-out connections are transposed, contrary to the published data sheets.

Integrated circuits have been known to have open-circuit terminals or intermittent internal connections.

It is unfortunately almost impossible to locate or prove dubious operations. The best advice to all purchasers is: buy through reliable organisations with well established reputations; know where your components come from; make sure you have proper protection options in Law in the event of faulty goods; know whether you are buying from a recognised franchised distributor (such as a member of AFDEC), a retailer or direct from the manufacturers; above all test transistors and i.c.s *before* fitting them into your equipment.

M. A. COLWELL—*Editor*

THIS MONTH

THE NEXT ISSUE DATED JANUARY WILL BE PUBLISHED DECEMBER 17

Corrections: Our apologies for the omission of (*f*) in the caption to Fig. 3, page 21, last month. The waveforms shown in (*f*) are the burst output at pin 7 of the TBA560 (top) and the burst input at pin 5 of the TBA540 (bottom).

Alan C. Ainslie's name was accidentally omitted from the heading to his article on page 12 last month.

There were some signal path indication errors (i.e. arrowheads wrong or missing) in the block diagram included with our *Basic Colour Faults Guide* in the October issue. An *output* goes from the reference oscillator to the phase discriminator; the chroma amplifier output goes to the chroma delay line and to the add and subtract summing networks.

TELETOPICS

MINIATURE SOLID-STATE TV CAMERAS

It looks as if the time when miniature all solid-state TV cameras will be readily available for a wide variety of applications including home use is fast approaching. A couple of months ago we mentioned Fairchild's introduction of a 500-element solid-state charge-coupled device (c.c.d.) for image sensing. Fairchild have now announced the development of a low-resolution TV camera using a 10,000-element c.c.d. array to convert the scene into a corresponding video signal. The camera, Model MV100, is the size of a cigarette pack and weighs only six ounces. It is said to be the forerunner of a new range of colour and monochrome cameras using c.c.d. arrays to be announced "over the next few years". The camera can operate under lighting conditions ranging from bright sunlight to subdued room lighting. TV receivers require slight modification for use with it though no alteration is required to a videotape recorder. Suggested applications include security surveillance, instruction and industrial process control.

The potential market for such cameras is obviously very considerable and a number of firms are at work developing solid-state sensing arrays and complete cameras. Announcements about successful development work in this field have come recently from Bell, RCA and GE of Australia. Whoever comes up first with a reliable high-resolution camera will be on to a good thing indeed.

The latest news from RCA is of their development of a 120,000-element c.c.d. image sensor, the largest announced to date and claimed by RCA as "a key milestone in the creation of a new generation of tubeless TV cameras for government, commercial and consumer use". A demonstration of this device was given at the recent Electro-Optical Systems Design conference in New York. RCA are aiming to demonstrate shortly the feasibility of manufacturing a c.c.d. image sensor with a performance substantially equivalent to that of a two-thirds inch silicon vidicon tube. Half the elements in RCA's c.c.d. sensor form the imaging array, transforming the picture into individual charge packets which are then rapidly read out by charge transfer technique using the other half of the elements.

WHICH? ON COLOUR RECEIVERS

The Consumers' Association has reported again in their magazine *Which?* on colour receivers. Last time they did so they suggested that on balance provided a reasonable discount was given it was better to buy than to rent a colour set. This time they report that the introduction of VAT has moved the advantage further in favour of purchase. *Which?* comments that now production has risen to meet demand customers should be more choosey about the set they obtain and the discount offered. Proper setting up and installation are emphasised, with the recommendation that final adjustments to a set should be made on a transmitted test card at the purchaser's home. Of the 16 sets tested the best buy given was the Philips Model 523 at about £200. This is fitted with the well known Philips G8 chassis.

Which? complains that the BS safety requirements are still not adequate. Half the sets tested were rejected because they were fitted with plastic rear covers which when set on fire burned fiercely, pieces of flaming plastic dropping on the floor. Another safety feature commented upon is the fact that it is too easy in spite of BS recommendations being followed to come into accidental contact with the chassis: narrow necklaces can for example pass through the ventilation holes in many colour set rear covers. The answer to this type of problem seems to be to cover the slots on the inside with nylon mesh.

It says something for the reliability of modern, single-standard colour chassis that outright purchase should be recommended and our only comment is that we are not so sure that the supply situation is as rosy as *Which?* suggests.

VIDEO RECORDING

A magnetic disc video record/playback system that operates using a conventional turntable is under development by Bogen (Berlin). Approximately half the disc consists of a spiral groove which guides an arm/stylus arrangement to which a magnetic head with an 0·01μm gap is linked. This head scans the other, magnetic half of the disc which is treated with chromium dioxide. So far a playing time of five minutes and a bandwidth of 2·5MHz have been achieved with this magnetic videodisc system, operating at 156 r.p.m. The present aim is to extend the playing time to twelve minutes and the bandwidth to 3MHz, with a speed of 78 r.p.m.

The TED videodisc playback system is now understood to be in production in W. Germany and is expected to be on the German market in January. Prices quoted are roughly equivalent to £165 for the player and £1·50-£4 each for the videodiscs. Plans are said to be under way to supply Scandinavian countries soon afterwards.

Philips hopes to have sold some 8,000 of their videocassette machines in the UK this year, out of a total expected European sales figure of some 75,000, and anticipates a doubling of these figures the following year. Hitachi have now joined the already extensive list of companies who have entered into agreements with Philips to produce machines to their standard. Hitachi have previously concentrated on EVR players. Siemens are to join the ranks of those offering Philips type VCR machines in the UK.

Bell and Howell are introducing on the European market, including the UK, two videocassette machines designed and built by the Victor Company of Japan. They are the CP5000E cassette player and CR6000E recorder/player. Both machines are for colour and monochrome operation and use the self-contained U-type cassette containing ¾in. tape developed jointly by JVC with Sony and National. The record/player machine will record off-air or from a camera. There are two sound channels.

STATION OPENINGS

Two new high-power u.h.f. transmitters have been brought into service by the IBA. **Llanddona** (Anglesey) transmits HTV Wales programmes on channel 60 (receiving aerial group C). **Rosemarkie** (N.E. Scotland) transmits Grampian programmes on channel 49 (receiving aerial group B). The transmissions from both stations are horizontally polarised. The following relay stations have been brought into operation.

Abergavenny (Monmouthshire) channel 49 carrying HTV Wales programmes (receiving aerial group B).

Bethesda (Caernarvonshire) channel 60 carrying HTV Wales programmes (receiving aerial group C).

Congleton (Cheshire) BBC-1 channel 51, BBC-2 channel 44 (receiving aerial group B).

Ebbw Vale (Monmouthshire) BBC-Wales channel 55, HTV Wales channel 59, BBC-2 channel 62 (receiving aerial group C).

Marlborough BBC-1 channel 22, BBC-2 channel 28 (receiving aerial group A).

Mynydd Bach (Monthmouthshire) channel 61 carrying HTV Wales programmes (receiving aerial group C).

Weymouth (Dorset) channel 43 carrying Westward programmes (receiving aerial group B).

All these relay transmissions are vertically polarised.

The JVC CR6000E videocassette recorder/player.

NEWS FROM THE TRADE

An 18in. colour receiver, Model 7018, has been added to the **Invicta** range. This is fitted with the Pye group's 713 chassis and a varicap tuner. The suggested price of £205·24 includes a £7 service allowance to the dealer. UK produced colour sets are to be sold under the new brand name **Concorde.** There will be 20, 22 and 26in. models fitted with a modular chassis and varicap tuners.

Bush have added a 12in. mains/battery portable, Model TV350, to their range. The suggested price is £62·95. RRI are to concentrate UK production of monochrome receivers at a new factory at Stoke, near Plymouth. Production of the Murphy Traveller 12in. mains/battery portable is due to start there shortly. Production at the new plant is expected to build up to 4,000 a month of which 2,500 will be portables. Thorn estimate that their production of TV sets this year will reach 745,000 colour and 620,000 monochrome receivers.

A new range of colour sets has been introduced by **Telefunken** who have just opened a new UK headquarters at Bath Road, Slough. Several of the models in this range are fitted with an audi-visual control for operation in conjunction with a videotape recorder. Top of the range Model 773 at £455 also features cordless supersonic remote control. A West German firm, Ebdo Elektronik Baulemente of Dortmund, is to set up a colour set production plant at Newcastle West near Limerick in the Republic of Ireland. The aim is to overcome the effect of currency fluctuations on their operations in the UK market.

ITT have announced that production of colour TV tubes at their Esslingen W. German plant is to be doubled and that within two years they expect to be producing the latest type with in-line guns and integral neckware (see TELEVISION, June 1973). The Central Applications Laboratory at Esslingen is developing circuits for use with the new tubes. It is understood that some sixteen of Europe's largest TV setmakers are at present producing sets to designs developed at Esslingen. Present tube output consists mainly of thick-neck 110° types, with smaller numbers of 90° and thin-neck 110° tubes also in production. Amongst the work in progress at the Central Applications Laboratory is the development of m.o.s. shift registers for use in TV sets, presumably to replace the ultrasonic glass delay lines at present used in colour receivers.

Sharp have introduced an 18in. colour set, Model C18-31H, at £259·95. This is said to include a new system giving improved colour definition but we have no details so far. A 12in. mains/battery portable, Model 3410UK, has been added to the **JVC** range. The new **Hitachi** 9in. portable Model 190 can be operated from the mains, a car battery or twelve rechargeable batteries which cost £8 extra. Japanese setmakers have announced that they are prepared to limit TV set exports to the UK during 1973/74 to 275,000 colour and 220,000 monochrome receivers but the UK industry is pressing for lower figures. It is estimated that Japanese colour set exports to the UK during 1972/73 reached 300,000.

RCA have announced that they have received a substantial order for the export of US produced colour sets to Taiwan. Could this be the turn of the tide in Western/Far Eastern electronic trading?

ADDITIONAL I.F. AMPLIFICATION

KEITH CUMMINS

A young colleague recently acquired an "old banger" 405-line TV set. The tuner was almost a total wreck and the overall performance was poor. In order to assist with this problem I suggested that we should carry out a tuner "transplant" from another receiver: we discovered a suitable set with a defective tube and substituted the tuner. The receiver then operated rather better: the tuner was at least reliable and selected channels correctly. The overall gain and sensitivity were still low however. Here came the crunch—the only obvious way to improve matters could involve multiple valve replacements and the whole business would then become totally uneconomic.

At this point I suggested that an additional i.f. amplifier stage would be helpful. Long faces were pulled at the prospect of mounting a valve on a bracket, winding i.f. coils etc. and an alternative approach was sought. When one considers the problem, it is helpful to realise that the i.f. connection between the tuner unit and the i.f. stages is made by coaxial cable at low impedance: if a current amplifying device with low-impedance input and output is connected between the tuner and i.f. strip additional gain will result.

A valve i.f. stage is unattractive from this point of view but the use of a transistor seemed very promising. Both the input and output impedances are low. They may not match the rest of the circuit exactly, but they are near enough to enable the transistor to be interposed between tuner and i.f. strip. While tuned circuits could be employed to improve the matching and gain, if simplicity is to remain the keynote the circuit should be reduced to the minimum number of components possible.

The circuit devised is shown in Fig. 1. It consists of one transistor, two resistors and two capacitors—a circuit "cut to the bone" so to speak. By feeding the collector of Tr1 from the h.t. line via a high-value resistor (R1, 100kΩ) the need for a separate power supply is eliminated. Forward base bias is provided from the collector via R2 and the transistor thus protected against h.t. The i.f. signal from the tuner is fed via C1 to Tr1 base and is taken to the i.f. strip from its collector via C2.

This simple circuit was found to provide a gain of around 12dB (assessed by calibrated attenuation at the aerial input). The overall performance was thus vastly improved and the "old banger" came very much to life, much to our amusement and delight. A few vertical bars were in evidence on the screen however. This proved to be line timebase ripple on the h.t. line reaching Tr1. A decoupling network connected between the h.t. rail and the transistor cleared up the trouble—values of 10kΩ and 0·1μF are adequate.

The circuit was built up on a piece of tagstrip as shown in Fig. 2 and attached to the inside of the cabinet.

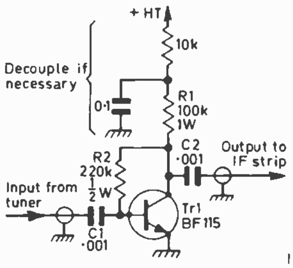
Many people bring TV receivers into this country from abroad unaware of the incompatibility between the standards used by the differing TV systems and on numerous occasions I have been asked to modify a 625-line v.h.f. only receiver (with 5·5MHz intercarrier sound) to UK standards. In such cases it is first necessary to replace the v.h.f. tuner with a u.h.f. one: if the gain of the u.h.f. tuner is lower than that of the v.h.f. one removed it is essential to provide additional i.f. gain.

Sometimes a u.h.f. tuner of Japanese origin with a diode mixer is encountered. By replacing the diode by a transistor and arranging for this mixer to be the lower half of a cascode i.f. amplifier improved mixing and higher i.f. gain are achieved simultaneously.

A suitable circuit is shown in Fig. 3. The pickup loop in the tuner is the original one used to feed the diode mixer. A coaxial lead is used to connect Tr1 collector to the emitter of Tr2 which operates as the grounded-base half of the cascode pair.

A tuned circuit is used in this case, to enable maximum energy transfer to take place from Tr2 collector to the main i.f. strip. A certain amount of experimenting is necessary with L1 and L2. Too loose a coupling will result in instability, while too tight coupling results in loss of gain. L1 usually works out at about 15 turns wound on a ¼in. former fitted with a dust-iron core. L2 is three turns wound on the earthy end of L1.

Since this article deals with i.f. amplification I will not pursue other details concerning TV conversions at this stage: these will form the basis of an article to follow later. ■



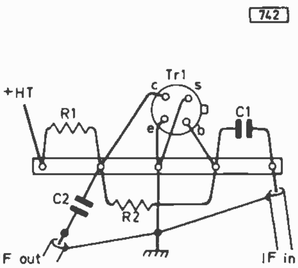


Fig. 1 (left): Simple untuned transistor i.f. stage.

Fig. 2 (right): Layout on a five-way tagstrip.

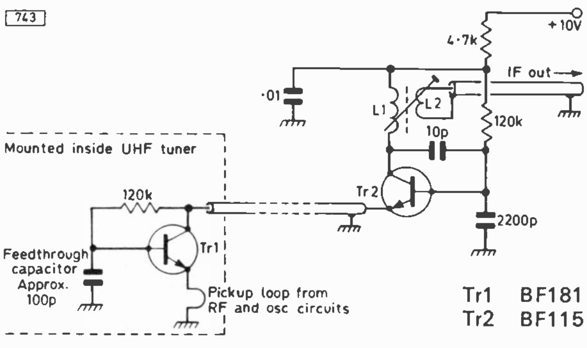
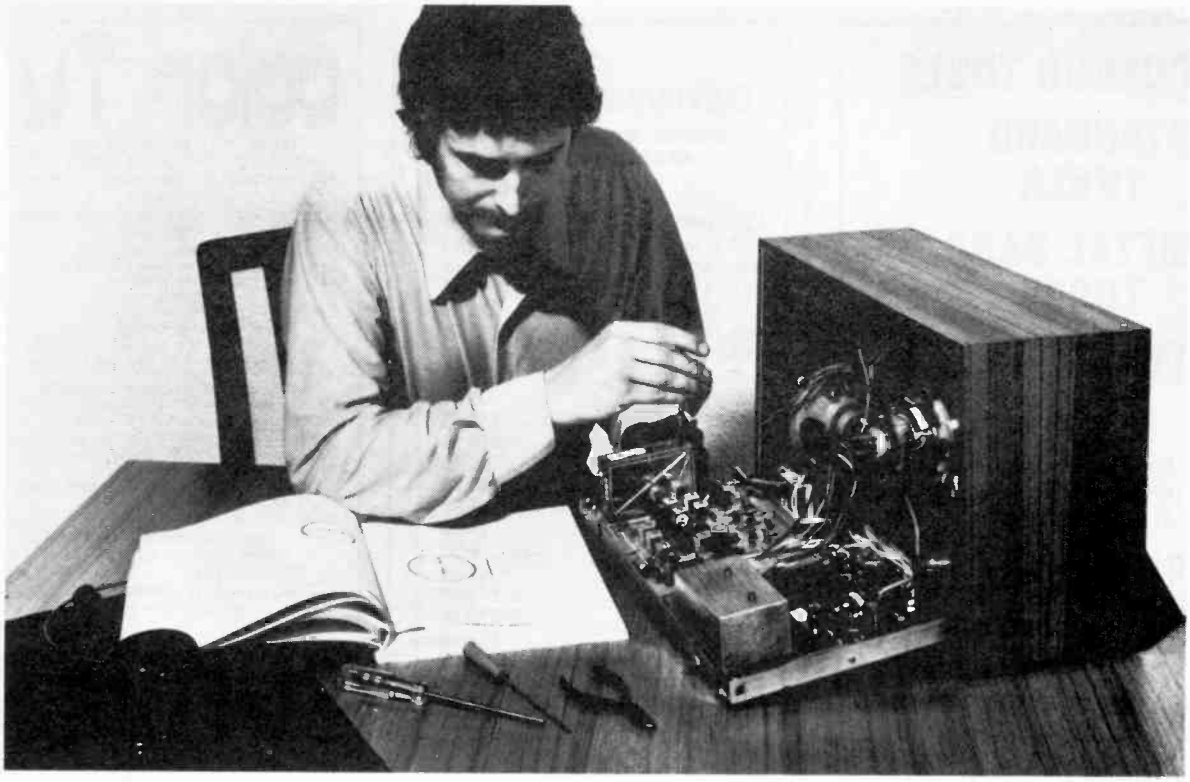


Fig. 3: Cascode mixer-amplifier circuit.



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DECODER—1

THE PAL decoder used in the Philips G6 chassis is almost entirely valved and is one of the most elaborate decoders ever mass-produced. In spite of this it is fairly reliable, although some very peculiar faults are possible.

The circuit of the decoder is shown in Fig. 9: it bristles with unusual features. Chroma from the i.f. panel is initially amplified by V7001, a familiar gain-controlled vari-μ valve (EF183). The first unusual feature is the chroma noise clipper circuit connected across this valve's anode load L7506. The v.d.r. R7145 provides a stabilised 5V across C7022/3; if a noise pulse exceeds this amplitude X7315 conducts and the excess voltage is shunted to chassis by C7021. Chroma noise clippers are not usually found in solid-state designs where the lower h.t. supply automatically limits the signal swing.

Amplified chroma is coupled by C7026 to the second chroma amplifier V7002, and via L7508/9 to the gated burst amplifier. V7002 is a straight EF184 pentode. The reference burst is removed from the chroma (to prevent a vertical strip of colour on the screen) by a line pulse which causes X7318 to conduct and shunt the tuned anode load L7517/C7516. Chroma is coupled by L7518 to the usual one-line (64 μsec) delay line/matrix circuit where direct and delayed chroma signals are summed to feed the B—Y preamplifier T7011 and differenced to feed the R—Y preamplifier T7012 via the PAL switch which in this chassis works on the R—Y chroma instead of the reference signal feed to the R—Y demodulator. The 4·43MHz tuned circuit L7513/C7514 can be detuned slightly to modify the delay; it should be adjusted together with R7159 (matrix balance) to eliminate Hanover blinds on a colour-bar pattern.

The B—Y and R—Y preamplifiers are similar except that the R—Y one has high-pass input filtering (L7524) to remove any half line frequency content introduced by the PAL switch, and a gain control R7173. The two preamplified chroma signals are then fed into a dual demodulator assembly in one can. Here the reference signal (4·43MHz) is received on pin 1 from the crystal oscillator. At this point the reference signal has the same phase as the B—Y chroma signal component. A 90° phase shift is introduced by L7559/60/C7534 so that correctly phased 4·43MHz reference signal is applied to X7570/1 to demodulate R—Y. A further 90° shift is provided by L7562/3/C7535 so that the 4·43MHz reference signal once again on the B—Y axis is applied to X7568/9 to demodulate B—Y.

The Burst Channel

The reference burst signal needed for phase control of the reference oscillator is extracted from the chroma signal at L7508 by means of a gate pulse fed through L7509 to V7008. The burst gate pulse is derived from a 160V line pulse as follows. On the main positive part of the pulse X7316 blocks but on the negative backswing it conducts and tuned circuit L7574/C7043 is excited. The tuned circuit rings to provide a positive-going pulse which passes via C7045, R7189, L7509 and R7255 to turn on V7008 simultaneously with the burst. The gate pulse is clamped at approximately 0V by X7317 to avoid overdriving V7008. The viewer colour saturation control varies the d.c. conditions of the burst amplifier V7008 and hence its gain: since the automatic chrominance control (a.c.c.) potential is derived from the amplified burst this indirectly controls the chroma gain.

Passing over the a.c.c. arrangements for the moment, the amplified burst is coupled by tuned transformer L7624-6 to the usual burst demodulator (phase discriminator) where the output of the crystal reference oscillator (V7009), shifted to the R—Y axis by L7627/C7608, is compared with the burst phase. The error voltage appearing at R7618 slider is smoothed by C7101/2 and used to control the oscillator via the reactance triode V7009a. The oscillator circuit uses a PCF802 valve, better known for its use in timebase oscillators, oscillation being sustained by feedback between the control and screen grids of the pentode section at the crystal frequency. Capacitive anode-grid feedback via C7103 around the triode section makes it appear as a reactance loading one end of the crystal; its reactance is varied by the phase error voltage applied to its grid.

