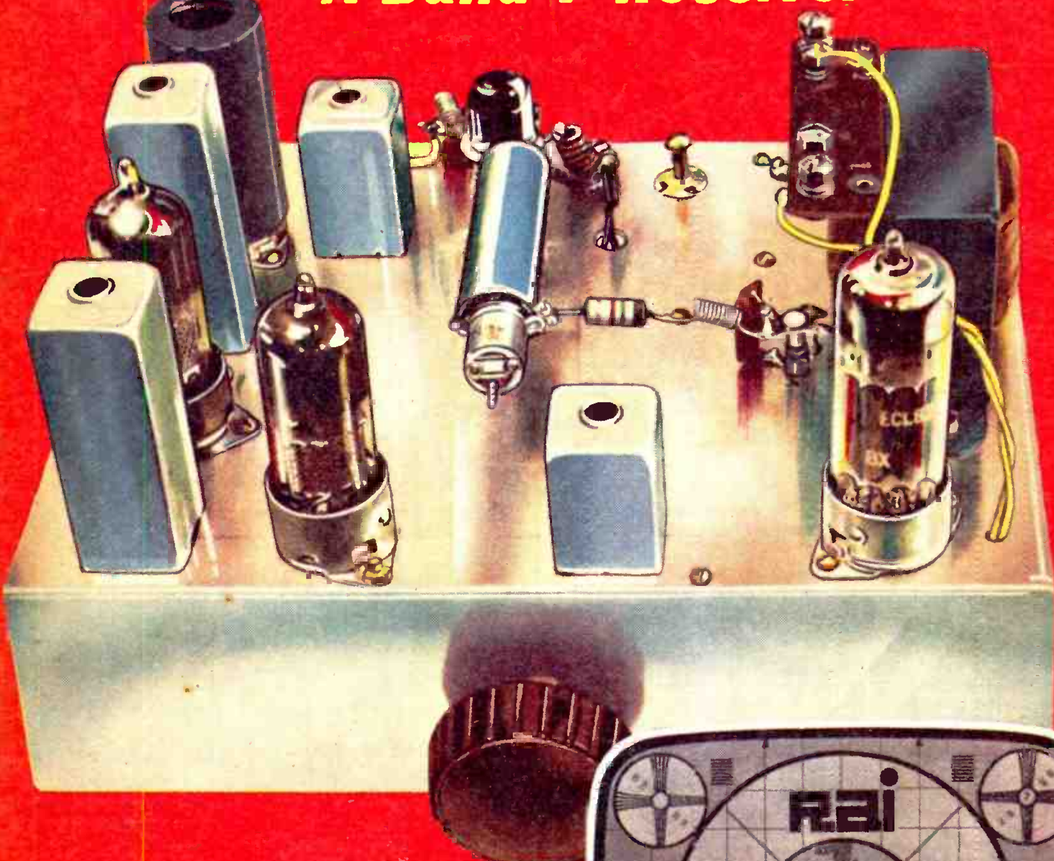
Practical TELEVISION

JANUARY 1962 1/9

PREPARING FOR UHF — A Band V Receiver



How to receive Continental television

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Practical Television

AND TELEVISION TIMES

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Contents

ITA and the Lines Battle

ANOTHER stage has been reached in the lines controversy by the publication of a booklet by the Independent Television Authority setting out solutions to the problem from an entirely different angle. They state that hitherto most of the thinking about the change from 405 to 625 lines has been based on the assumption that it would be necessary to transmit the two existing services in duplicate for a long period—on 405 and 625 lines. At the end of this period, the 405-line transmissions would cease and programmes would continue only on 625 lines. The plan now outlined by the ITA, which would seem to be very sound, differs radically from this, and is designed to avoid all duplication, and retain the virtues of the 405-line transmission for the present two national services. After outlining the reasons why a change to 625 lines is desirable it suggests that an 'appointed day', on which all transmissions will be changed to 625 lines, should be nominated at the end of a transitional period, during which new transmitters should be installed and new receivers placed on sale for the dual systems. They suggest that as early as possible the planning and building of a national network of UHF stations should begin, and arrangements be made for the introduction, area by area, of two new programmes on 625 lines. They recommend that all future receivers which are manufactured should be capable of reception on VHF and UHF and on 625 lines, and also on the existing VHF channels on 405 lines. They point out that the future world market will undoubtedly be a market not only for 625-line receivers, but also for dual UHF/VHF sets. This is a completely different outlook from those we have yet seen put forward and it will no doubt receive the attention that it deserves from the Pilkington Committee. Incidentally, early in November when a Member of Parliament asked the P.M.G. to hasten the Committee's report, he stated that it was not intended to press for an interim report and that the vital problem of line definition should be properly solved before thinking about colour.