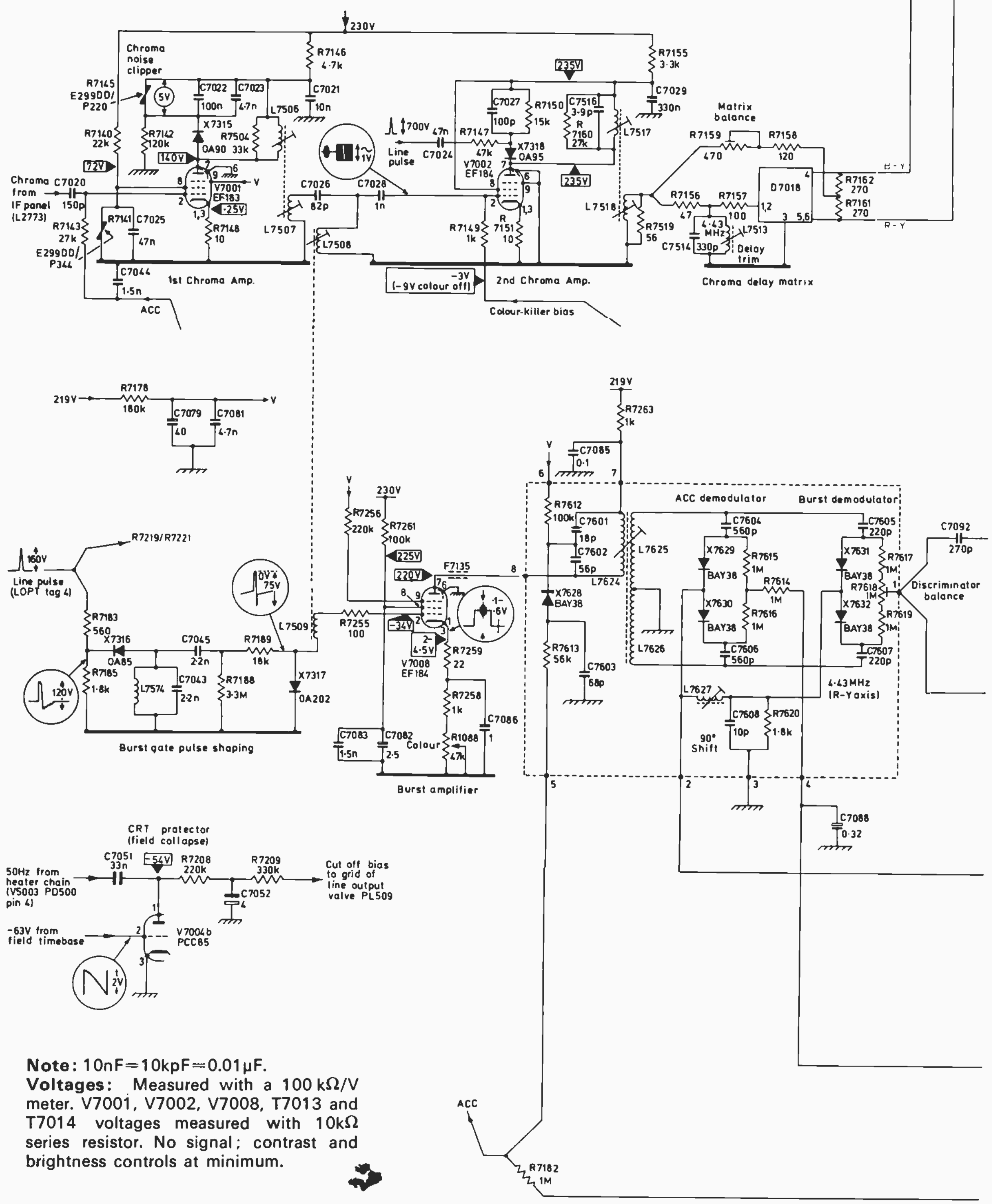
PAL Switch

The ident amplifier and PAL bistable circuits at least hold few surprises. The half line frequency (7·8kHz) component (burst ripple) of the unsmoothed phase error voltage, caused by the ±45° alternations of successive bursts about the R—Y axis, is extracted by C7092, amplified by the tuned stage T7015 and applied by C7095 to the PAL bistable to phase correct it if necessary. The bistable is reversed ("toggled") by line pulses coupled to the bases of T7013-4. The opposite-polarity squarewaves at T7013-4 collectors alternately switch on X7320 and X7321 thereby operating the R—Y signal reversing switch. Extensive choke and capacitive smoothing is used to prevent switching transients entering the R—Y signal.

Automatic Chrominance Control

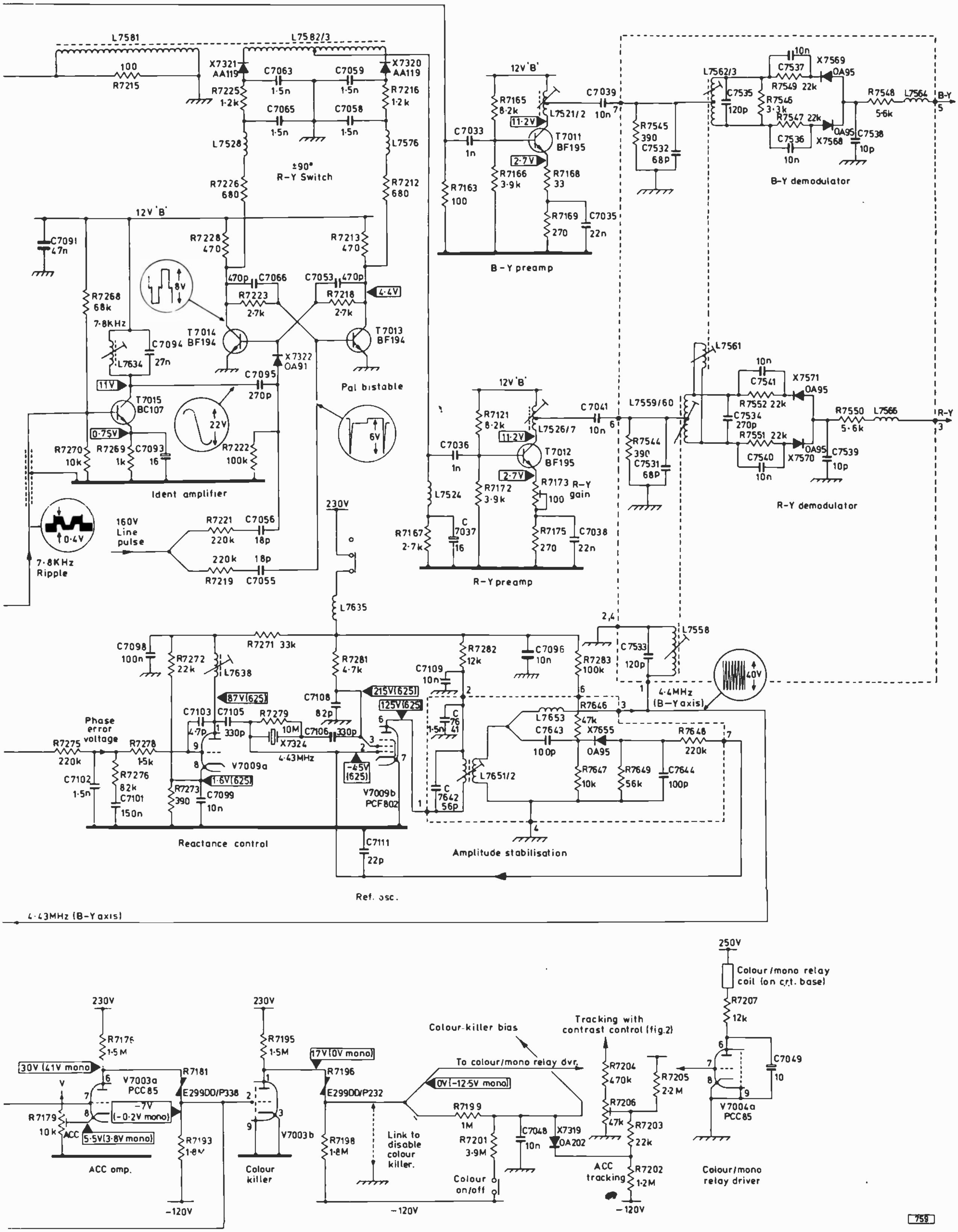
Since the chroma amplitude can vary greatly with such things as channel changing, tuning drift or aircraft flutter some form of chroma a.g.c. (i.e. a.c.c.)

Modifications: V7004 removed, an OA91 diode being fitted in place with its anode to the junction R7196/R7199 and cathode to chassis. The secondary side of the reference oscillator output circuit was rearranged, also the h.t. switch connections may differ. With a later delay line the component values in the matrix circuit differ.



Note: 10nF=10kpF=0.01µF.
Voltages: Measured with a 100 kΩ/V meter. V7001, V7002, V7008, T7013 and T7014 voltages measured with 10kΩ series resistor. No signal; contrast and brightness controls at minimum.

Fig. 9: Circuit of the decoder used in the Philips



G6 chassis. See also Fig. 11 (overpage).

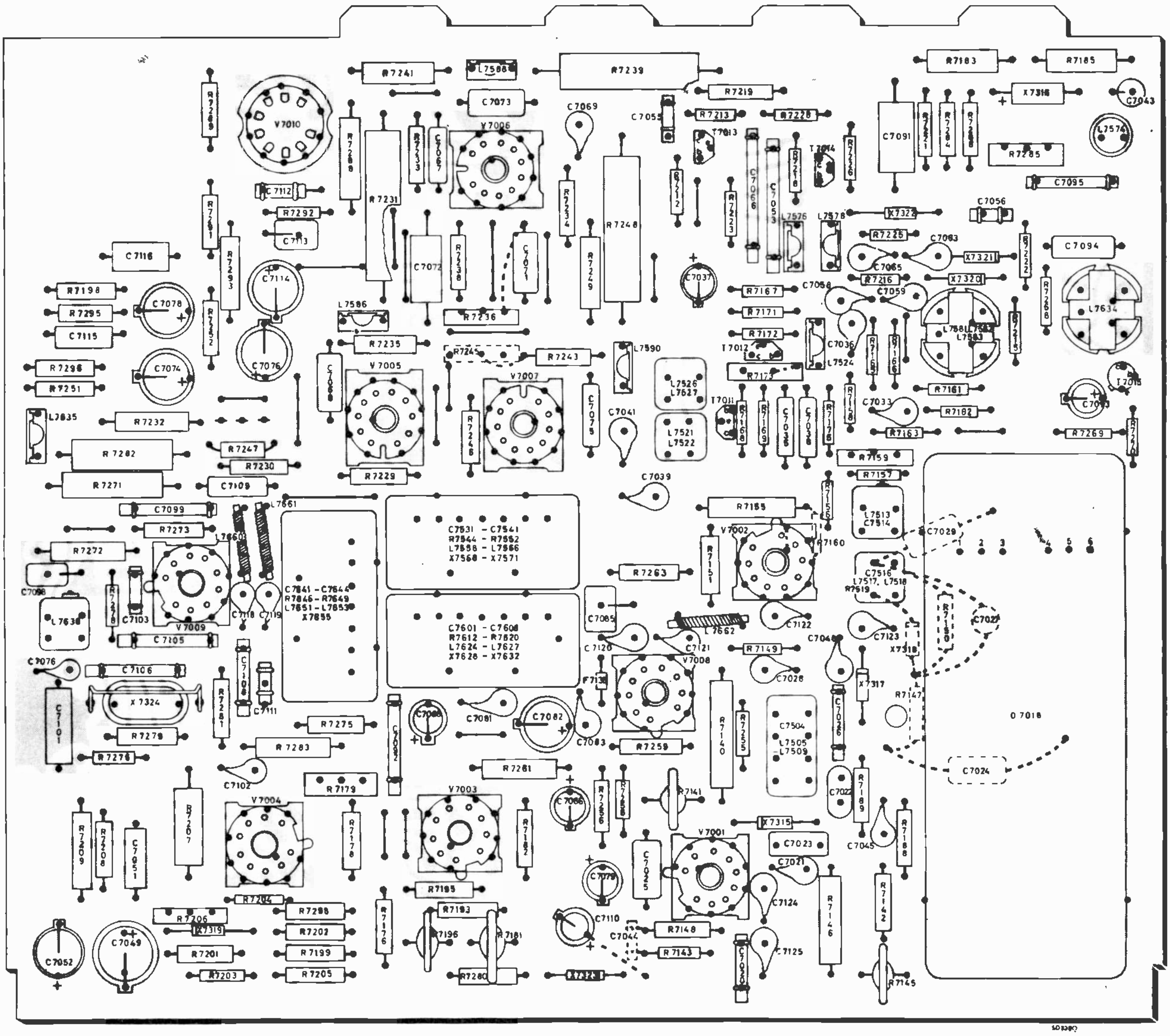


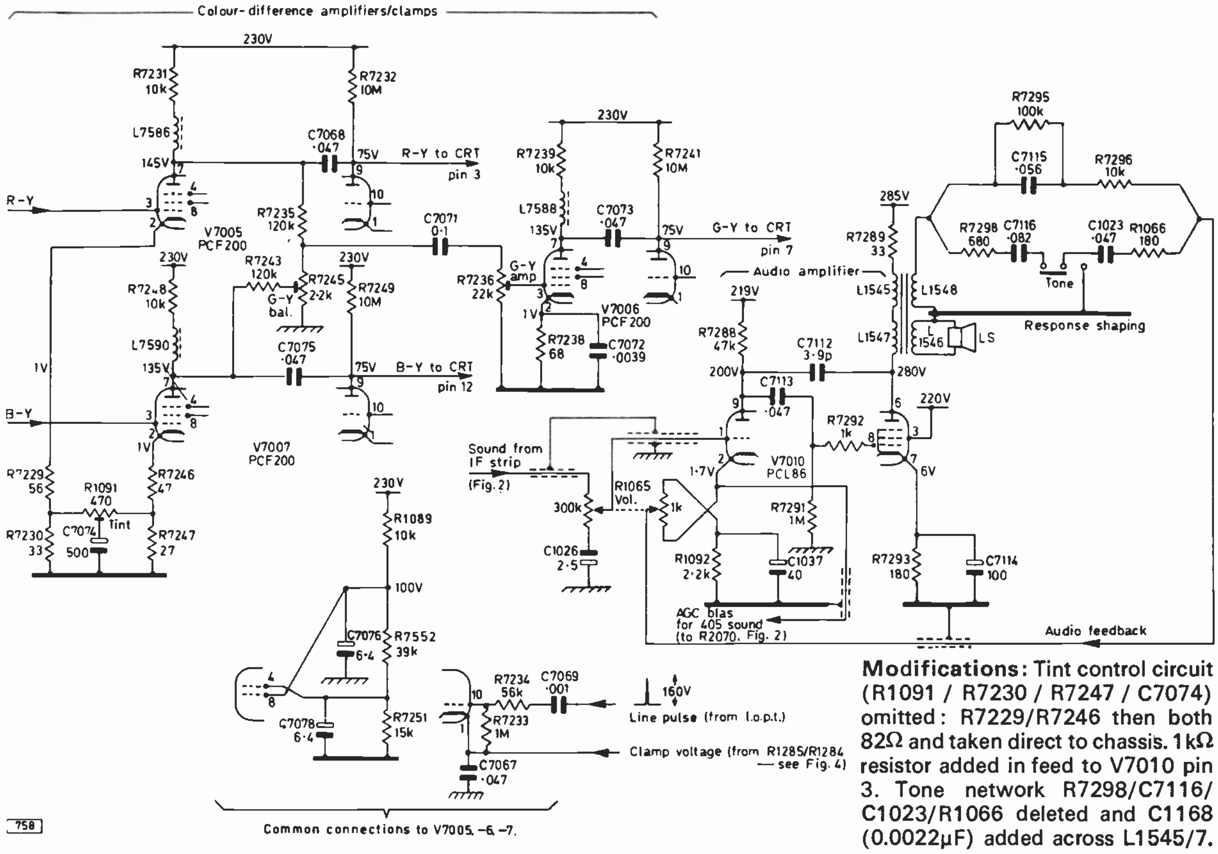
Fig. 10: Layout of the decoder panel. The author advises cutting out R7209 (if present) at lower left. On some panels the sound output transformer is mounted above left. Corrections: C7504 should read R7504 and L7505, L7506 (can with L7509); C7076 should read C7096 (left-hand side beneath L7638).

should be provided to keep the colour saturation constant. The usual method of obtaining a control voltage proportional to the chroma signal strength is by simple envelope detection of the burst and this is done by X7628 which rectifies part of the amplified burst tapped off C7601/2. The smoothed negative-going voltage across C7603 is fed back via R7613 and R7143 to control the gain of the first chroma amplifier V7001. This is only part of the a.c.c. arrangement however: there is also a special synchronous a.c.c. demodulator which gives more accurate control.

This is similar to the burst demodulator except that the diode junction (X7629/30) is supplied with reference oscillations on the B−Y axis. Provided the oscillator is locked to the burst this will result in the same amplitude output on each burst, proportional to the burst (chroma) amplitude. These positive pulses are smoothed to a d.c. level by C7088 and tend to turn on the a.c.c. amplifier V7003a. The anode voltage is shifted negatively about 45V by the v.d.r. R7181 to provide a second negative-going chroma a.c.c. supply which is fed by R7182 and R7143 to V7001. The interesting feature of this dual a.c.c. arrangement is that when a colour transmission is first tuned in and the oscillator is not yet locked the phase-dependent a.c.c. demodulator does not produce an output and the resulting high gain of V7001 helps to establish reference oscillator a.p.c. loop lock. Once the oscillator is in lock the chroma gain depends so closely on the burst amplitude from V7008 that R1088 provides effective saturation control.

Colour Killer

This stage (V7003b) is similar to the a.c.c. amplifier but acts as a switch. If chroma is present the few



Modifications: Tint control circuit (R1091 / R7230 / R7247 / C7074) omitted: R7229/R7246 then both 82Ω and taken direct to chassis. 1kΩ resistor added in feed to V7010 pin 3. Tone network R7298/C7116/C1023/R1066 deleted and C1168 (0.0022μF) added across L1545/7.

Fig. 11: The colour-difference amplifiers and the audio channel.

volts negative at V7003b grid hold it cut off and approximately 0V "colour killer bias" is fed to the second chroma amplifier V7002 allowing it to function. If chroma is absent however so that V7003b conducts, or if the colour on-off button is depressed, about −12V bias is fed to V7002 cutting it off. Although the colour killer merely switches the colour killer bias, the bias line is also used for gain control of V7002 during colour reception by means of X7319 which provides tracking between the contrast control and colour saturation, i.e. saturation is automatically reduced as contrast is reduced, the amount of interdependence being set by R7206. If R7206 has no effect X7319 is probably open-circuit.

The colour/monochrome relay fitted in early sets has been described; it is energised by V7004a being biased on during colour reception.

Colour-Difference Amplifiers

The colour-difference amplifiers and clamps shown in Fig. 11 are conventional although it is unusual for the G−Y matrix network (which derives this signal by summing weighted amounts of the demodulated R−Y and B−Y signals) to be adjustable. R7245 and R7236 can be easily set up viewing a colour-bar pattern.

Audio Circuit

The audio amplifier has its own sophistication: a "loudness" control instead of a simple volume control. This is intended to give increased bass content as the volume setting is reduced, to give a more "natural" effect. The frequency response modification is performed by the 1kΩ potentiometer which is ganged to the main 300kΩ volume control: it injects a negative feedback signal from the response shaping network into the cathode of the triode stage. At minimum volume setting the 1kΩ potentiometer slider is at the cathode end of the track for maximum tone correction. There is a push-button manual tone control also, in the feedback circuit.

For 405 sound (a.m.) only, the d.c. component from the detector is passed through the triode stage which acts as a cathode-follower to this signal and is returned to the first sound i.f. transistor to provide a.g.c.

CRT Protection

The c.r.t. protector stage (V7004b) is normally held cut off by a negative potential generated in the field timebase and in these conditions has no function. The idea is that if the field timebase should fail V7004b will conduct and rectify the a.c. at its anode to produce on C7052 a very strong negative voltage which will disable the line output stage and hence the e.h.t. supply to prevent a horizontal line being burnt into the tube face. This stage has little use however and can be misleading to the uninitiated. It is quite in order therefore to disable it permanently by cutting out R7209.

NEXT MONTH: FAULTS AND SETTING UP

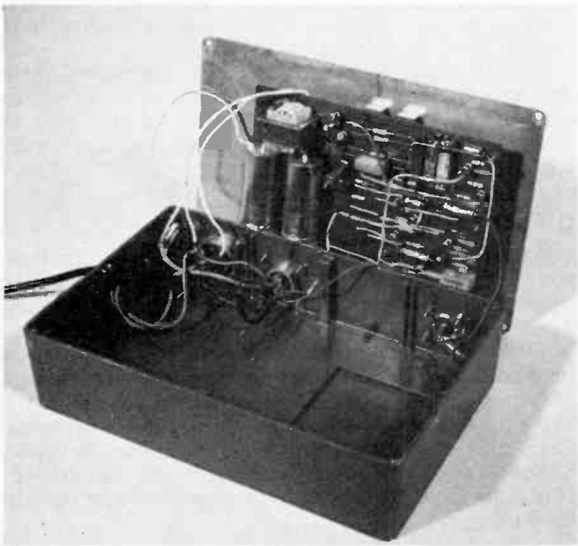
VIDEO MIXER

M J HUGHES MA

THIS unit is designed for use with any standard video system in which the cameras are synchronised and there is a composite video signal available from at least one camera. The mixer provides fades, dissolves, switch cuts and superimposition and has the possibility of adding an effects unit to permit electronic wipes and split-screen operation.

No dramatic claims are made for the bandwidth of the unit but the insertion loss is negligible compared with the bandwidth limitations of most medium priced video recorders. The circuit has been designed for simplicity of construction and uses no inductors. High-frequency response is maintained by operating throughout at low impedances—a glance at the circuit (Fig. 1) reveals the extensive use of emitter-follower stages. The layout is not critical and although a d.c. oscilloscope is very useful for the initial setting of the preset controls these can be adjusted quite successfully by viewing the final picture on the normal monitor.

The prototype was used in conjunction with a Crofton Educational Camera, an Ikegami VF302 viewfinder camera and a Shibaden SV610 videotape recorder. As standard 1V composite video signals from a 75Ω source are required there is no reason why other camera/VTR configurations should not be used. Also, although it has been used in only a two-camera system to date there is no reason why it should not be extended to three or more cameras—this point is referred to in the description that follows.



View of the mixer with the top cover removed.

Inputs

The video inputs enter the unit via multipin camera connectors which also carry mains and synchronisation lines. There was no need for provision to monitor the individual camera outputs before mixing in the prototype set-up but monitor points could be provided by looping into the input signal points—R8 and R15 ought then to be switched out and the monitors terminated in 75Ω. A single mixed output is available capable of driving a chain of monitors—again the last in the chain being terminated at 75Ω—or a VTR which would probably have its own monitor output.

Video Stripper

One camera signal *must* be composite, i.e. video plus sync pulses. This input is designated "1" in the circuit diagram. Tr1 and Tr2 act as a "video stripper"—effectively removing all video signals but leaving the sync pulses. Tr1 is biased *just* into conduction: thus positive-going video will not appear at its collector although the negative-going sync pulses will appear as quite a high-level inverted signal which is reinverted and its rise time sharpened by the direct-coupled grounded-emitter stage Tr2. In the absence of D2 and D3 the sync pulses would comprise a 12V negative-going signal at Tr2 collector: they are clipped however by the diodes, giving clean sync pulses with a black level of +1·2V—the amplitude being between +1·2V and ground.

Sync Strippers

Input "1" is also applied to the "sync stripper" circuit comprising Tr3 and Tr4. This circuit effectively removes the negative-going sync pulses but leaves the video signal untouched. Tr3 is an emitter-follower with its base biased at 0·6V: thus all the positive-going video appears across its emitter load VR1. The latter acts as the level control for that channel. The output of channel "1" can be blanked by SW1 which simply grounds the video signal at

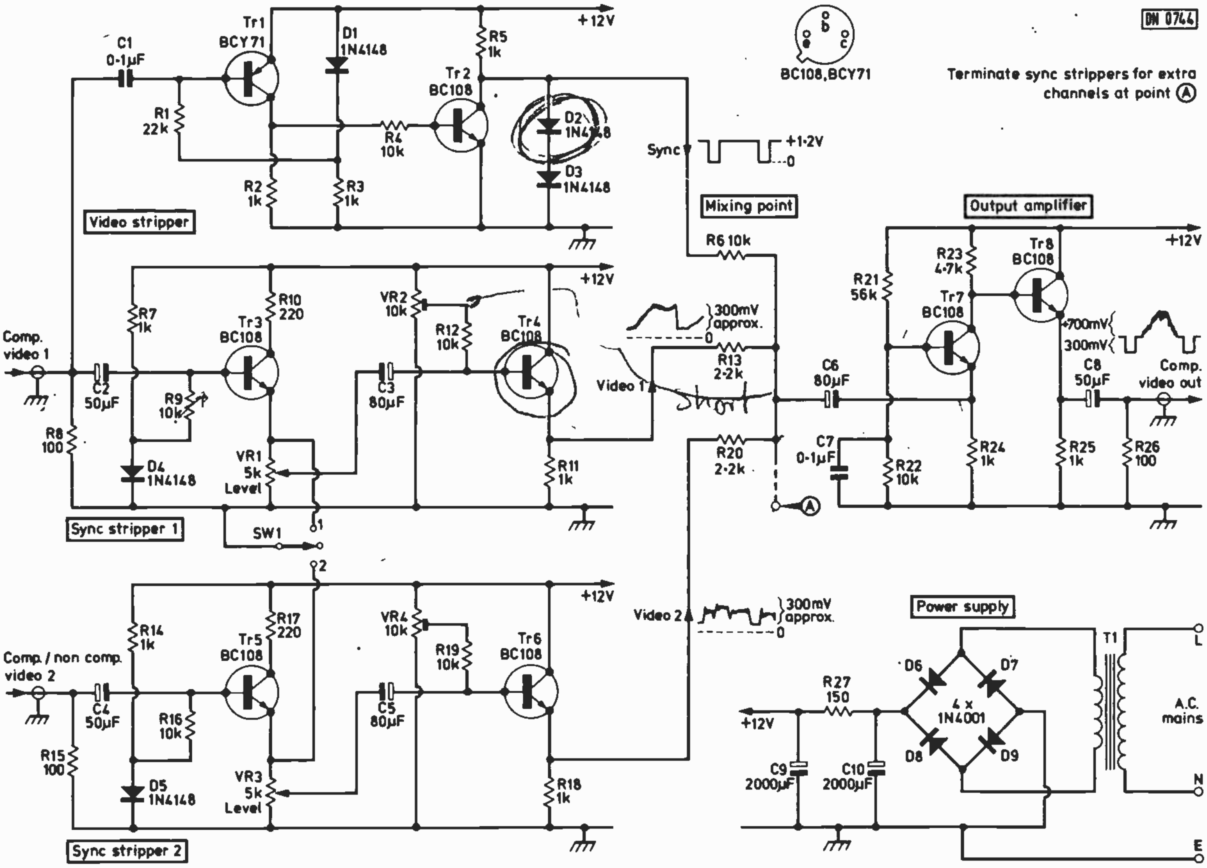


Fig. 1: Circuit diagram of the video mixer—two-channel version.

that point (R10 is included to limit the transistor's collector current).

Tr3 emitter could be coupled through suitable diode gating to an effects monostable operating from a negative rail and triggered by the sync pulses: this would permit alternate switching between channels in order to give wipes and split-screen operation (this has not yet been done with the prototype but is mentioned as a useful idea for those wishing to take the circuit a stage further).

The required video level—set by VR1—is a.c. coupled to emitter-follower Tr4 whose output is biased by VR2 (preset) to +1·2V. Any positive-going video is thus placed on a 1·2V pedestal.

Tr5 and Tr6 form an identical sync stripper for the second channel, the input of which can be either of composite or non-composite form.

Mixing

The outputs of the two sync strippers (the video signals in their desired proportions) and the sync pulses from the video stripper are combined at the mixing point A through resistive arms and then pass to a grounded-base amplifier (Tr7). There is a certain amount of level loss due to the signal processing and the amplifier is designed to compensate for this. The sync needs attenuation by a factor of about two while in the prototype it was found that a gain of two was required for the two video signals. The values of R6, R13 and R20 are selected to give the correct gain and mixing in the correct proportions. The level of each signal can be increased by reducing the value of its respective mixing resistor and vice versa. No problems should be expected in this respect: it is suggested that the values shown are used and altered only if problems arise.

The grounded-base stage Tr7 is terminated into

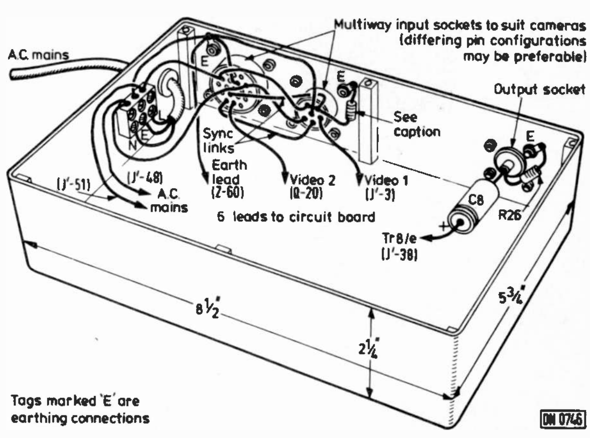


Fig. 2: Wiring to the case. The board and the controls are mounted on the lid of the diecast box. The resistor (say 100Ω) shown terminating the sync link at the camera 1 socket may be necessary to match sync lines.

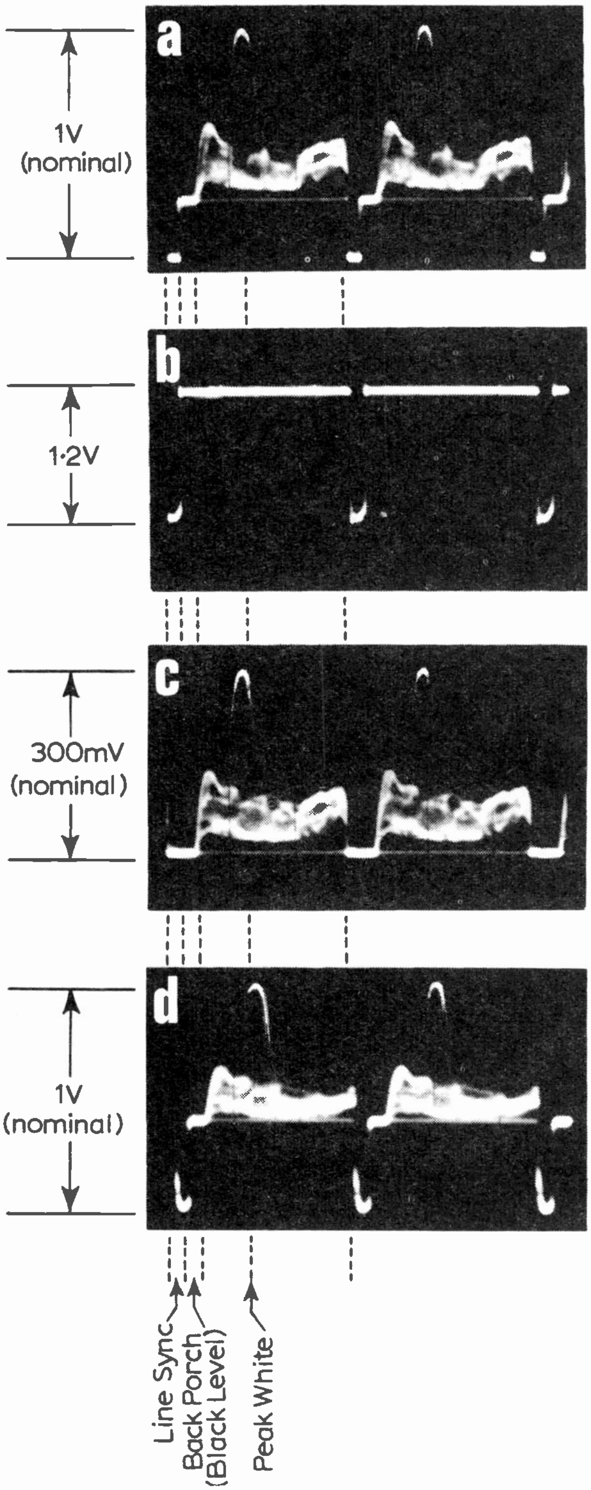


Fig. 3 (left): Waveforms. (a) Input from camera (250mV/cm vertical deflection). (b) Sync pulses at Tr2 collector, extracted from the composite input signal (500mV/cm vertical deflection). (c) Video signal at Tr4 emitter, with sync pulses removed (500mV/cm vertical deflection). (d) Mixed and processed video signal recombined at the mixer output (junction C8/R26) with the sync pulses (250mV/cm vertical deflection). The video and sync ratios are controlled by the values of R6, R12 and R20.

an emitter-follower (Tr8) to provide a low output impedance for the mixed composite signal.

It should be possible to add extra sync strippers to the circuit, coupling them into point A through suitable mixing resistors, if mixing between more than two channels is required.

There should be no problems in powering the unit from a simple unstabilised supply—it is only necessary to ensure that all ripple is removed with adequate smoothing.

Operation

Switch cuts can be effected quite simply by means of SW1 (toggle, rotary or pushbutton types will suffice). The advantage of this circuit is that normal break-before-make switches can be used without causing momentary screen blanking. During the switch over both video signals appear on the screen for a fraction of a second.

For switched cuts set both faders at high and move the switch quickly from one camera position to the other. For cross fades or dissolves set the

★ components list

Resistors:

R1	22k Ω	R15	100 Ω
R2	1k Ω	R16	10k Ω
R3	1k Ω	R17	220 Ω
R4	10k Ω	R18	1k Ω
R5	1k Ω	R19	10k Ω
R6	10k Ω *	R20	2.2k Ω *
R7	1k Ω	R21	56k Ω
R8	100 Ω	R22	10k Ω
R9	10k Ω	R23	4.7k Ω
R10	220 Ω	R24	1k Ω
R11	1k Ω	R25	1k Ω
R12	10k Ω	R26	100 Ω
R13	2.2k Ω *	R27	150 Ω 1W
R14	1k Ω	* See text	

All ¼W 10% unless otherwise indicated.

VR1, VR3, 5k Ω lin. (slider or rotary)
VR2, VR4 10k Ω rectilinear presets (normal rotary presets will do with appropriate layout change).

Capacitors:

C1	0.1µF		C7	0.1µF	
C2	50µF	12V	C8	50µF	12V
C3	80µF	12V	C9	2,000µF	20V
C4	50µF	12V	C10	2,000µF	20V
C5	80µF	12V	C1, C7 polyester		
C6	80µF	12V			

Semiconductors

Tr1	BCY71	D1-5	1N4148
Tr2-8	BC108	D6-9	1N4001 *

* or encapsulated bridge, 20V 500mA minimum rating

Miscellaneous

SW1 Single-pole; 3-way. Preferably toggle with centre neutral or three-section push-button bank.

T1 240V primary, 12V r.m.s. 100mA secondary.

Multiway sockets to suit equipment interfaces.

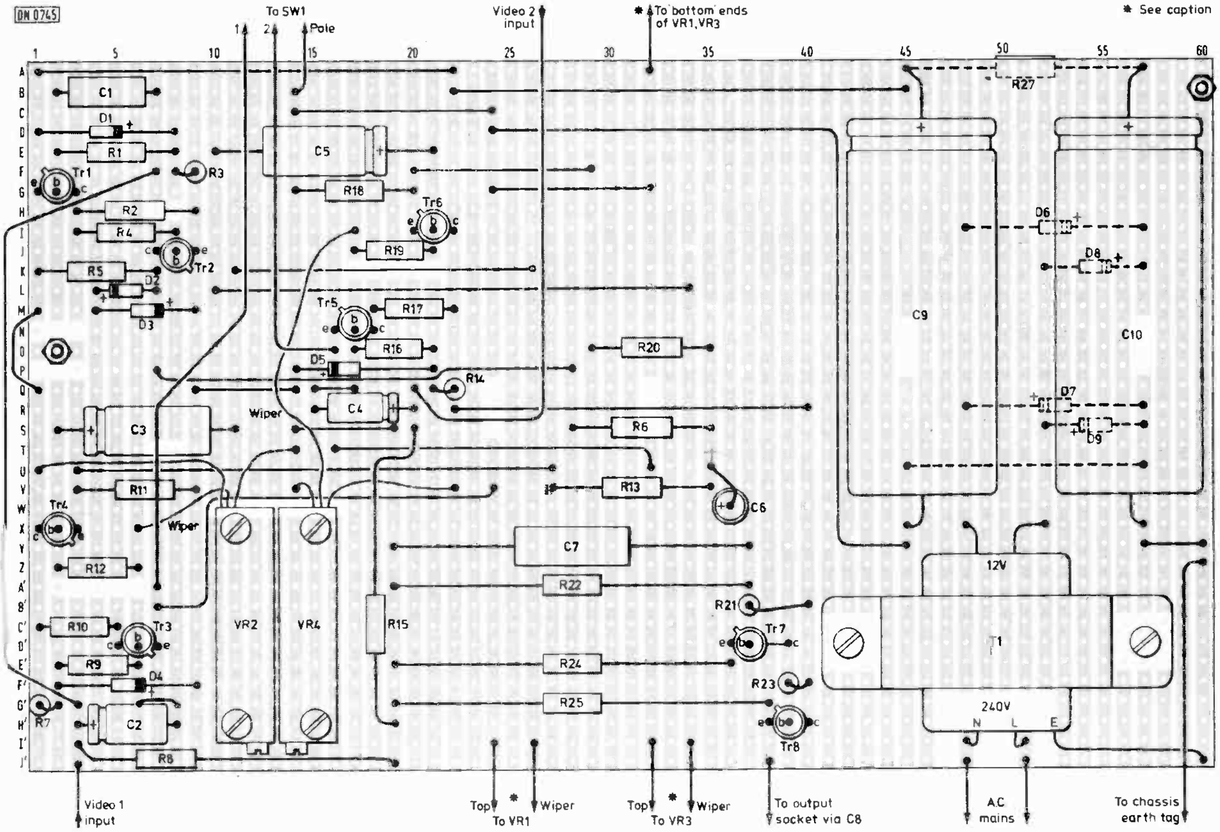


Fig. 4: Veroboard layout, viewed from the component side (0.1 in. Veroboard used). R27 and D6-9 are mounted on the copper side. Connections to VR1 and VR3 can be made via flying leads or if sliding potentiometers are used (as in the prototype) these can be soldered directly to the copper side. Ensure that the mains connections are well insulated from the rest of the circuit board.

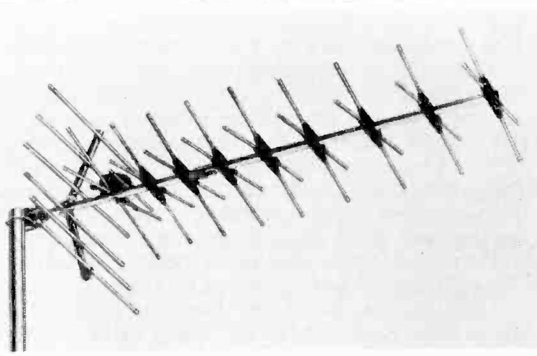
switch in the centre position and use the faders as necessary. For fade outs leave the switch towards the camera concerned and use the appropriate fader.

Setting Up

To set up the unit it is necessary to adjust the presets VR2 and VR4 which determine the black level of the video signal. Ideally this should be at +1·2V relative to ground at the emitters of Tr4 and Tr6 respectively. The best way of carrying out this adjustment is to make sure that both sliders are at the earthy end of the tracks. Set VR1 to maximum level and have camera 1 viewing a test card. VR2 should then be adjusted until a satisfactory picture is produced (peak video will be seen to "lift" out of the black level as adjustment is made). Adjustment should be carried out slowly due to the time-constant of C3 with R12, and the picture allowed to stabilise after each adjustment. The setting is correct when a complete grey scale can be resolved on the monitor. Channel 2 should be adjusted in like manner. Once set there should be no need for any readjustment. ■

NEW ANTIFERENCE AERIALS

A new range of two extra-gain aerials designed to give improved fringe area reception has been introduced by Antiference. The dipole and director assemblies each consist of four half-wave in-phase elements in a shallow X formation. A large six-element full-wave reflector assembly is used with these. The XG8 has eight director assemblies while the XG14, intended for use in outer fringe areas, features 14 director assemblies. Accurate matching to the full-wave dipole is achieved by means of an integral balun plus resonator. Full details are available from Antiference Ltd., Aylesbury, Bucks.



The new Antiference aerial type XG8.

PART 1

COLOUR BRIGHTNESS CONTROL

S. GEORGE

BRILLIANCE control in a monochrome receiver is a simple matter of directly varying the c.r.t. grid-cathode potential, complicated only by switch-off spot elimination arrangements. The c.r.t. cathode potential may be kept at a constant bias level and the grid voltage varied by means of the brilliance control or vice versa. With a colour set however there are three c.r.t. beams to be considered and the three beam currents must be balanced throughout their operational range to prevent picture tinting at different brightness levels. For this reason the brightness control must be placed farther back in the receiver circuitry. The brilliance control system adopted depends on whether colour-difference or RGB tube drive is employed. In the present article we will look at brightness control with colour-difference c.r.t. drive: a second instalment will deal with the techniques used with RGB tube drive.

Fig. 1 shows the luminance output stage used in the Pye 691 single-standard chassis, including the brilliance control and beam limiter circuitry. The techniques used in this chassis were very widely employed in colour sets with colour-difference c.r.t. drive.

As there is always more than one stage in the luminance channel it is common practice to use *RC* coupling at some point. It is then necessary to re-establish the d.c. level of the signal, either by means of a d.c. restorer diode or a clamp circuit, in order to ensure that the luminance signal is based on a constant potential. In the Pye 691 chassis a d.c. restorer diode (D39) is used for this purpose.

D.C. restorer diodes used in monochrome receivers (e.g. in the Philips 210 chassis) are usually simply shunted across the video output pentode grid circuit with the anode to chassis. In a colour receiver however this is a convenient point at which to introduce the brilliance control action. As can be seen in Fig. 1 the anode of the d.c. restorer diode D39 is returned via a 22kΩ resistor (R201A) to the slider of the brilliance control. The track of the brilliance potentiometer is connected between negative and positive rails via limiting resistors. The tapped off potential does not go positive however, the arrangement simply allowing the beam limiting transistor (VT35) to operate. The net result is that the voltage tapped from the brilliance control forms a d.c. base on which the d.c. restored luminance signal is superimposed. This signal is applied to the luminance output pentode (V6) grid via R351: thus altering the brilliance control setting varies the valve's operating point. As the anode of the luminance output pentode is directly linked to the three cathodes of the shadowmask tube variations in the mean anode voltage of V6 due to changes in its negative grid bias are transmitted to the c.r.t., varying the brightness of the display.