On the latter point the ITA now point out that the problem of colour is not a problem of transmission but one of reception. They quote the position in the U.S.A., and confirm the point of view which has been freely expressed, that colour should not be introduced at all on 405 lines for it would be prohibitively expensive, if not a mass-production impossibility, to make satisfactory colour sets capable of reception on both 405 and 625 lines. It says, however, that on the 'appointed day' when all transmissions will be on 625 lines, colour could be introduced at once on both the VHF and the UHF services. It appears to us that whereas all previous arguments about line definition have been put forward by manufacturers of receivers and other similarly interested parties, this new suggestion, coming from one of the authorities interested only in the actual transmission, will carry much more weight and is probably less biased. It will be interesting now to see what reception the book will receive from the trade and the general public.

Our next issue, dated February, will be published on January 19th.

How to receive Continental television

By D. Kemp

HOW TO MODIFY YOUR SET TO RECEIVE FOREIGN TRANSMISSIONS

SOME time ago, interest was aroused by a report of reception of continental television transmissions by a Buckinghamshire service engineer. It was achieved with an ordinary modified domestic television receiver. Although doubtful as to whether such reception was possible in my area (Liverpool), it was thought worth investigating. So, some time later, a domestic receiver was modified. A matter of a day or so after the completion of the modifications, an outside broadcast from Portugal of a sports meeting was seen and, the following day, test cards from Spain and Portugal were received at strength. Since then, test cards from Italy, Switzerland, Sweden, Spain, Portugal, Russia, and Czechoslovakia have been received and recorded, during periods of good reception, which never seem to be more than a few days apart during the summer months. Programmes too, have been received, and it is interesting to compare the type and quality of programmes from various countries with our own.

This article gives details of how to carry out the necessary modifications for yourself and thus have your own " window on the world "!

Requirements

Although the modifications will only cost a matter of a few shillings, it is advisable to start off with the right kind of aerial and a reasonably good television receiver, or results may be disappointing.

Receiver

The receiver need not be ultra-sensitive. The receiver used by the author was a standard model (bought, by the way, for 30s. from a television dealer). Almost any 13-channel or 5-channel set will be adequate. It must of course be reasonably sensitive (a good test of this is to see whether any BBC stations other than the " local " can be received at all). A fringe model is ideal.

It is very important that the set should be fully tunable over the whole of the 5 channels in Band I, either by the fine tuner or by adjustment of the local oscillator frequency. The former is generally a feature of older receivers and for this reason, and the fact that they employ easily-modified group-boards, not printed circuits, they are more suitable for modification than modern receivers.

Aerial

Various experiments proved that an elaborate aerial system is not essential. Naturally, a good aerial means good signal strength, but it must be remembered that signals may come in from any point of the compass, and that a multi-element array can only give a good signal strength from signals within a small angle. Thus, unless such an aerial may be rotated, it is more likely to be a hindrance than a help. A dipole or " H " aerial, at as high a point as possible, is advised. It should be " tuned " to the middle of the band i.e. a channel 3 aerial should be used if possible. If such an aerial is not available, a simple dipole can be made and, provided it is erected in a high place, such as a loft or attic, and the aerial lead is not too long, very good results can be obtained. Using a similar aerial, hung from a light in an attic with the receiver a few yards away, many different test-cards have been received. To test such an aerial, tune to a weak BBC station (if possible) and then try moving the aerial for best results. (It should be mentioned here that all transmissions were received with the aerial vertical.)