Following usual practice the luminance output is applied at full amplitude to the c.r.t. red gun cathode but via preset drive potentiometers to the green and blue gun cathodes. To ensure that adjustments made to these controls do not materially affect the working d.c. potential of the tube they are connected between the luminance output feed and the junction of the two resistors R356 and R358 which are connected between the h.t. line and chassis. The voltage at the junction of these two resistors is 220V, the same as that at the anode of V6 during the blanking intervals on full drive. There is zero voltage therefore across the blue and green drive potentiometers during these intervals and adjusting them will not affect the d.c. conditions significantly.

As on the other hand the live end of the drive potentiometers is connected to V6 anode while the earthy end is connected to chassis via the 8μF electrolytic C354 they are right across the luminance output from the signal point of view and can provide luminance outputs from zero to maximum to the blue and green guns. The 25pF capacitors C501 and C502 which shunt the drive potentiometers maintain full luminance drive at h.f. regardless of the setting of the potentiometers.

Beam Limiter

The beam limiter transistor VT35 controls the voltage applied to the top end of the brightness control and is driven from the cathode of the line output pentode. Under normal conditions, i.e. when the contrast and/or brilliance control settings do not result in excessive c.r.t. beam currents, VT35 is reverse biased by the voltage applied to its emitter from the potential divider R214/RV16. If the e.h.t. demand is excessive however the line output pentode conducts more heavily than normal and the voltage developed across its 10Ω cathode resistor R226 is sufficient to bias VT35 on—provided the beam limiter preset RV16 is correctly set. VT35 then passes collector current, and the increased current drain through R213 reduces the voltage at the junction of R213/R212 and thus the potential tapped from the slider of the brilliance control. This of course biases V6 back, reducing the drive to the c.r.t.

Flyback Blanking

Line and field flyback blanking are effected by using transistor VT28 to cut off V6 during these periods. V6 cathode is returned to chassis via R359

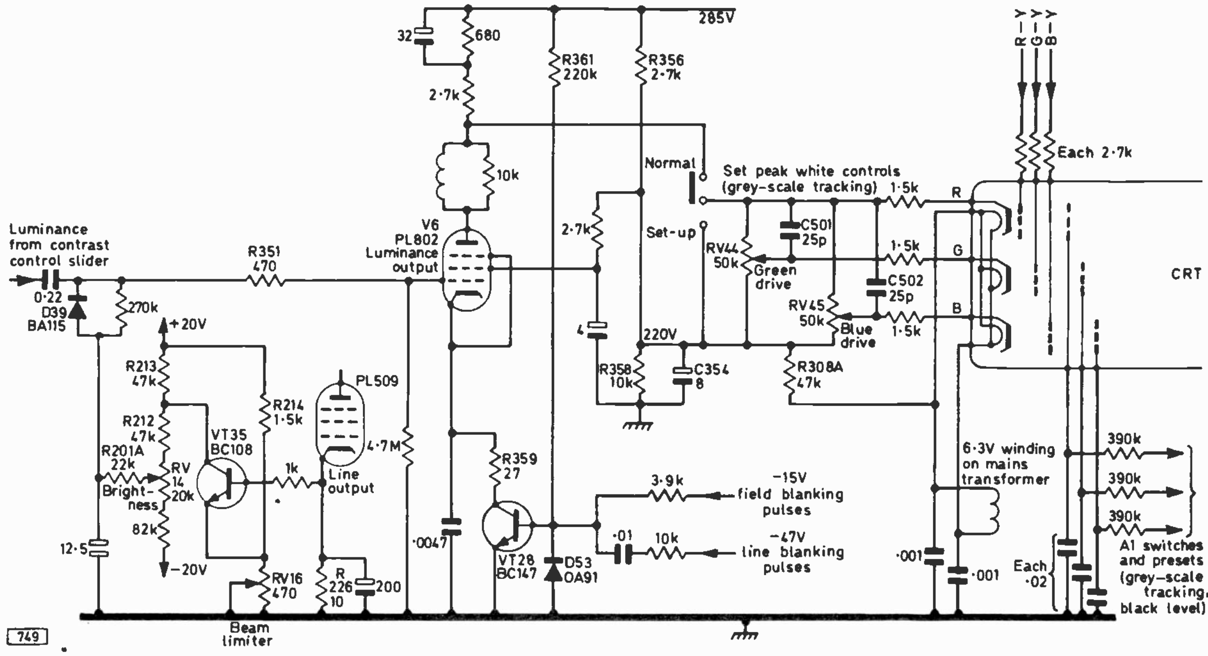


Fig. 1: The luminance output circuit used in the Pye 691 chassis, showing the brightness control, flyback blanking and beam limiting arrangements.

and VT28 which is normally held conducting by the bias applied to its base via R361 from the h.t. line. Negative-going line and field flyback pulses are applied to VT28 base so that during these periods it cuts off: since V6 cathode is then virtually open-circuit its anode voltage rises to the full h.t. line potential and the c.r.t. is cut off, blanking the flyback. D53 protects VT28 base-emitter junction by clipping the blanking pulses.

Note incidentally that c.r.t. heater-cathode strain in this chassis is minimised by connecting one side of the heaters via R308A to the junction of R356 and R358.

Driven Clamp

Very similar brightness control and flyback blanking arrangements are used in the GEC group chassis, the Decca CTV25 and the Bush/Murphy CTV25/CV2510 series. In the latter however a driven double-diode clamp is used in place of a simple d.c. restorer. A d.c. restorer diode conducts when the negative-going line sync pulse arrives, the coupling capacitor then charging to the potential tapped from the brightness control. The driven clamp (Fig. 2) used in the Bush/Murphy dual-standard chassis is driven into conduction once each line by positive- and negative-going drive pulses from the line output stage. The action of a driven clamp is faster and more accurate than that of a simple d.c. restorer.

Alternative Techniques

With colour-difference c.r.t. drive then it is the usual practice to incorporate the brightness control in the luminance channel d.c. restorer/clamp circuit. Two exceptions are the various versions of the Philips G6 chassis, in which the brightness control varies the luminance output pentode screen grid voltage, and those Korting chassis in which the brightness control acts in conjunction with driven clamps in the colour-difference output stages. This latter arrangement is necessitated by the fact that in these chassis the luminance channel is d.c. coupled throughout: an example was described and illustrated in the July 1973 issue (page 393).

Fault Conditions

Finally let us consider the types of fault that can develop with the circuitry shown in Fig. 1. Inability to obtain an untinted raster throughout the range of the brilliance control is almost always due simply to incorrect setting of the grey-scale tracking adjustments. Inability to obtain normal peak brightness is commonly caused by an incorrectly set beam limiter but can also of course be due to a low-

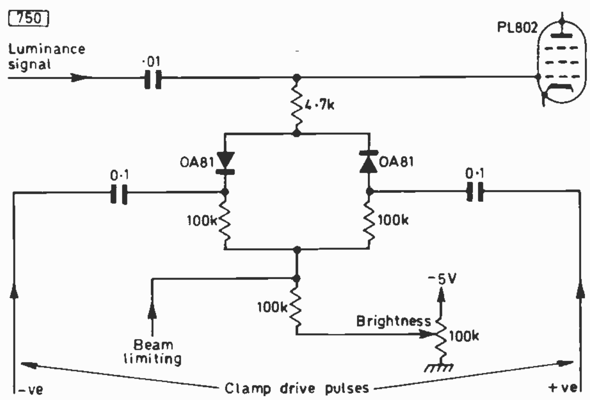


Fig. 2: Double-diode driven clamp used in the RBM dual-standard colour chassis.

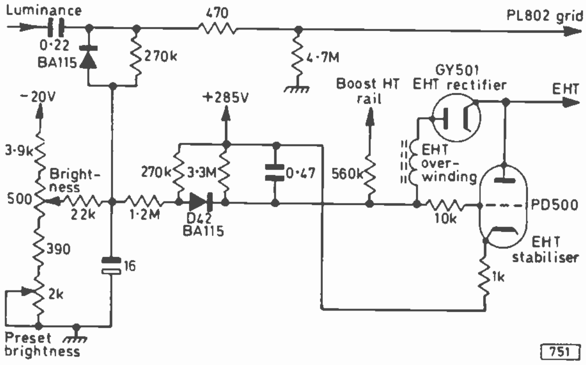


Fig. 3: Beam limiting arrangement used in conjunction with a PD500 e.h.t. stabiliser triode.

emission luminance output valve. The luminance output pentode may also pass inadequate anode current to give peak brightness as a result of reduced screen grid voltage, excessive bias, or the blanking transistor in its cathode lead not being fully conductive during picture information. This latter possibility is generally due to the transistor itself being faulty but can also be caused by its base bias resistor increasing in value or by leakage in the protection diode shunted across its base-emitter junction. The voltage at the collector of the blanking transistor should be about 0·4V.

If the line output valve cathode voltage is abnormal—due to incorrect line drive etc.—the beam limiter action will be affected as well as the picture width and e.h.t. Since the line output valve cathode, the beam limiter transistor and the grid of the luminance output valve are all d.c. coupled, subnormal brilliance control range can be caused by incorrect voltage at any of these points: after checking that the beam limiter control is correctly set it is usually best to start fault-finding by checking the voltage at the cathode of the line output valve, progressing point by point up to the luminance output valve anode and if necessary on to the shadowmask tube.

Vertical striations on the left-hand side of the screen can be caused by a faulty blanking transistor in the luminance output pentode cathode lead.

Shunt EHT Stabiliser

In earlier, dual-standard colour-difference drive models which use a PD500 e.h.t. shunt stabiliser triode the sensing point for the beam limiting system is the grid of the PD500. A typical circuit (Pye dual-standard chassis) is shown in Fig. 3. If the c.r.t. beam current is excessive the PD500 will be cut off by a high negative voltage at its grid. It thus loses control over the e.h.t. current. Diode D42 will then conduct however since its cathode will be negative with respect to its anode. The increased current flowing in the brightness control network will increase the negative potential tapped from the brightness control slider and applied to the luminance output stage, reducing the drive to the c.r.t. The beam limiting action with this arrangement may be applied to the a.g.c. circuit (Philips G6 chassis) instead of the brightness control circuit but the net effect is the same.

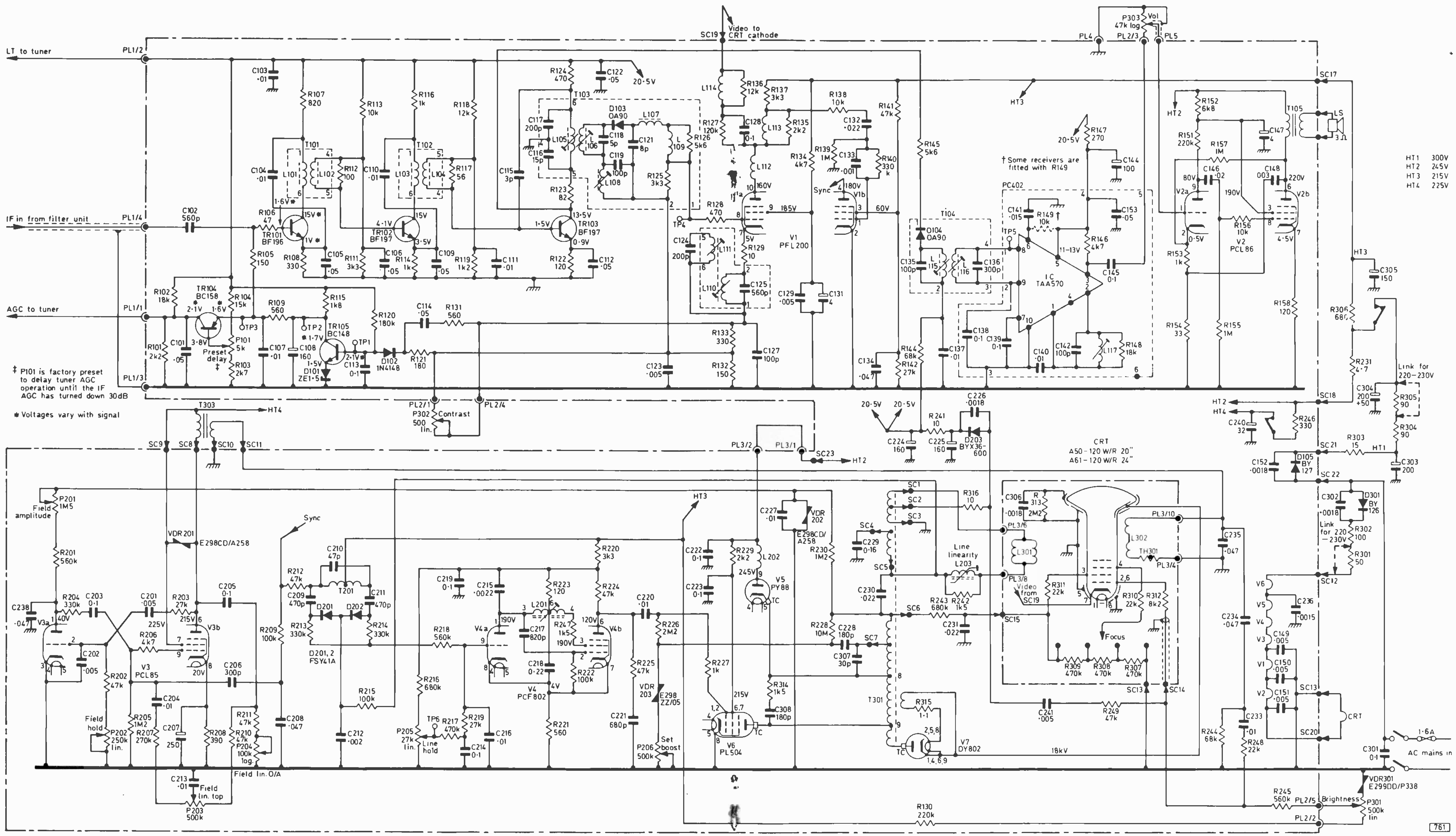


Fig. 1: Circuit of the GEC group Series One chassis. Tuner and i.f. shaping filter circuits will be shown next month. Several different intercarrier sound i.c.s have been used: their external circuits differ.

sive than replacing the line output transformer which will be the casualty if the control is left flat out. The value of the control is not too critical—from 500kΩ up.

More often however the control is not at fault: resistor R228 is the prime suspect. Its value is 10MΩ but again this is not too critical. If this resistor is not at fault check the PL504 and PY88.

We have not yet had a case in these receivers of the boost line capacitor (C230) shorting. It should be remembered however that this component is not returned to the h.t. line as is the usual practice but to chassis via the line scan coils and the output transformer. Thus if C230 shorts the PY88 will get rather hot under the collar and won't survive very long unless something farther up the line goes first—this won't always be the fuse as R303 doesn't need much of an excuse to pop off.

CONTINUED NEXT MONTH

RECEIVER System for Long-Distance RECEPTION

ROGER BUNNEY

THIS article is a follow-up to my recent article on varicap tuning units. It provides information on the receivers used and the modifications made to them. The construction of the varicap tuning units coincided with a change of receivers, the 14in. directly tuned sets previously used being discarded (after many years of good service!) in favour of more modern 19in. dual-standard models. The receivers eventually selected for the purpose were some in the Murphy V849/V879 series (equivalent to the Bush TV125 series). This seems to have been one of the last chassis to employ hand wiring throughout and to have three vision i.f. stages (using valves). The complete circuit along with servicing notes appeared in Les Lawry-Johns articles in the June/July 1969 issues of Practical Television (as this magazine was then known).

Requirements for DX-TV

The requirements of a receiver for long-distance television reception are of course more demanding than those of a receiver for normal domestic reception. We are working with signal strengths of marginal levels—if not lower! Thus high gain is essential and along with this a high degree of stability. Unwanted noise must be kept at a very low level if we are to be able to use the equally low signal levels. The a.g.c. circuits must be sufficiently versatile to be able to cope with the exceedingly strong and fluctuating signals produced by Sporadic E and the abrupt MS (meteor scatter) signal flashes. Then the sync circuits must be capable of locking in on a signal immediately it appears since many signals are present for only short periods—certainly not long enough for the enthusiast to leap to the receiver to adjust rear-mounted controls!

The Bush/Murphy chassis selected seemed ideal for DX work. Strangely enough most engineers in the trade seem to regard it as not too hot from the gain point of view. Sufficient to say however that once the receiver has been correctly aligned it is capable of high v.h.f. gain which can be increased further if frame-grid valves are fitted. This article describes the work done by myself on these sets for my own use and I hope the information will be of interest and assistance to others. I would however welcome any suggestions from others on possible modifications and improvements to the chassis and if sufficient interest is expressed these will be passed on at a later date.

Initial Work

When the receivers arrived the first task was general overhaul to obtain first class operating conditions. In two cases this required replacement of the mains dropper. Following this checks were carried out on the stock faults on the chassis—see the L. Lawry-Johns articles mentioned above.

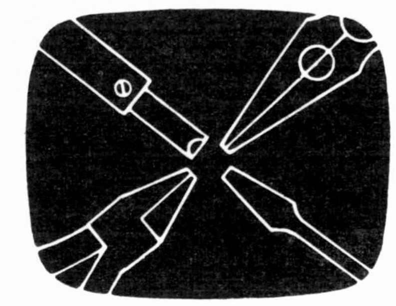
The i.f. strips were then aligned and all vision i.f. valves replaced, an EF184 frame-grid type being used in the third vision i.f. stage in place of the EF80 originally used there. Correct and careful alignment is essential, particularly on the 405-line standard. As an experiment one receiver was modified and realigned using frame-grid valves throughout the i.f. strip: the gain was subsequently found to be excessively high and the original type valves (EF85 and EF80) were replaced in the first two i.f. stages. The circuit of the i.f. strip is shown in Fig. 1.

IF Strip Modifications

Once work on the i.f. strip (not forgetting to peak the i.f. output coil in the v.h.f. tuner) was complete the sets were modified to v.h.f.-only working, the u.h.f. tuners where fitted being removed. This makes one of the system switch contacts, 2S1a, redundant (take the i.f. input direct to pin 3 of the input tuning coil 2L3 in the first vision i.f. stage). 2S1a can then be used for another purpose (see later). The h.t. feed resistor 2R32 on 2S1c should then be removed and a shorting link fitted in its place—this switch section has to be retained simply to provide connection for 2R5.

Since we want to be able to use both the negative and positive vision detectors the detector switching must be separated from the vision i.f. strip switching so that the detectors can be selected independently. The RBM designers have kindly provided a convenient gap on the long system switch three sections down from the top (between 2S1g and 2S1k). There is a long rectangular gap in the main switching assembly through which the sliding portion can be seen. Operate the switch to note the uppermost movement relative to this gap. Carefully drill a 6BA hole through this sliding portion just below the upper end of the rectangular gap. Fit a small 6BA nut/bolt/washer and apply a spot of glue/Araldite to prevent it unscrewing. It is possible to cut out of the sliding portion a section of about ½in. length under the 6BA bolt. When this has been done a plastic knitting needle which protrudes vertically upwards above the i.f. chassis can be glued to the underside of the moving portion, giving separate adjustment of the three upper switch sections and consequently the vision detectors.

The i.f. strip selectivity is good in its existing form but a further improvement can be had by fitting an additional sound rejector (retuned to the vision i.f. of 34·65MHz) in the grid circuit of the



SERVICING television receivers

L. LAWRY-JOHNS

GEC SERIES ONE CHASSIS

GEC receivers fitted with the Series One chassis include the 2047, 2048, 2065, 2066, 2082 and 2083. The equivalent Sobell models are the 1047, 1048, 1065 and 1066. They are single-standard sets with a four pushbutton tuner unit.

The basic design and layout have certain points in common with the ITT VC200 chassis dealt with in the last two issues, i.e. the use of a hybrid circuit employing transistors mainly with valves in the high-power sections, along with a single swing-down panel. The GEC design does not employ a transistorised video stage however, the designers preferring to pin their faith to the proven PFL200 which does seem to have settled down to a long and useful life in contrast to earlier production of this valve.

The intercarrier sound channel and f.m. demodulator consists of an i.c. (TAA570). The output of this is fed to the volume control via C145, the control forming the grid leak of the audio amplifier. Frequency correction is effected by feedback from the pentode anode to different points in the triode cathode circuit. Further current feedback is provided by the unbypassed cathode resistor R158 of the output section of the PCL86.

Dry-joints

As a point of interest we have had several cases of dry-joints in the line output stage of this and the ITT VC200 series. In one or two cases a lead to a line output transformer tag has been found to have never been soldered in the first place; in others it has been necessary to make continuity checks in order to find the source of the open-circuit, where an apparently good soldered connection to the panel has been found to have no electrical contact at all.

AGC

We do not propose to say very much about the tuner unit as this follows normal practice which has been the subject of many words in previous issues. The a.g.c. applied to the base of the BF180 is delayed by TR104 so that none is applied until the i.f. gain has been reduced by about 30dB. The actual point at which a.g.c. is applied to the tuner is determined by the factory preset control P101 which establishes the base level of TR104. The forward a.g.c. applied to TR101 is also applied to TR104 emitter but has little effect until it approaches the base voltage set by P101. When it does approach this level the current through TR104 decreases, the voltage at its collector rises and this increase is applied to the tuner via PL1/1.

IF Stages

We have not so far had much trouble with these transistor stages except for the final i.f. transistor TR103 (BF197). As this has to handle the largest signal swing it is understandable that if a transistor in the strip has to go it is usually this one. Don't forget that with this type the emitter, not the base, is in the middle. Fit the correct replacement as the large signal will tend to overheat a transistor of lower rating.

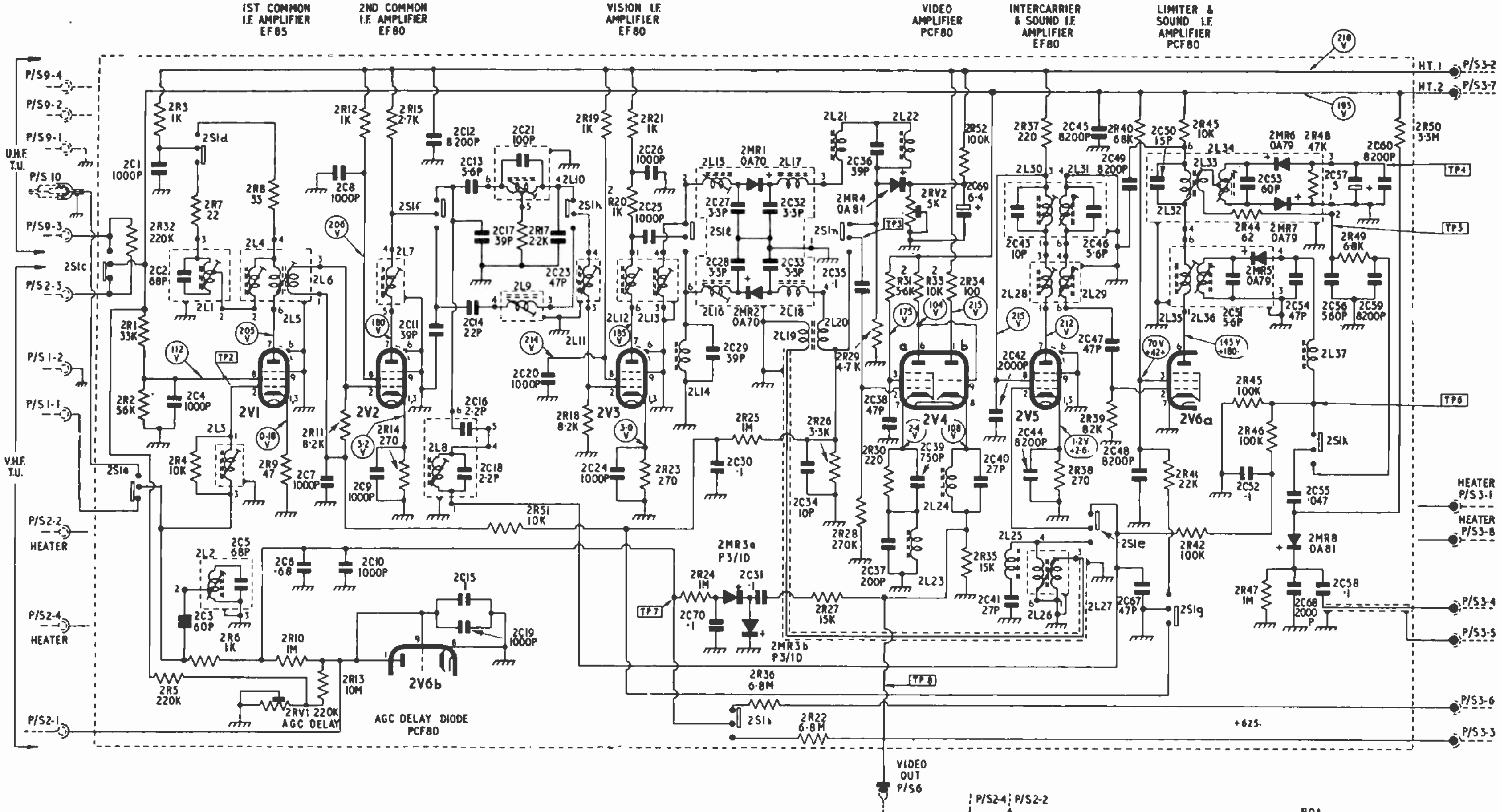
It is very difficult to predict the fault conditions which will be encountered in the i.f. stages as the majority of the troubles will be in the nature of dry-joints and other poor connections which cannot of course be predicted.

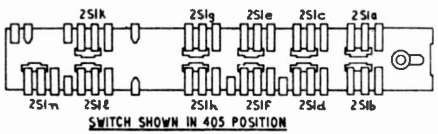
Line Output Stage

While we cannot anticipate the troubles that will be encountered in the i.f. stages there are a few common stock faults that crop up in the timebases. We have already mentioned several cases of dry-joints and leads not contacting in the line output stage. These possibilities should be borne in mind, particularly when the complaint is of a vertical line which does not fade away down the centre of the screen. One immediately jumps for the scan coils but in fact these are rarely at fault. With the scan coils quickly cleared it remains to check back from the socket PL3/6 to the transformer and chassis, from chassis to C229 back to the transformer (SC4) and from the transformer to PL3/8 via the linearity coil L203 if fitted (with some types of scan assemblies the linearity coil is not required and SC5 connects direct to PL3/8).

Where the linearity coil L203 is fitted note the 1·5kΩ damping resistor shunted across it: when (and if) this changes value, going up that is, striations will appear on the left extending and fading towards the centre. By striations we mean vertical rulings which shade and ripple the picture.

Lack of width is a common complaint which is not normally due to low-emission valves. The set boost (width) control may have a dud spot caused by sparking and this is easily checked by adjusting the control. If the width suddenly shoots out for heaven's sake don't leave matters like that. Switch off and replace the control: this is a lot less expen-





405/625 System switch (Receiver unit A348)

Fig. 1: Circuit of the receiver unit (type A348) used in the Bush/Murphy TV125/V849 series of dual-standard models.

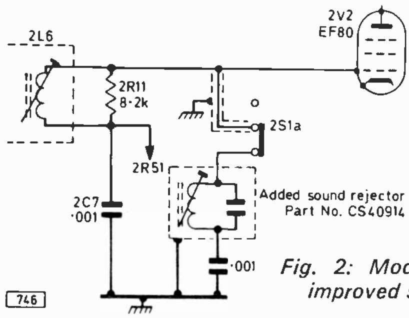


Fig. 2: Modification for improved selectivity.

second vision i.f. stage. This (see Fig. 2) is switched into circuit on 405 only by using the otherwise redundant 2S1a—the rejector can be mounted adjacent to the switch by means of a solder tag.

While tuning across strong signals it was noticed that the a.g.c. line response lagged unduly. To overcome this the a.g.c. line smoothing capacitor 2C6 was reduced in value from 0·68μF to 0·1μF.

IF Bandwidth

The next thing to consider is the question of the i.f. bandwidth. With the detector switching made independent of the other i.f. switching we can use the negative output detector with the narrow bandwidth (405) as well as the wide bandwidth (625). Many of the signals encountered are of marginal strength and a better image (i.e. less noisy) will be seen when narrow bandwidth i.f. strip operation is used. For this reason it is the general practice in DX-TV operation to use narrow i.f. bandwidths with weak signals and to switch to a wider bandwidth only on very strong signals. I have found that during Tropospheric openings signals that have been virtually lost in noise on the wide bandwidth (5·5MHz/625) have been noted by using the narrow bandwidth (3MHz/405). It is necessary to adjust the tuner slightly because of the different i.f.s required with the different i.f. bandwidths. Over many years of DX operation however I have always used receivers with narrow i.f. bandwidths. One very important advantage is the inherent selectivity, which is invaluable when signals are present on adjacent channels. For example in the case of channel E2 vision (48·25 MHz) and channel R1 vision (49·75MHz) a narrow bandwidth receiver will enable each channel to be tuned in whereas operating with wide bandwidth results in the two channels tending to float over each other.

To maintain selectivity at a high level for both positive and negative vision modulation it is necessary to modify the components associated with the vision detector input switching. The i.f. coil 2L13

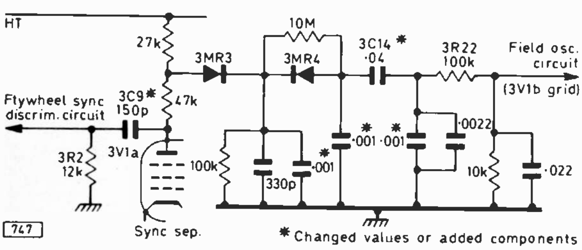


Fig. 3: Sync circuit modifications.

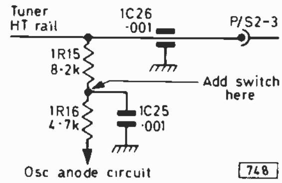


Fig. 4: A switch was fitted between 1R15 and 1R16 in the v.h.f. tuner to switch the oscillator in and out of circuit.

originally connected to the upper contact of 2S11 is connected to the centre contact instead so that it is in circuit for both vision modulation senses while 2L14 and 2C29 are removed. The i.f. coil 2L16 (top core in the large i.f. can) is then repeaked for maximum gain with the i.f. strip itself switched to the 405-line (narrow bandwidth) position.

Switch section 2S1g requires separate operation from the main i.f. strip switching unfortunately. This switch performs the following functions: with negative-going vision (625) it brings into circuit the so-called "anti-lockout" a.g.c. supplementary voltage and brings 2R41 into circuit to alter the screen grid voltage of 2V6a so that it acts as a limiter for the f.m. sound signal; with positive-going vision (405) it earths the "anti-lockout" line. I found it convenient to use instead a small slide-action single-pole changeover type switch. It can be soldered to the bracket which protrudes from the i.f. chassis, carrying the various tuner unit power sockets. This means an extra operation when changing from positive to negative vision modulation: possibly some mechanically-inclined reader can suggest some form of linkage to operate it from the detector switching strip?

Timebase Modifications

Little modification seemed necessary to the timebase sections of the receiver. The existing sync circuit produced good locking. Slight improvement was obtained however by making the following modifications: 3C9 which couples the line sync pulses to the flywheel sync discriminator circuit was increased in value from 82pF to 150pF; the field sync pulse coupling capacitor 3C14 was increased in value from 4,700pF to 0·04μF; additional filtering was introduced by including 1,000pF capacitors from the following points to chassis, junctions 3MR3/4, 3MR4/3C14, 3C14/3R22 (see Fig. 3).

Since for DX reception the receiver usually operates on 625 lines on either vision bandwidth the mechanical timebase switching arrangement was disconnected at the 405/625-line push-buttons so that this control when operated gives either wide or narrow bandwidth i.f. operation. The freed timebase switching cable was wired to one of the vertical upright chassis members where in the event of 405-line timebase operation being required it can be adjusted accordingly.

Front-end Modifications

The final receiver modification was to alter the front-end to operate in conjunction with the varicap tuning unit. In order to achieve high gain the v.h.f. tuner is used as an i.f. preamplifier, both stages being employed for this purpose. A single-pole changeover switch was fitted on the upper side of the tuner adjacent to the PCC89 valve base. Two wires were taken from this to 1R15 (8·2kΩ) and 1R16 (4·7kΩ), the junction of these resistors being separated inside the tuner. Thus with the switch in one position h.t. is removed from the triode section of the PCF86 mixer valve so that it then acts as a straight pentode amplifier while when the switch is closed the h.t. to the triode section is restored and normal v.h.f. tuner operation commences. For use with the varicap tuner unit the h.t. to the triode section of the PCF86 is isolated by means of this switch and the pentode section gives i.f. amplification.

To tune down to i.f. mechanically it is necessary to study the pushbutton mechanism carefully. It will be seen that as a pushbutton is tuned by being turned a nylon collar moves down a long thread and is eventually stopped by a washer and circlip on the end of the threaded section. Removing the circlip allows tuning below channel B1 and observing the screen shows a definite peak in vision noise. The position then reached is the optimum gain position for operation as an i.f. amplifier (with the changeover switch open of course so that the h.t. supply to the triode section of the PCF86 is removed).

Operation

This completes modification and the i.f. output from the varicap tuning unit can be fed straight into the v.h.f. aerial socket. The gain is of a high order.

With the v.h.f. tuner acting as an i.f. preamplifier and no input signal fed in the noise on the screen is very low—light drizzle is a good description. When the output from the varicap tuning unit is fed in the drizzle changes to a blizzard.

I found in practice that with the aerial preamplifiers I use ahead of the varicap tuning units the varicap tuner gain control is best set halfway for Band I and at maximum for Band III. On u.h.f. the varicap tuning unit gain control is best set to maximum except when working on channels adjacent to the local ones. The varicap tuning unit gain control will obviously require different settings depending on the amount of aerial preamplification used.

The main receiver contrast control is usually advanced only one third from minimum with the a.g.c. delay control on the main i.f. strip set half way. This avoids overloading while retaining the lowest noise figure.

Line Sync Adjustment

As a final adjustment when all modifications have been made check the line synchronisation by rapidly reducing the tuner gain and then advancing it to simulate a weak, fluctuating signal. It should be possible to synchronise to a signal as soon as it appears. If problems are experienced with line synchronisation adjust the flywheel line sync discriminator phase control 3RV1 as follows.

Switch to 405 and adjust the line hold control 3RV5 to mid-travel. Remove the sync pulse input to the discriminator circuit by connecting a shorting link across 3R2. Set 3RV1 to mid-travel and then adjust 3TC1 in the line oscillator circuit to give a stationary display. Switch to 625 and adjust the 625-line preset hold control 3RV3 for a stationary display. Then remove the shorting link across 3R2. Finally check the pull-in range of the line hold control 3RV5.

If the pull-in range limits are displaced clockwise readjust the phase control 3RV1 slightly clockwise and vice versa. Short 3R2 and set the line hold control to mid-travel. Adjust 3TC1 for a stationary display. Repeat this procedure until the pull-in range is placed correctly either side of the line hold control setting.

Conclusion

Carrying out all these modifications should result in a versatile high-gain receiver capable of working with marginal-level vision signals which would be virtually unseen on a conventional receiver.

Finally my thanks to Hugh Cocks for his assistance in obtaining a quantity of these Bush/Murphy receivers. ■

LETTERS

I would like to add to John Law's comments in the August issue on faults in the line timebase used in the Pye 11U series. In my experience—and I have renovated a very large number of these chassis—one of the most frequent causes of line timebase malfunction is R119 (270kΩ, ½W). This resistor is connected via a 12pF 5kV capacitor (C94) to tag 8 on the line output transformer and small in value though C94 is quite high pulse voltages occur across R119. On most of the sets passing through my hands R119 has been found to be discoloured, and resistance checks often reveal that it has gone high-resistance. The symptoms produced by its failure vary from weak and drifting line hold to a complete refusal of the timebase to oscillate at all. In some cases the timebase oscillates but at a drastically reduced frequency, in others there is a buzzing sound as if something is arcing over, while in yet others all appears well except that the timebase takes an inordinately long time to start oscillating.

I recommend replacing R119 with a 1W type, or alternatively with a 120kΩ plus 150kΩ pair of ½W resistors. In both cases increased spacing between C94 and V14B pin 1 should help deter high voltages from sparking over. Care should be taken to ensure that neither C94 nor the replacement R119 touches the line output transformer cover.—**P. Lane** (*Llanerchymedd, Anglesey*).

TCE 8000 CHASSIS

As a bench engineer employed by a company within the Thorn group I would like to provide a practical appraisal of the 22kV e.h.t. and line output transformer used in the 8000 chassis (see comments on this subject earlier this year). We have a large number of 8000 series receivers operating in customers' homes within our service area and to date have had no serious problem with line output transformer failures—indeed we have had to replace only two. This compares very favourably with the 3000/3500 chassis with its tripler and lower-voltage overwinding.—**P. C. Allen** (*Stirling*).

(See letter on page 367, June issue, and IBC-72 review in the March issue.)

THE 'TELEVISION' COLOUR RECEIVER FORUM

THE purpose of this feature, started last month, is to co-ordinate hints and tips from readers who have successfully completed the TELEVISION Colour Receiver and to pass them on for the benefit of others. We have already been in touch with a number of successful constructors as a result of which it has been possible to present readers with a considerable amount of useful material. We invite others to contribute notes on their findings, comments or suggestions that may be useful to others. Clear sketches and monochrome photographs of sets or parts of sets are welcome. All contributions published in this feature will be paid for at our normal rates. Contributors' addresses will not be published.

Please do not send in parts of receivers unless requested to do so. We regret that it is not possible to answer telephone enquiries regarding this feature or the set itself.

The Fault Finding Advisory Service (form in the August, September and October issues) will be continued until further notice.

Two constructors outline below their own power supply circuits: both seem to be very satisfactory and have their own obvious advantages.

Dear Sir,

POWER SUPPLIES

In order to get the set working without further loss of time I decided to forgo the advantages of using a mains isolating transformer and having the chassis earthed, taking the chassis to the neutral side of the mains supply instead. This is safe so long as you ensure that (1) all exposed metalwork goes to mains earth, i.e. disconnect the braiding connections to the front panel, and (2) the c.r.t. protection band is connected to chassis via an *RC* leakage path, not directly (use a 3·3MΩ 1W resistor and 0·0018μF 4kV tubular ceramic capacitor in parallel). The circuit I used is shown in Fig. 1. The resistor connected from one side of the c.r.t. heaters to the red gun cathode is to ensure that the safe c.r.t. heater-cathode voltage is not exceeded; it also removes hum injection. The slightly increased complexity of the 20V supply is well worthwhile. Note that the audio board supply (6L) will rise above 30V if the 20V load is reduced, so 6L should be connected last—if you are a purist! Incidentally I feel that the line output valve screen feed resistor would be better rated at 10W: this is not essential but is advisable in the interests of reliability and stability.

WIRING

(1) I recommend that the signal connections to the RGB board, from 2E to 3C, 1E to 3E and 1F to 3D, be made with v.h.f. coaxial cable. This avoids loss of h.f. signal components and spurious pick-up. Earthing at both ends has not caused any hum loops. If any setting up is done without the decoder fitted, i.e. with 3D and 3E disconnected, these two points should be taken to earth via 10μF electrolytics.

(2) On the decoder board I have found that to prevent subcarrier pickup it is best to use v.h.f. coaxial cable for the link designated V, from D16 cathode to C43: earth the ends at the earthy end of R63 and to L6 can earth respectively.

Coaxial cable earthed at both ends should also be used for the −80V pulse feed to 1D on the decoder from tag 9 on the line output transformer. Otherwise unstable sync can result due to radiation.

BEAM LIMITING

I found that the beam limiting circuit tends to spoil the effectiveness of the black-level clamping system by endeavouring to maintain a constant average beam current. Accordingly I have modified the circuit as shown in Fig. 2 (left-hand side). Tr702 is now normally off. When excessive beam current flows the voltage at 4H/9Q rises until 0·6V is developed at Tr702 base. It then turns on, holding the c.r.t. grids at 23V or so thus limiting the beam current to a safe value.

FLYBACK BLANKING

The arrangement I used for field flyback blanking is shown on the right-hand side of Fig. 2. The flyback pulse appearing at D305 cathode is inverted by the BC107 and used to cut off the c.r.t. grids. I also found that improved line flyback blanking was obtained using the circuitry shown.

DECODER

The reference oscillator refused to lock with L2/C13 in circuit. No trouble was experienced after removing them. I found that the preceding d.c. amplifier Tr3 likes to oscillate as well: a 470pF capacitor from collector to chassis stops this.

Low ident output was cured by changing L4 core, adding an 0·068μF capacitor across the coil and changing Tr6 to a high-gain BC149 transistor.

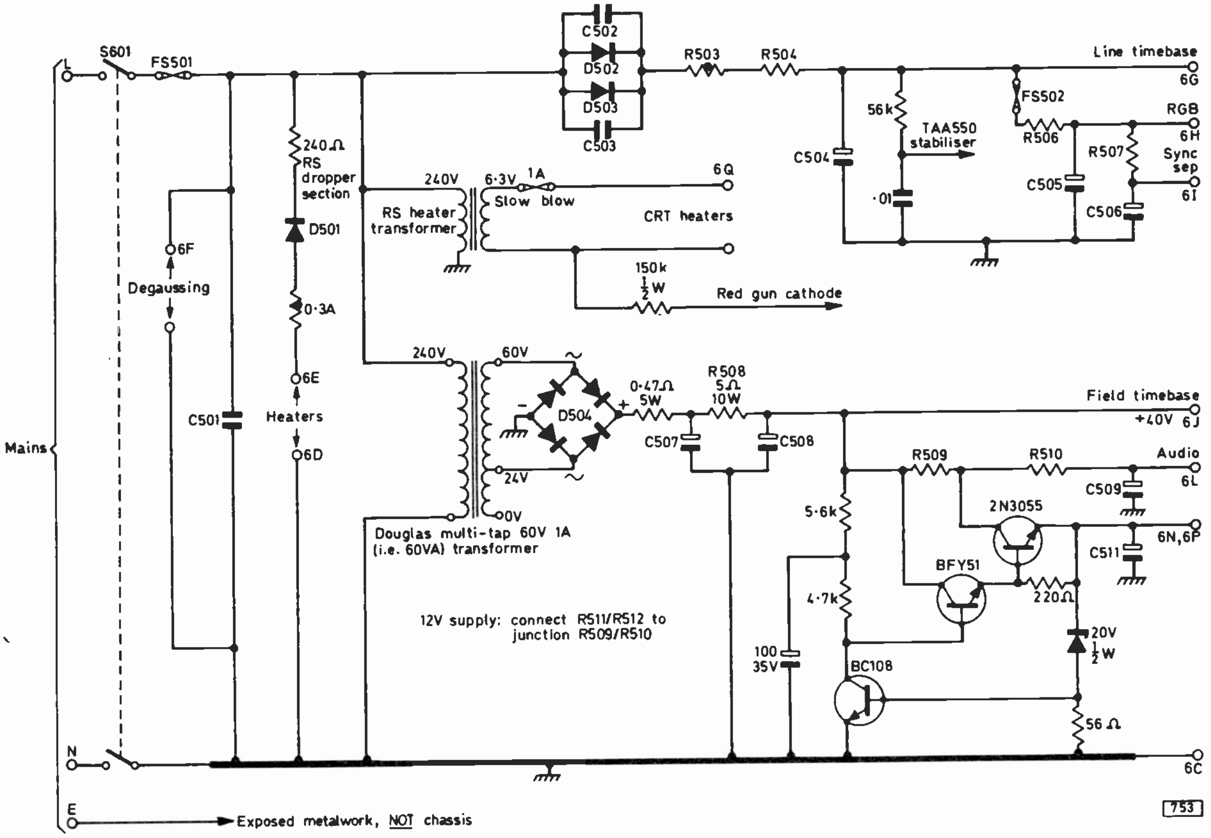


Fig. 1: Power supply circuit used by L. Cook, with stabilised 20V line. 36V a.c. is obtained across the 24V and 60V taps on the secondary winding of the Douglas multi-tap transformer.

Difficulty in getting the bistable to trigger reliably was cured by changing C40 to 0·0068μF and R53 to 82Ω; also an extra 0·0068μF capacitor may be needed across C39. It is possible however that L5 may be faulty, so these last amendments are only tentatively suggested though I have found them to work.

L. Cook

Editorial comment: We have heard from other readers of trouble with the network L2/C13 but do not recommend its removal. The trouble appears to be due to spreads in the value of the coil. Likewise the bistable triggering difficulty seems to be due to spreads in the value, which is quite critical, of L5.

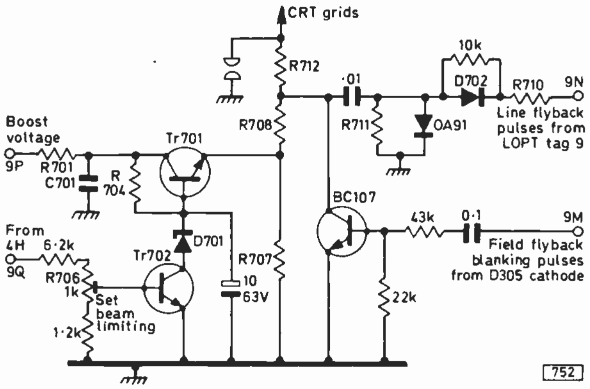


Fig. 2: Beam limiting and flyback blanking circuit used by L. Cook.

Dear Sir,

BOARD LAYOUT

As mentioned last month improved performance can be obtained by mounting the three signal boards side-by-side on a sheet of hardboard (make cut-outs for access to the printed side of the boards) at the left-hand side of the cabinet. The arrangement is shown in Fig. 3. Fig. 5 shows the small board on which the RGB drive controls are mounted (so that the signals, with the RGB board mounted towards the centre of the chassis to the left of the c.r.t., can be fed via short connections to the c.r.t. base panel).

In connection with the modified blanking circuit described last month it should perhaps be made clear that the line flyback blanking pulses are taken, as in Fig. 4 on page 403 of the July issue, from 9N via C704 and R709 to the junction R712/R708.

ADJUSTMENT IMPROVEMENTS

I have found that horizontal centring can be achieved much more satisfactorily if a centre-tapped potentiometer is used for R354. Connect the centre tap to PL301: the flying lead to SKT301/2 is then

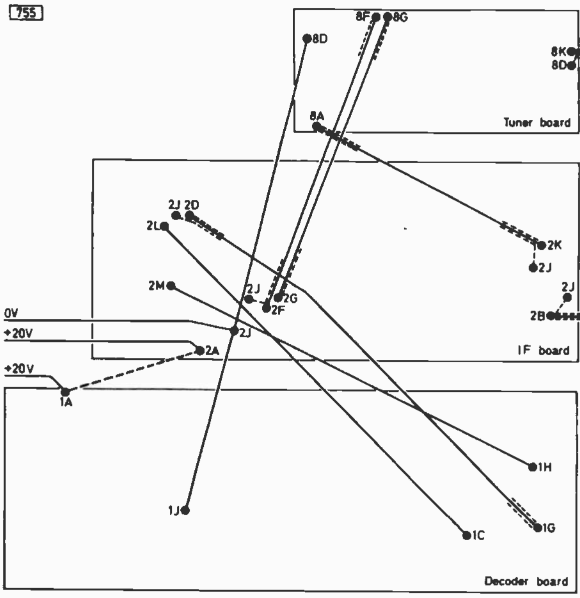


Fig. 3 (left): Arrangement of the three signal boards side-by-side adopted by E. Erven. This arrangement can be used only with 22in. or larger c.r.t.s. If a single regulated 20V line is used, add the link shown in broken line between 1A and 2A and use only one 20V connection to the power supply. Note that this diagram shows the interconnections between the three boards only.

not necessary. The potentiometer should be a wire-wound type rated at 2W (available from Forgestone Components, complete with mounting details).

On the decoder board it was found that the B−Y quadrature adjustment was more easily made if the value of C37 is reduced. I have used a 6·8pF capacitor in this position.

REGULATED POWER SUPPLY CIRCUIT

I have now built up on a printed panel (Figs. 6/7) and fully tested the power supply circuit shown in outline form in Fig. 6 last month. The final circuit is shown in Fig. 4. The components used are those supplied in Pack 18 plus a number of extra ones. The adjustments necessary (R5 and R12) are easy to

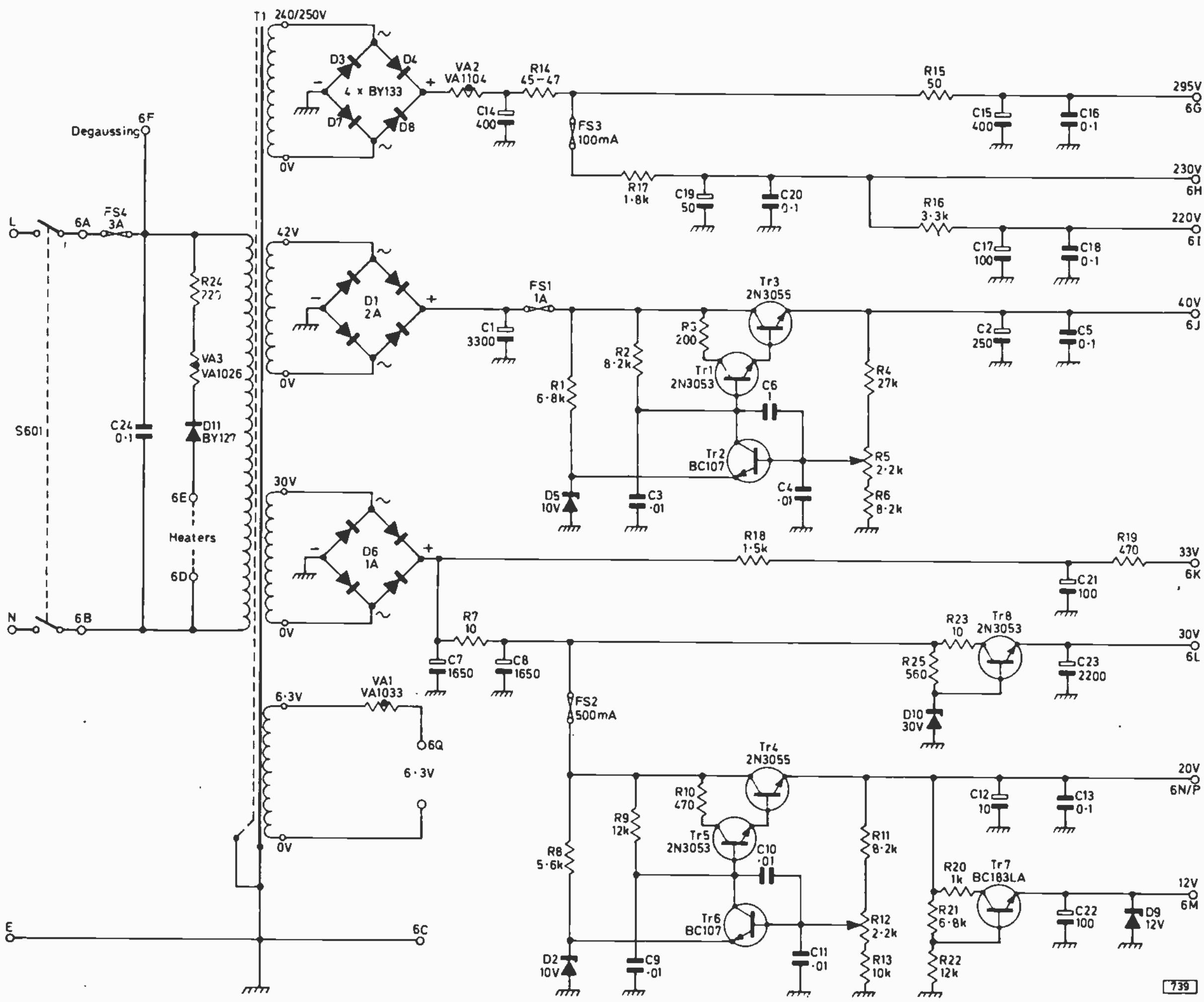


Fig. 4: Power supply circuit designed for the receiver by E. Erven, with stabilised 40V and 20V outputs. R14 can be made up from the 30Ω and 15Ω resistors (R504 and R509) supplied in the original component pack.

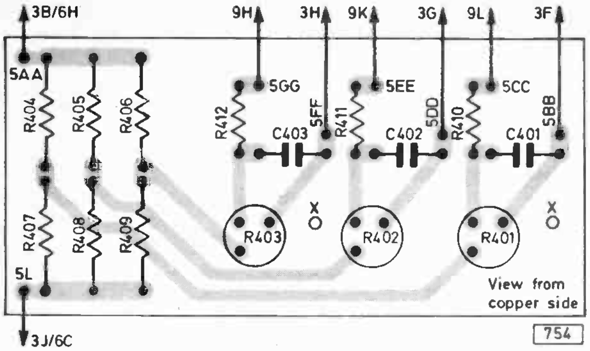


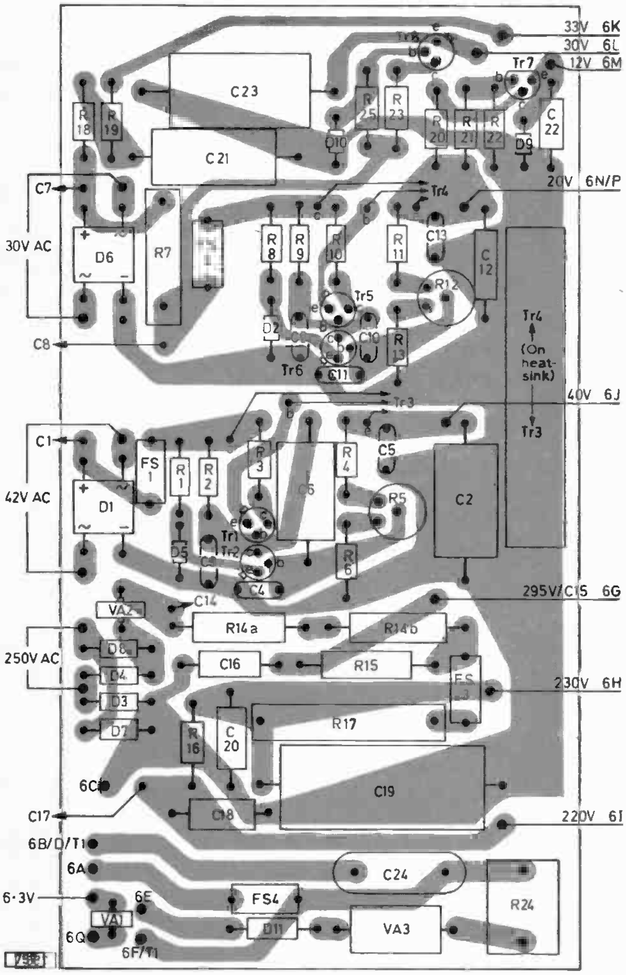
Fig. 5: The small board used by E. Erven to mount the RGB drive controls: drill ⅛ in. holes in the positions marked X to secure the board to two of the RGB output transistor heatsinks—ensure that the board is insulated from the heatsinks. Shown half scale (viewed from the copper strip side).

carry out: the potentiometers are simply adjusted to give the stated outputs.

The stabiliser circuits have been devised so that if the outputs are inadvertently short-circuited the fuses will blow without the transistors going.

The ratings of the various mains transformer secondary windings are as follows: 0—250V 1A, 0—42V 1A, 0—30V 500mA, 6·3V 1A.

Measurements on the circuit give the following performance figures. The output from the 40V regulator is 40V with no load falling to 39·9V at an output of 1A into a resistive load. 2·5V p-p ripple at the input is reduced to 50mV p-p at the output. The regulator draws 12mA, the short-circuit current is 5·6A and the output can be adjusted from 36-44V by means of R5. With no load the output from the 20V regulator is 20V, falling to approximately 19·9V with an output of 500mA into a resistive load. 400mV p-p ripple at the input is reduced to 10mV p-p at the output. The regulator draws 12mA, the short-circuit current is 2·2A and the output can be adjusted from 18·5-22V by means of R12. The h.t. supplies remain stable to within ±10% of the specified figures at normal average brightness levels: at excessive brightness levels the voltage falls to −10% or worse. The regulated supplies will hold their out-



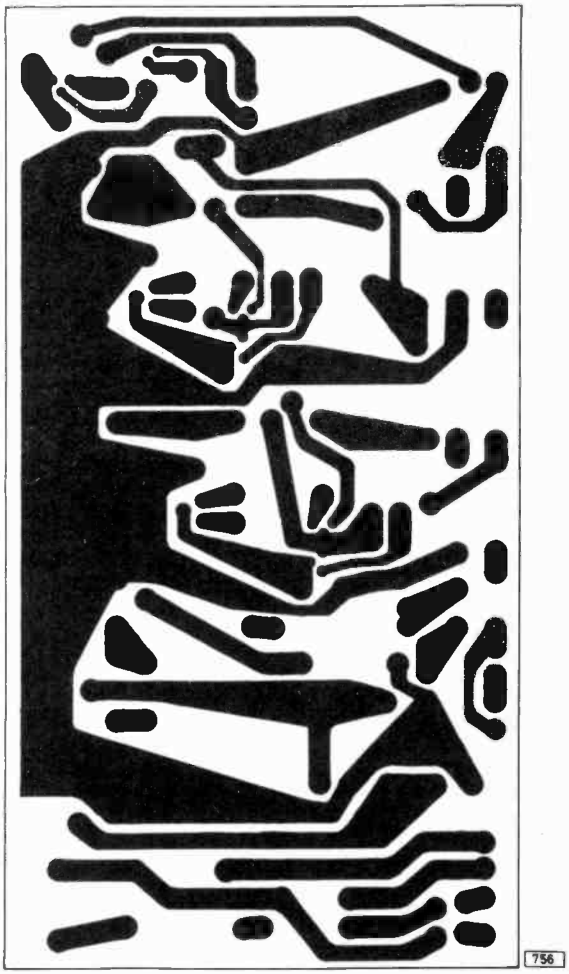
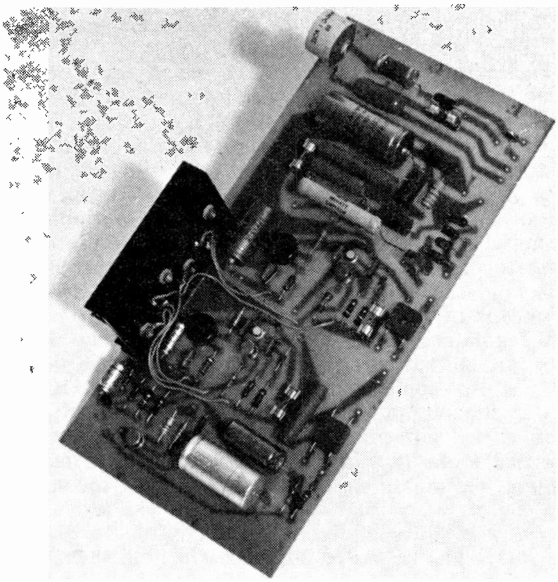


Fig. 6 (left): Layout of E. Erven's power supply, viewed from the component side. C1, C7/8, C14 and C15 are mounted off the board.

Fig. 7 (right): Printed panel pattern (copper side), shown half scale.



E. Erven's power supply unit. Four large can electrolytics are separately mounted using suitable clips.

puts within 0·5% for a variation of the nominal mains voltage of ±15%.

E. Erven

Editorial comment: The power supply circuit devised by E. Erven is illustrated in the accompanying photograph. We have found it to provide wholly satisfactory results. We understand that the components required can be obtained from Forgestone Components.

CROSSHATCH GENERATOR

It was originally intended to publish details of a crosshatch generator devised specifically for the colour receiver. After costing this out however we have found that the advantage lies with using the design by C. R. Bradley B.Sc. published in the September 1972 issue (during the series on the colour receiver). This has been tried out with the colour receiver and operates perfectly satisfactorily. Line pulses can be picked up by wrapping the generator's insulated input lead around C327 (timebase board): feed the video output signal from the generator to the base of Tr109 on the i.f. panel. Note the crosshatch generator modification given in the January 1973 issue (page 129)—adding a 200pF capacitor from Tr1 base to chassis.

The generator (assuming purchase of a Bi-Pre-

components list (Fig. 4)

Resistors

R1	6.8kΩ		R7	10Ω	10W	R14	47Ω*	15W	R21	6.8kΩ	
R2	8.2kΩ		R8	5.6kΩ		R15	50Ω	10W	R22	12kΩ	
R3	200Ω	2W	R9	12kΩ		R16	3.3kΩ	1W	R23	10Ω	
R4	27kΩ		R10	470Ω		R17	1.8kΩ	15W	R24	220Ω	0.3A
R5	2.2kΩ	¼W pot	R11	8.2kΩ		R18	1.5kΩ		R25	560Ω	
R6	8.2kΩ		R12	2.2kΩ	¼W pot	R19	470Ω				
			R13	10kΩ		R20	1kΩ				

All ½W unless otherwise indicated. *See Fig. 4 caption.

Capacitors

C1	3300µF	63V	C7	1650µF	63V	C13	0.1µF	50V	C19	50µF	350V
C2	250µF	50V	C8	1650µF	63V	C14	400µF	350V	C20	0.1µF	400V
C3	0.01µF	50V	C9	0.01µF	50V	C15	400µF	350V	C21	100µF	35V
C4	0.01µF	50V	C10	0.01µF	50V	C16	0.1µF	400V	C22	100µF	15V
C5	0.1µF	50V	C11	0.01µF	50V	C17	100µF	275V	C23	2200µF	35V
C6	1µF	50V	C12	10µF	25V	C18	0.1µF	400V	C24	0.1µF	900V

Semiconductors

D1	2A bridge	D9	12V 1W zener (1N3022)	Tr6	BC107
D2	10V 1W zener (1N3020)	D10	30V 1W zener (1N3031)	Tr7	BC183LA
D3	BY133/1N4007	D11	BY127	Tr8	2N3053
D4	BY133/1N4007	Tr1	2N3053	VA1	VA1033
D5	10V 1W zener (1N3020)	Tr2	BC107	VA2	VA1104
D6	1A bridge	Tr3	2N3055	VA3	VA1026
D7	BY133/1N4007	Tr4	2N3055		
D8	BY133/1N4007	Tr5	2N3053		

D3, D4, D7 and D8 must be the same type.

Miscellaneous

FS1 1A
FS2 500mA
FS3 100 mA
FS4 3A
All anti-surge.

T1 Mains transformer (see text)
Heatsink assembly type A1057D/T03; transistor mounting kits; printed board; capacitor mounting clips.

Pack kit) can be mounted in the receiver as follows. Discard the original box. Mount the rotary switch in the normal position but for the slide switch break off the mounting side plates and bend back the three contacts opposite the slide switch lever itself. Mount these three contacts through the holes in the board closest to the edge and wire up the other three contacts with connecting wire. Discard the original VR2/S3 and use instead an RS 4·7kΩ 16mm potentiometer with s.p.s.t. switch. Glue this on the corner of the board where the original component was to be mounted, using Araldite: the switch contacts should hang over the edge of the board. Wire the potentiometer and switch contacts to the printed circuit tracks with connecting wire. Mount all the other components in the usual way. The generator can then be positioned in the convergence drawer behind board three. We expect to be able to provide details of the convergence drawer top panel shortly.

DEGAUSSING

C.R.T. demagnetising was not mentioned in the setting-up instructions. Several constructors with whom we have talked have reported that they found it unnecessary. It is possible however that some c.r.t.s may have become excessively magnetised before use, making purity difficult to obtain. Details for the construction of a suitable degaussing/demagnetising coil were given in the June 1972 issue, during the series on the colour receiver, on pages 368/9, together with instructions on its use.

SETTING-UP PROCEDURE

First a correction: the instruction to restore the power supply connection to 5P should have been given under the heading "Timebase Checks" along with the instruction to restore the connection to 4B, not just prior to making the picture geometry adjustments.

Secondly mention of the coil (L501) on the tuner/i.f. preamplifier board was omitted. The tuning is not very critical: adjust for maximum output, after tuning in the varactor control panel on one pushbutton. This is done during the "initial stages".

We shall be publishing next month a detailed procedure for aligning the decoder using just a multimeter and a simple diode probe.

MODULE INTERCONNECTIONS

The fact that there are two earth pads marked 8D on the tuner board was overlooked in the module interconnection list given in the July issue. As mentioned in the alignment instructions (May) the i.f. preamplifier output (8K) should be connected to the input point (2B) on the i.f. board via coaxial cable (no longer than 10in.) with the cable screen earthed at both ends, i.e. at 8D adjacent to 8K at one end and 2J adjacent to 2B at the other. This is important. Connect the other 8D pad to the main 2J to 6C point on the i.f. board (not direct to 6C).

BOARD POSITIONS

A number of readers have pointed out that the line output transformer and e.h.t. tripler cannot be mounted between the boards on the right-hand side of the cabinet as suggested in the June issue: they should be mounted behind the RGB board.

TIMEBASE FUSE

Note that the 500mA fuse FS301 on the timebase board must be an anti-surge type (otherwise you may get repeated fuse blowing).

CRT FIRST ANODE SWITCHES

Several readers have complained about a crack from these switches when they are operated. One of the modifications given in E. Erven's letter last month, decoupling the c.r.t. first anodes with 0·01μF capacitors, has been found to overcome this.

POWER SUPPLY

In the event of it being necessary to replace the zener diodes D506, D507 or D508 following the power supply modification suggestions made last month we recommend the use of 7 or 10W types.

Partial loading of the low-voltage d.c. outputs is not recommended otherwise these will rise excessively giving false operating conditions.

MISCELLANEOUS

The component reference number R605 was unfortunately used twice in the project. There should be no confusion however since one "R605" is the 470Ω 1W carbon resistor connected in series with the black lead from the e.h.t. multiplier unit while the other one is the VA8650 positive temperature coefficient thermistor in the degaussing circuit.

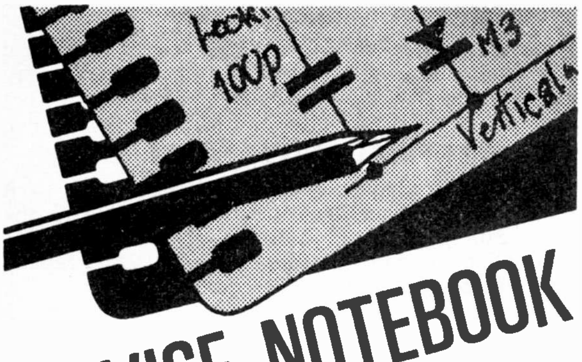
A number of readers have asked why a ferrite loudspeaker was specified. The author states that this type of loudspeaker has a low radial field compared to its fairly large axial field: the low radial field minimises its effect on the picture purity/convergence.

It is possible however that some slight picture discolouration may still be experienced if the loudspeaker is close enough to the tube: its siting is an important factor therefore.

NEW FROM MULLARD

An improved version of the Mullard luminance and chrominance signal processing i.c. is being introduced: the new version is designated TBA560C. It offers the following advantages over the earlier version: full short-circuit protection; increased automatic chrominance control (a.c.c.) range; reduced crosstalk between the chrominance and luminance channels; improved black level stability with variations in picture content and contrast control setting. When a C version is used to replace the original TBA560 certain minor component changes in the peripheral circuitry are necessary.

For applications—including line timebase circuitry—where a fast diode "snap off" characteristic can introduce unwanted interference Mullard have introduced four new "soft recovery" diodes, types BY206, BY207, BY210-400 and BY210-600. The soft recovery characteristic is obtained by using a p diffusion into an n substrate. This results in a more gradual reduction of the stored charge when the device cuts off. The BY206 is a direct and improved replacement for the BA145 and BA148 which are found quite widely in line timebase circuits and are now being phased out by Mullard.



SERVICE NOTEBOOK

G. R. WILDING

Erratic Width

The problem with a Philips colour set fitted with the G6 single-standard chassis was occasional erratic changes in picture width. The impression was of a dry-joint in the timebase circuit rather than impending transformer breakdown. The line stabilisation control R5040 (Fig. 1) operated smoothly, with no suggestion of a bad spot on the track, and the two series-connected 3.3MΩ resistors connected from a tapping on the line output transformer primary to the width stabilising v.d.r. were replaced without any improvement (such high-value resistors are found in the width circuits of all modern receivers and frequently go high-resistance to cause reduced width, but the possibility of a poor connection between one of the lead-out wires and the composition body must always be considered). Slight voltage variations at the line output valve control grid indicated that the fault was in this part of the circuit, the possibles being the v.d.r. itself, the 1.8MΩ grid resistor, the coupling capacitor from the line oscillator stage and the 150pF pulse feedback capacitor C5017 across the two 3.3MΩ resistors. As this latter component is subject to high-voltage pulses it seemed the most likely suspect and although its insulation seemed to be in order when tested with a Megger replacing it completely cured the trouble. Once again the only sure capacitor test, especially when the fault is intermittent, is replacement.

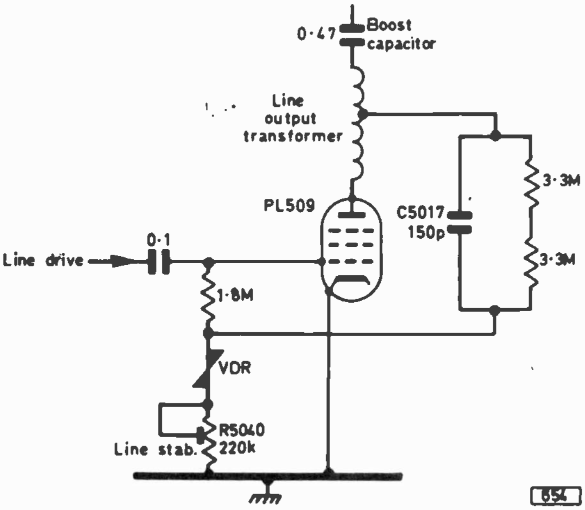


Fig. 1: Line output valve grid circuit of the Philips G6 chassis (single-standard version). The complaint was occasional erratic width reduction.

Dark Band Across Screen

The complaint with a 19in. Defiant model (Plessey chassis) was the appearance of a dark band across the screen. The owner mentioned that sparks and flashes could be seen through the back of the set following the development of the trouble. These models have two large printed panels, one carrying the i.f./video and the other the timebase circuitry. We found that a section of the former panel near the PCL84 video pentode had darkened considerably, current tracking across intermittently in two places. This was probably due to the effect of prolonged heat from adjacent high-wattage resistors. The main leakage was between the printed wiring to heater pin 5 on the PCL84 valveholder and the valve's control and screen grids.

Tapping the discoloured panel areas with a sharp-bladed screwdriver resulted in the defective paxolin flaking off without weakening the valveholder mounting. The strips of printed wiring originally crossing these areas, plus those crossing even slightly discoloured sections, were completely peeled off therefore and replaced by jumper leads. The PCL84 appeared to be in order but was replaced since this type of valve frequently develops internal shorts after some years in service, and this one had certainly been subject to ill treatment. On retesting perfect results were obtained with no suggestion of the original screen hum bar.

If tracking or arcing across insulating panels of any type is caught in time and the defective areas chipped out the repair is usually a complete success.

No Field Lock; also Contrast Fault

THE COMPLAINT with a set fitted with the BRC 1400 chassis was that the picture could not be locked. On inspection it was found that although line lock could be obtained after careful adjustment it was impossible to obtain vertical lock, while the picture shape suggested that there was more at fault than the field timebase running too fast. On removing the back the cause of the trouble was obvious—all valves were glowing far too brightly as a result of the heater rectifier being short-circuit. This particular rectifier (a BY130) is mounted at the top of the swing-out chassis, near the left-hand side of the multiple dropper, and is so small (about the size of a vision detector diode) that it is easily overlooked. When it goes short-circuit a.c. appears on the heater line and as on this chassis the bias for the pentode section of the field timebase valve (PCL85) is taken from a point along the heater chain the result is constant field tripping and a distorted raster—this safety feature prevents the set being used until the fault has been cleared. On replacing the rectifier a normal picture was obtained but the contrast on both standards was found to be well below standard.

The rear-mounted 405/625 contrast controls had only slight effect. As is usual in valved dual-standard models they are used to add a small positive potential to the negative potential derived for a.g.c. purposes from the sync separator grid circuit—maximum gain is obtained when the negative a.g.c. bias is completely offset by the bias obtained from the contrast control(s) and the clamp diode is brought into conduction to prevent the a.g.c. line going positive. The fact that the controls had limited effect did not necessarily imply that they were failing to offset the negative a.g.c. potential: if the input to the sync separator is small—due to low tuner, i.f. or video gain—there will be little negative bias developed to be offset! In practice, however, limited effect on gain by the contrast controls usually indicates that they are not applying sufficient positive bias to the a.g.c. rail. The only sure test of this is to short the a.g.c. rail to chassis on a strong signal with the contrast control fully advanced. If the gain improves then clearly the negative potential from the grid of the sync separator is not being completely offset. This in fact turned out to be the case and it was found that the high-value resistors connected to the sliders of the contrast controls were almost completely open-circuit. The high-value resistors generally used in this position frequently go high-resistance after some years of use and must always be number one suspect in faults of this type. On much rarer occasions the clamp diode goes open-circuit. This results in the contrast control(s) having a very severe action at first, after which a small positive potential on the grid of the controlled valves gives a very unstable, flat picture usually with sound-on-vision and vision-on-sound.

Weak Field Hold

Two KB models fitted with the ITT VC52 chassis came in during the same week with the same fault, weak field hold. On test the line locking was also found to be well below standard though the picture never broke up horizontally once the line hold control was correctly set. As always valve suspects were changed before delving into the circuit—the PCL85 field timebase valve, PCF80 sync separator and PCL84 video amplifier all being replaced, the last because in these as in most other ITT dual-standard chassis the triode section is used as a field sync pulse amplifier. There was no improvement so next we started to check voltages, starting with the sync separator. The cause, almost zero anode voltage, was immediately found and was due to the anode load resistor (R66, 220kΩ) being open-circuit. Replacement gave normal field locking. The surprising thing is how well the line timebase locked in spite of the fault. In earlier ITT/STC dual-standard chassis I have known weak field sync with quite good line sync to be the result of an increased value sync separator screen grid feed resistor—this also greatly reduces the h.t. to the anode of the PCL84 triode field sync pulse amplifier.

Fluctuating Picture

"Fluctuating picture" was the reported complaint on a colour set fitted with the RBM single-standard chassis and on inspection this proved to be a fair description. After eliminating the possibility of aerial or internal plug connection troubles we eventually traced the cause to small variations in the h.t. voltage. The h.t. supply in this chassis is provided by

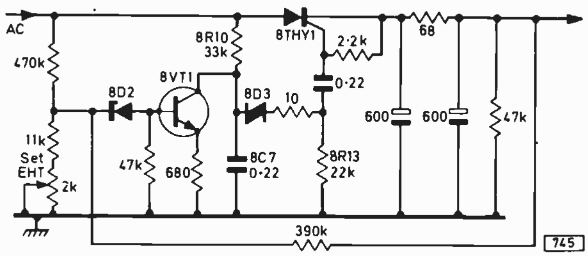


Fig. 2: The stabilised thyristor power supply circuit used in the RBM single-standard chassis.

a stabilised thyristor rectifier circuit (Fig. 2). Stabilisation is achieved by varying the point at which the thyristor 8THY1 conducts during the positive-going excursions of the a.c. mains input waveform. When 8C7 charges sufficiently via 8R10 to reach the breakover voltage of the diac 8D3 this device fires and supplies a pulse to the gate of the thyristor so that it turns on: the charging of 8C7 is controlled by 8VT1 to which feedback is applied at its base.

As we have known defective thyristors cause low h.t. we decided to change this first in case its triggering point was varying. The fault persisted however so attention was next directed to its control circuit. All resistors appeared to be virtually new and free from discolouration so we changed the diac in case its breakover potential was varying. This again proved unsuccessful so the zener diode 8D2 was replaced. This proved to be the cause of the trouble since no further h.t. voltage variations occurred. 8D2 is used as a temperature compensating device.

Field Jitter

It is worth noting that in later production versions of the RBM 90° single-standard colour chassis the value of 8R13 (Fig. 2) has been reduced to 1kΩ: this modification is recommended by RBM in cases where field jitter is experienced.

Instant Diagnosis!

There was no picture on a Philips colour receiver fitted with the G6 chassis, due to absence of e.h.t. On removing the cage which protects the line output valve (PL509) and boost diode (PY500) it was discovered that nothing resembling an arc could be drawn from the PL509 anode although voltage was present since small sparks were evident at the anode clip. The PL509 was hardly warm in fact and though this could have been due to the valve being faulty it proved to be quite OK. What was the cause of no output from this valve then?

As the slight anode sparks indicated that the valve was passing some anode curent it could be taken that the cathode connection was intact while grid drive was obviously present since there would otherwise be gross overheating. The only real possibility therefore was an open-circuit screen grid feed resistor and this proved to be the case. Had the boost capacitor been short-circuit or the line output transformer defective the valve would still have been at about the usual temperature while had its anode voltage been very low or zero the screen grid winding would have started to glow. Without screen grid voltage a pentode passes very little current.

LONG-DISTANCE TELEVISION

ROGER BUNNEY

SEPTEMBER has displayed a slackening in the field of long-distance television reception, at least compared with recent months. This is to be expected of course at this time of the year. Fortunately the log has been enlivened by improved tropospheric reception while at times Sporadic E propagation has shown itself, with reception of several distant countries. I took the opportunity of visiting Ian Beckett at Buckingham towards the end of the month—more about that later.

My own log is as follows; the period 16th-22nd inclusive is the log from Garry Smith (Derby) who held the fort during this time whilst I was away.

1/9/73 SR (Sweden) ch. E2—SpE (Sporadic E).
2/9/73 NOS (Holland) E4; BRT (Belgium) E8, 10—all trops.
3/9/73 DFF (East Germany-GDR) E4; DR (Denmark) E4—both MS (Meteor Shower); TVE (Spain) E2—SpE; NOS E4—trops. The tropospheric conditions showed a lift on this day into Central France—particularly at u.h.f. (new ORTF station logged, Amiens E47).
4/9/73 CST (Czechoslovakia) R1; DFF E4—both MS; R1 unidentified SpE signal.
5/9/73 CST R1; RAI (Italy) IB—both MS; NOS E4—trops.
6/9/73 DFF E4—MS; TSS (USSR) R1, 3; CST R1; TVP (Poland) R2, 3; NRK (Norway) E2—all SpE; also unidentified signals; NOS E4—trops. u.h.f. trops into ORTF (France).
7/9/73 DFF E4—MS.
8/9/73 WG (West Germany) u.h.f. trop opening in Band III through u.h.f. Two new u.h.f. stations logged, both WDR – 3.
9/9/73 DFF E4—MS; NOS E4; several WG u.h.f.—all trops.
10/9/73 DFF E4; DR E4—both MS.
11/9/73 DFF E4—MS; NOS E4; E21 u.h.f. WG—just out of the noise—all trops.
12/9/73 CST R1; RUV (Iceland) E4—both MS; NOS E4—trops.
13/9/73 CST R1; WG E2; ORF (Austria) E2a—all MS.
14/9/73 DFF E3, 4; CST R1—both MS; SR E2—SpE; NOS E4—trops.
15/9/73 CST R1—MS; unusual trop opening to the NE, NOS only at u.h.f., particularly Wieringermeer E39 with a good signal; also DR E6, 7 (three new stations this day). At 1526 whilst sitting on Lille – 2 E21 the Fubk card was noted to be alternating with the ORTF station—this can only be CLT Luxembourg!

Now to Garry Smith's log:

16/9/73 TVE E2; CST R1—both MS.
17/9/73 CST R1; TVP R1; ORF E2a—all MS.
18/9/73 CST R1 twice; TVP R1; RTE (Eire) B7—latter trops, others MS.
19/9/73 TSS R1; CST R1; MT (Hungary) R1; WG E2, 3; SR E3; NRK E3—all MS.
20/9/73 CST R1; TVP R1—both MS.
21/9/73 CST R1; ORF E2a—both MS.
22/9/73 TSS R1—SpE.

Back to my log:

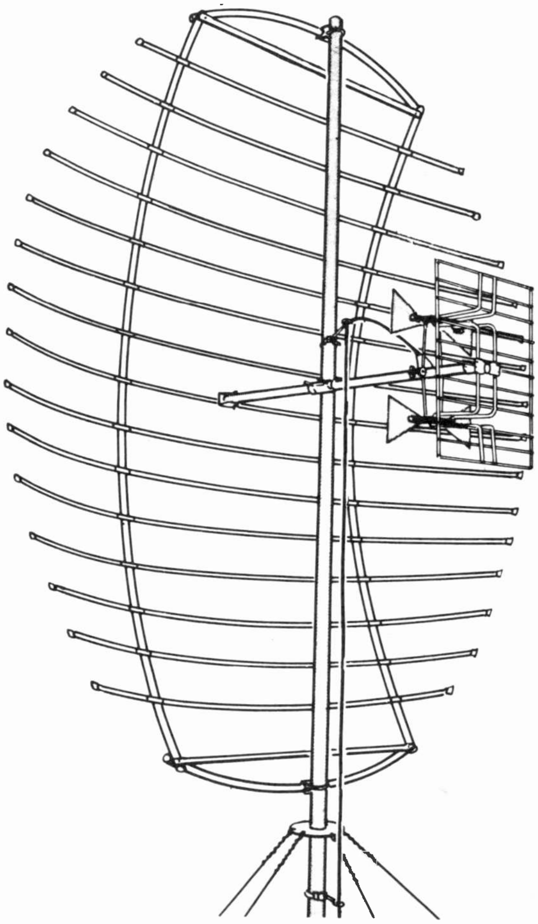
23/9/73 DFF E4; CST R1—both MS.
24/9/73 DFF E4—MS.
25/9/73 TSS R1; DFF E4—both MS.
26/9/73 CST R1—MS; NOS E4—trops.

It is interesting to note that the majority of my loggings are in the early mornings whereas Garry's are between 1215-1330.

From the results over the past month I have been able to evaluate the new aerial system thoroughly. In Band I NOS ch. E4 is received much more regularly, to the extent that I propose to discontinue logging it if the reception frequency remains as at present. Band III has been more difficult to evaluate though the BRT/RTB E8/10 transmitters in Belgium are received much more easily. With the dish paraboloid now at 51½ft. (centre), u.h.f. has shown a remarkable improvement, so much so that Paris ch. E22 is received daily (although well into the noise—previously it was 'in' only during openings). The ch. E25/28 Wavre transmitters are also received daily (of sorts) whereas previously they were just not visible.

Aerials

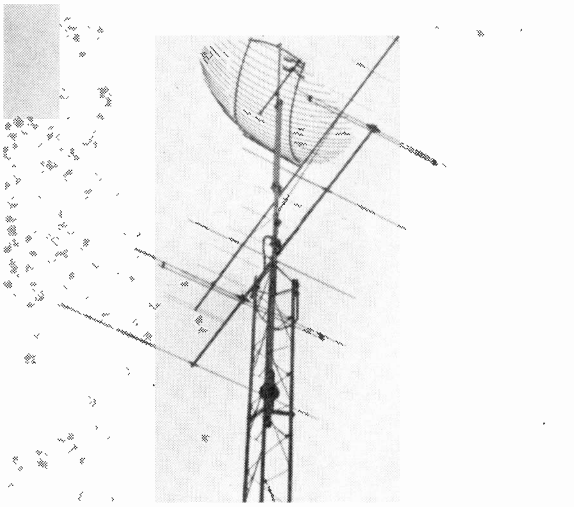
Elsewhere in this column are illustrations showing the mast and a detailed sketch of the dish. This latter array is some 7ft. high and 5ft. wide, having at the paraboloid



Drawing of the Channel Master paraboloid "Super Panascope" u.h.f. aerial.

focal point a twin stacked bowtie arrangement. The element rods comprising the reflector dish are ½in. diameter alloy. The quoted gain is 18dB at 450MHz rising to just under 24dB at 900MHz. The array is of USA origin and imported into the UK by CATV Services Ltd., 2 Leeson Park, Dublin 6, Eire. (This firm is also known as Phoenix Relays Ltd.) They tell us that a professional u.h.f. dish is also available from stock: this has a gain of 30dB, is constructed of aluminium with a weldwire surface and is priced at £1,000 or alternatively in a kit form. This must be the ultimate for DX-TV work!

Whilst on the aerial theme, during my visit to Ian Beckett I took the opportunity of visiting the Antiference factory at Aylesbury. By coincidence our visit came at a time when a new u.h.f. array was being launched and we were able to study the whole process of aerial manufacture from development through to the packing of the finished product. The new array certainly looked impressive on paper. Known as the "extra gain", it resembles the Fuba type multiple director array although with a large reflector assembly. The quoted gain figures for the two models are type XG8 15·5-17·5dB, type XG14 17-19dB, with front-to-back ratios averaging 30dB (the poorest figure quoted is 27dB).



The top section of Roger's present aerial structure, with the u.h.f. paraboloid atop.

Round Up

During a recent tropospheric opening Hugh Cocks (Mayfield) noted the WDR ch. E32 transmitter radiating the EBU bar carrying an identification "Zentrale Kontrollstelle Frankfurt/Main". Hugh also noted BRT carrying a Eurovision transmission of a cycle race from TVE (2nd September)—the point worth noting is that this race was in *colour.* I feel that TVE will be carrying increased programming in colour over the next year with the possibility of appropriate test patterns. Whilst in the PM5544 region (!), both the BBC and IBA will be making increased use of this card. It has been noticed already in Ulster. The reason is to enable the GPO lines to be used for other purposes.

Peter Vaarkamp comments that WDR-1 uses the SWF/Fubk pattern now with "WDR-1" as identification. WDR-3 is similar but varies at times to an alternative "WDR-Z" when the pattern comes from the transmission centre. Peter also mentions that a list of both West German and East German (GDR) transmitters can be obtained from Fernmeldetechnisches Zentralamt Deutsche Bundespost, 61 Darmstadt, Postfact 800, West Germany at five German marks.

I was very pleased to meet Dieter Scheiba of Brussels, Belgium recently here at Romsey. Amongst the things we discussed were the BRT/RTB test transmissions—there has always seemed to be some variation with the timings of these. The position is as follows. Both v.h.f. and u.h.f. test transmissions vary daily depending on the transmitter. Antwerp may transmit both early and late. Other transmitters can remain on test card for considerable periods after programmes finish at night. Generally, programmes commence at approximately 1800-2300 during the week. On Saturdays the situation varies according to the sports activities, at times opening during the afternoon but otherwise at 1800. On Sundays the hours are generally 1000-1200, 1400-1700, 1800-2300.

The reasons for the ORTF-1 625-line tests were also discussed. It seems that there was a plan to change the 819-line service to 625 lines to coincide with the start of ORTF-3. Due to the numbers of 819-line receivers in use as the time approached however the plan was dropped, but 625-line tests continue on Tuesday mornings at 1000-1200.

The WTFDA (USA DX TV club) bulletin recently came to hand and of particular interest is the description of the Mexican TV network. Two WTFDA members spent some time travelling in Mexico and found an unusual transmitter at Monterrey. This transmitter—XET-6—always seemed to provide an excellent signal at great distances. It is sited atop the high Cerro de la Silla mountain. The inaccessible site is floodlit at night and is visible from afar. The crew ascend for shift duty for one or two week spells, the final part of the journey being on muleback!

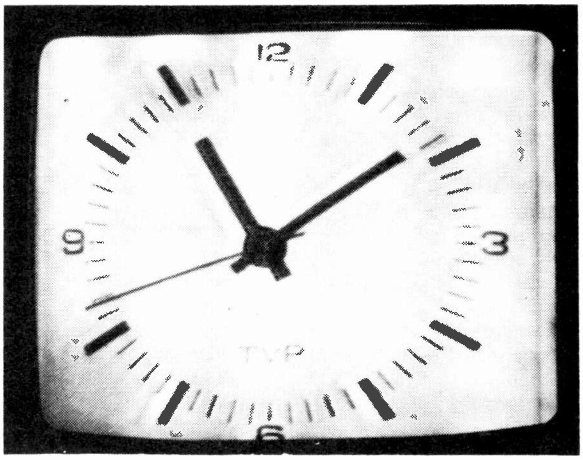
ORTF now have regional programming on all three networks between 1820-1840 GMT. For example the Paris region has "Iel de France" whereas the Lille area carries the "Nord Picardie" programme, Reims the "Champagne" programme and so on. This is a very convenient way of identifying transmitting stations.

News Items

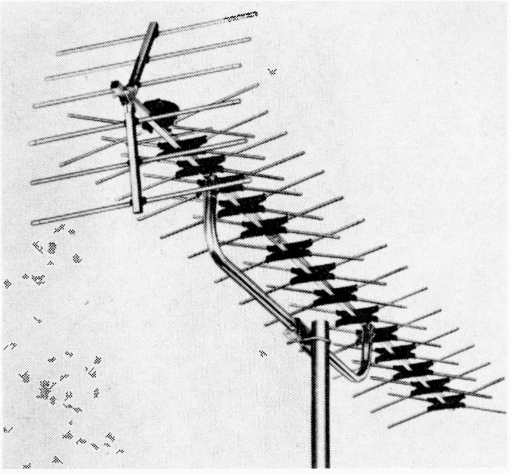
China: We understand that the Peking Broadcasting Administration has purchased colour TV equipment from a UK manufacturer for the forthcoming introduction of colour to their TV network. Of the 29 provinces in China 25 have monochrome TV coverage. We understand that the PAL system is to be used. There are apparently 30,000 colour receivers in China.

West Germany: The American Forces Radio and TV Service is to increase its TV coverage in West Germany and to this end a list of new transmitters throughout West Germany has been made available. The transmitters will have powers up to 8kW maximum—several are located at principal transmitting sites.

West German engineers predict that by 1980 an



TVP (Poland) 1st chain clock. Courtsey C. Athowe.



The new Antiference "Extragain" Model XG14.

operational satellite TV system providing up to five channels and operating at 12GHz could be in being, giving coverage to West Germany and other parts of Europe. Will we have to look to the skies for our TV-DX in future?

Canary Islands: The Europese Testbeeldjagers advise that transmission times are as follows—weekdays 1315-1615 and 1745-2400; Saturdays 1515-2400; Sundays 1045-2400. All times GMT. The test card is similar to the TVE mainland type. Apart from the time difference (1 hour) the other way of identifying the ch. E3 Izana transmitter is the caption "TeleCanarias" which follows the end of the satellite-linked "Telediario" programme.

Spain: The Europese Testbeeldjagers also tells us that Santiago TVE-2 is to go u.h.f. within two years, with some joint working for a few months between the present ch. E2 outlet and the new u.h.f. outlet. The only regional programme transmission in Spain originates from the Barcelona area and is known as "Programa Catalán". It is radiated on the last Tuesday of each month from 1700, preceded by the normal test card. Captions to look out for on ch. E4 are "Teatro Catalan" or "Mare Nostrum". Programme language is Catalán.

It is still possible to sight the old TVE test card. Apparently the Madrid TV centre produces a special Spanish programme for Spanish workers in West Germany and Holland. This card precedes the programme and is radiated by a number of West German and Dutch transmitters.

Eire: RTE have plans for a second service, RTE-2. This will be all colour with selections of BBC/IBA programmes and approximately eight hours of locally produced material. Transmitters will be at v.h.f. and u.h.f.

Finland: Seppo J. Pirhonen tells us that the following u.h.f. transmitters are to go into operation: Lapua E24 1000kW, Kuopio E36 600kW, Joutseno E32 600kW, Mikkeli E38 600kW. The latter will be early 1974, the others late 1973. All transmissions will be horizontally polarised.

New US Forces TV Transmitters in West Germany

Powers range up to 8kW (e.r.p.). 525 lines, 60 fields, 4.5MHz sound-vision spacing, f.m. sound.

Butzbach	E21	Wildflecken	E48
Crailsheim	E21	Stuttgart	E48
Schwabisch Hall	E21	Hanau	E48
Ansbach	E22	Hahn	E50
Bindlach	E27	Heilbronn 1	E51
Erlangen 1	E27	Schwabach 2	E51
Munster	E27	Katterbach	E51
Herzogenrauch	E28	Zirndorf	E52
Gieben	E30	Bad Hersfeld	E53
Furth 1	E30	Illesheim	E53
Erlangen 2	E31	Furth 2	E53
Wertheim	E31	Kirch-Gons	E53
Babenhausen	E32	Kitzingen 2	E54
Friedberg	E32	Heilbronn 2	E55
Neckarsulm	E32	Hohenfels	E56
Bamberg	E39	Budingen	E57
Bad Nauheim	E41	Bitburg	E57
Grafenwohr	E41	Bad Kissingen	E57
Schwabach 1	E42	Nurnburg 2	E57
Kitzingen 1	E44	Fulda	E58
Nurnberg 1	E44	Schweinfurt	E59
Vilseck	E45	Wurzburg 1	E59
Gelnhausen	E46	Wurzburg 2	E60
Amberg	E48		

Wideband Band I Aerials

Following recent articles on wideband Band I arrays we understand that several aerial manufacturers have been approached regarding the supply of the arrays shown. We must stress that these are not available from any UK aerial manufacturer at the moment, there being relatively little demand for such arrays. We are however looking into the possibility of locating a source to supply a complete kit of parts for a wideband 1-3 element array covering 47-66MHz. As soon as there is more definite news we will report further.

From Our Correspondents . . .

It has been what can only be described as a chaotic month for letters. Since taking over this column some 2½ years ago a record monthly number has come in! All have been replied to with the least delay and several interesting items have come to light.

Lothar Scholt (Ziegelroda, GDR) wrote enclosing two photographs. These were ch. E3 test card signals (RETMA with a checkered border). The odd thing is that the signals were 525 lines, 60 fields. They can originate only from station HZ22, Dhahran ch. A2, Saudi Arabia. The signal was noted at 0715 GMT on June 29th and was quite clean. A caption, "Afris", followed at 0720.

Clive Athowe (Norwich) has written about the excellent tropospheric signals in the East Anglian area over the past few weeks. The most spectacular reception was an RTB ch. E45 transmission from the new 500W relay at Brussels!

Tropospherics also feature in a letter from Cliff Dykes (Sutton). Cliff lives in a flat and can use only loft aerials. Despite this he has with a fixed Band I dipole and a log-periodic u.h.f. array received a number of excellent signals including the ch. E33 Ostfriesland transmitter.

John White (Scunthorpe) has also been using the u.h.f. bands—with his Fuba XC391d array—and has received excellent u.h.f. signals from Sweden. He intends to instal a v.h.f. to u.h.f. upconverter shortly to give coverage of Bands I and III.

James Burton-Stewart from Stowe School, Buckingham has triumphed early in his TV-DX career with reception of CLT Luxembourg ch. E21 on EBU bar pattern. A very long log has been sent in by James and by all accounts his aerial system is working well.

Finally Garry Smith comments on an unusual programme seen over TSS. Garry noted on July 14th a programme preceded by a "star" caption. A large picture was then noted of the 0249 card, with a man pointing at the identification area. In his hand was a globe which also had the identification written on it. Does anyone recall seeing this?

YOUR PROBLEMS SOLVED

★ Requests for advice in dealing with servicing problems must be accompanied by an 11p postal order (made out to IPC Magazines Ltd.), the query coupon from page 91 and a stamped, addressed envelope. We can deal with only one query at a time. We regret that we cannot supply service sheets or answer queries over the telephone. We cannot provide modifications to circuits published nor comment on alternative ways of using them.

ULTRA 6632

When the brightness control is turned up the picture balloons and disappears. The line output and boost valves have been replaced, also the e.h.t. tray. This later resulted in much more e.h.t. but the picture is now about two inches in at the sides of the screen all round. The set is fitted with the BRC 950 chassis —T. Singer (Harrow).

There are both three- and five-stick e.h.t. trays for these BRC sets: using the wrong type can cause all kinds of symptoms. Assuming that the type you are using is identical to that originally fitted however the next check should be on the value of the 330kΩ resistor in series with the width control. Also check the line output valve screen grid circuit components —R128 feed resistor (2·2kΩ) and C103 decoupling electrolytic (1μF). Further checks if necessary should be the value of the 2·2MΩ resistor (R130) and 1·8MΩ resistor (R131) in the line output valve grid circuit and the 1μF electrolytic (C100) which decouples the boost line to the h.t. rail.

EKCO T418

A short occurred in the heater line, blowing the c.r.t. heater. Before this happened the set was operating normally. On replacing the c.r.t. a full raster was obtained but there is no vision signal. The sound is OK. Both vision i.f. valves have been replaced.—K. Jowett (London SE9).

The PCL84 video amplifier valve is inclined to suffer from internal shorts and we suspect that this valve is the cause of your loss of vision. It may be necessary to check the resistors in this stage, also the vision detector diode V7 (CG64H). (Pye 11U series.)

GEC 2018

When the camera traverses a scene on u.h.f. there are two sets of line tearing across the screen. The picture is then perfect and steady until the camera swings again.—G. Younger (Felstead).

There are two extra capacitors in the coupling from the video amplifier to the sync separator on 625 lines, C97 (0·047μF) and C98 (0·002μF). These could be faulty and should be replaced.

PYE 48

The overall field linearity control is at one end of its travel and it is impossible to fill the screen without excessive adjustment of the top linearity or height control. The picture is then expanded at the top and bottom. If the overall linearity control is set to mid-travel the picture is excessively cramped at the bottom. The PCL85 and ECC82 field timebase valves, the capacitors in the oscillator, linearity and output circuits and most of the resistors in these circuits have been checked or changed.—T. Grower (Norwich).

The field output transformer could be the cause of the trouble, as could the field deflection coils. Embedded in the latter is a thermistor which can give trouble: it can be shorted out as a quick check. (Pye group 67 chassis.)

HMV 2629

The troubles with this set are lack of brightness, test card dicing cramped at the top and on switching off the picture disappears as a small rectangle instead of a dot. The video amplifier and line timebase valves have been replaced. The voltage on the c.r.t. first anode (pin 3) is only 120V which seems to be low.—R. Clarkson (Potters Bar).

The c.r.t. first anode voltage is certainly low. As a quick check remove the existing lead to pin 3 and link pins 3 and 4 (focus). This latter pin usually stands at 400V and this action should restore normal brightness. If it does the cause of the trouble is that the 0·1μF capacitor C93 which decouples the first anode feed to the h.t. line via a 2·2kΩ resistor is short-circuit. C93 also affects the spot decay, so replacing it should remove this trouble as well. For the top cramping first adjust the top linearity preset on the extreme left side of the chassis then if necessary check the linearity feedback capacitor C90 which is connected to the anode of the field output pentode. (BRC 950 chassis).

BUSH TV181S

The picture is perfect except for the top two inches or so where vertical lines on the picture pull towards the left and waver a bit. Often a good tap on the cabinet top produces a very brief small picture after which the fault clears, only to return again however. The aerial is in order and there are no signs of ghosting.—R. Evans (Southampton).

Check carefully the soldering of the vertical metal strip to the panel in the vicinity of the EF184 line oscillator valve—poor soldering causes a lot of troubles on this chassis. If all is OK here check the 10μF electrolytic 3C31 which smooths the supply to the line oscillator valve.

GEC 2035

We are having difficulty with the channel selector switch. This was removed for cleaning but after refitting it only BBC-1 and ITV can be obtained—BBC-2 is absent.—F. Blaise (Birmingham).

The system switch linkage is operated by a large plastic cam at the rear of the v.h.f. tuner. At the tuner end the coupling rod is held in the correct position by means of a pivot and screw which is set so that the system switch changes over to 625 lines when the v.h.f. tuner is in the u.h.f. position.

PYE 11U

The sound is OK but the screen blank. A high-pitched note is present in the background however. All valves in the line output stage have been changed.—G. James (Consett).

We assume that the high-pitched note is line whistle, so there seems to be some sort of line timebase operation. The 0·01μF coupling capacitor C87 to the line output valve is inclined to give trouble in this chassis so the first move should be to replace it. If this does not restore results the line output transformer could well be faulty.

MARCONIPHONE 4614

This set works perfectly on v.h.f. but when operating on u.h.f. there is occasionally a broad grey line which rolls from the bottom to the top of the screen, causing distortion of the picture.—R. Smales (Keighley).

The cause of the fault is impaired smoothing. It is evident on 625 lines only since on this system the field frequency is not locked to the mains frequency. Any discrepancy in frequency produces a mild hum bar which on 405 lines is blanked out during the flyback. Stab a high-voltage electrolytic of about 50μF or thereabouts across each of the main electrolytic decouplers—C112, C113, C91 and C41—in turn. If you find that the effect is removed when one of these is bridged you know that the original needs replacement. It is also possible for the effect to be caused by slight heater-cathode leakage in one of the valves, even the PCF805 in the v.h.f. tuner (it acts as an additional i.f. stage on 625). Before going to the expense and trouble of trying out new valves however check the smoothing capacitors. When the fault is not apparent this doesn't mean that the smoothing is adequate, merely that the mains frequency is spot on at 50Hz. (BRC 950 chassis.)

KB WV90

There are two problems. First the picture takes some time to appear. When it does it increases from nothing until it fills the screen. It is dull during this time and when it is full size the screen briefly goes blank before the picture appears normally. Secondly, on switching off the picture reduces to a single bright spot instead of diminishing to nothing.—J. Slater (Barnsley).

The late arrival of the picture is due to a lazy valve in the line output compartment. Check the PY801 and the PL36. The residual spot should not appear if the set is switched off using its own on-off switch (not the wall switch) provided the brightness control is wired correctly. On the chassis as produced the earthy end of the brightness control is returned via a 47kΩ resistor to the neutral side of the on/off switch (not to chassis). Consequently on switching the set off with its own on/off switch the c.r.t. grid is briefly at h.t. potential and the e.h.t. rapidly discharges to prevent spot formation.

MURPHY V310

Could you advise on boosting the c.r.t. (CRM 172) in this receiver which I intend to use as a second set. The raster can be seen only when the brilliance control is turned up two thirds of the way. If it is turned right up the picture disappears. I would also like to replace the LW7 h.t. metal rectifier with a silicon type.—J. Hennesy (Ayr).

Use a 13V booster transformer to boost your c.r.t. heater. Connect the mains side to the on/off switch and the boost side to the c.r.t. heater—having previously disconnected the existing heater leads and taped them together to complete the heater chain. A BY127 silicon rectifier with a 10 or 15 ohm (10W) surge limiter resistor in series can be used to replace the LW7. A new U26 is probably required.

PYE 60

The problem with this set is no line output—with absence of line whistle. All valves in the line output stage have been replaced. A slight crackle is obtained by touching the PY800 top cap but that is all. Removing the PY800 top cap does not produce any results.—B. Harris (Dunstable).

Since you do not mention overheating, the line oscillator seems to be operating. Your other tests indicate that the output stage valves are passing current and that the boost reservoir capacitor is in order. It seems likely therefore that the line output transformer is the cause of the trouble. First however make sure that the scan coils are OK by disconnecting them. If they are faulty the e.h.t. will then return. (Pye group 368 chassis.)

MURPHY V410

Sound is OK and the e.h.t. present but there is no picture or raster. On checking the c.r.t. base voltages I found that a picture appeared when the meter was applied to the cathode (pin 11) but it soon went negative. I checked the components in the cathode circuit but all appear to be in order.—T. Smith (Welwyn Garden City).

Either the c.r.t., the 30FL1 video amplifier valve (V6) or its 10kΩ anode load resistor R37 is faulty.

WEAK CRT

In a recent issue it was stated that to check the condition of the c.r.t. in an old set the brilliance control should be turned up. If the picture then takes on a silvery appearance and details in the white areas of the picture start to disappear the c.r.t. is probably starting to fail. This is the condition I have encountered and I am wondering whether a session with one of the c.r.t. rejuvenators for which you have published details would be worth while.—V. Bartlett (Chelmsford).

We have no doubt that the use of a c.r.t. rejuvenator would improve the results obtained from the c.r.t. in this set. As a quick way of improving picture sparkle however you could do what many service engineers do when they want to revive a weak tube and the condition of the set does not justify fitting a new one. That is to connect a high-wattage resistor of 5 to 10kΩ from the fuse side of the live mains input—say a point on the mains dropper—to the unearthed c.r.t. heater pin. Leave the other pin connected to chassis of course. The extra current supply will boost the tube and extend its life for a while longer without over-running the valves.

McMICHAEL 3011

The trouble with this set is that the top of the picture curves over to the left from time to time with intermittent loss of line hold. By reducing the setting of the contrast control some improvement is obtained.—E. Smith (Poole).

The fault could well be in the aerial, downlead or plug so these should be checked. If necessary then turn attention to the flywheel line sync circuit, checking the flywheel sync discriminator diodes (MR1/2), their load resistors (R113 and R115, both 330kΩ) and input coupling capacitors (C160 and C162, both 470pF). (GEC 2012 series.)

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TELEVISION DECEMBER 1973

TEST CASE

132

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.

? *Lack of colour was the symptom on a Ferguson model fitted with the 2000 series dual-standard chassis. Sound was unaffected and the display on monochrome was fully defined.*

The receiver was brought into the workshop for detailed tests and much to the amazement of the field technician a picture in perfect colour appeared immediately upon switching on. The receiver was left running for the whole morning and was then switched off for lunch. Switching on again afterwards produced a perfect picture in monochrome—but no colour!

With the circuits active, tests with a multimeter and 'scope were commenced in the decoder section and after one or two measurements the colour suddenly appeared. It was soon discovered that by applying a meter probe to certain parts of the decoder circuit the colour could be restored. There were also times when the colour would appear straight away on switching on, as during the first test. The intermittency was such that the colour could sometimes be triggered on by channel changing, by switching the receiver off then on again and by bursts of electrical interference.

Where in the decoder circuit would a fault producing this kind of symptom most likely be, and why was the colour triggered on by electrical disturbances?

See next month's TELEVISION *for the solution and for a further item in the Test Case series.*

SOLUTION TO TEST CASE 131

Page 43 (last month)

The three tests made by the technician to determine the cause of the intermittent flashes were all associated with the first anode feed to the picture tube. The first test made at this electrode, of voltage, showed that this varied significantly while the flashes were occurring.

Next the first anode decoupling capacitor was disconnected at one side and the varying voltage continued. The third test was of the voltage at the input to the first anode feed resistor (1·2MΩ). This remained constant in spite of the fluctuations at the other side. The 1·2MΩ feed resistor was then replaced and the fault was cleared.

The usual trouble in this area is a shorting decoupling capacitor, but this commonly removes the first anode potential completely. The feed resistor rarely goes open-circuit, though any high-value resistor in a high-voltage circuit is always suspect.

Similar symptoms would have been produced by first anode leakage in the picture tube, but it is generally easier to clear the feed circuits before checking the tube by substitution!

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23TG153a	G20T232	G24T300
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23TG164a	G20T238	G24T302
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12u
13u
14u
15u
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