Local Conditions

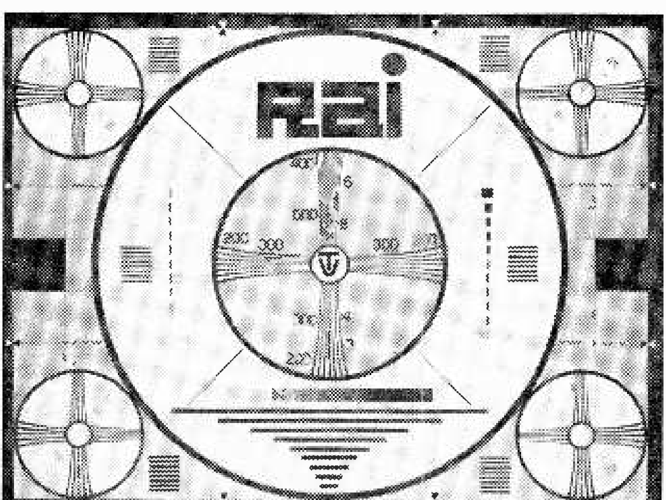
There is no need to worry too much about local conditions. If the reception is poor, it is probably due to an obstruction limiting reception in one direction. But as was mentioned earlier, signals may come from any direction, and it is reasonably certain that signals from a few countries should be able to weave their way through the hills and gasholders to your aerial!

If, on the other hand, poor reception of the BBC is caused simply by distance from the transmitter, then there is the advantage that weak continental signals will not be blotted out by the BBC signal.

Modifications

Because all Continental transmitters use a different standard from that of the BBC and ITV, British receivers will not produce a picture when supplied with a Continental signal, unless certain modifications are carried out. These modifications are not drastic, but are essential. They have been designed so that anyone who knows his way round a television can perform them, and the receiver can still be used for normal viewing after the changes have been made.

Most stations use the 625-line system with negative modulation and F.M. sound. Therefore, an unmodified receiver, when confronted with these signals would show sloping white lines (the sync pulses) on the screen. This is what to look for on an unmodified receiver to see whether signals are present.



The television test pattern of Radiotelevisione Italiana.

The sound associated with the Continental video signal cannot, unfortunately, be received with the picture as the sound carriers are on the wrong side of the vision carrier for the I.F. in the receiver. If sound is required, another receiver must be employed or a separate tuner for the sound section of the receiver.

The first step is to modify the video section for negatively modulated signals. This is achieved quite simply by reversing the video detector diode. The typical circuitry surrounding this stage is shown in Fig. 1, and the positive/negative switch circuit is shown in Fig. 2. D1 is the original diode.

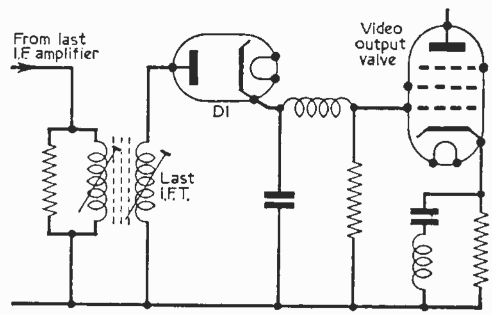


Fig. 1—Typical video detector circuit.

A valve diode is shown, but matters would be unchanged if a crystal diode had been used. D2 is the extra diode used for the Continental stations. It will be noticed that this diode is the opposite way round to the original.

In some receivers, the interference limiter and video detector are both provided by a single double diode valve (e.g. EB91). If this is the case, and the limiter is not required, the limiter circuit may be removed and the spare diode used as D2.

The switch, SW1, should be placed on the chassis *within two or three inches of the original diode.* This is so that all wiring is kept short, to prevent oscillation, or losses which might cause poor sensitivity. The switch should be of the small toggle or slide type. After completion, slight readjustment of the last I.F. transformer may be necessary to restore the picture to its former strength. The effect of switching to "negative" when tuned to a British station will be to make the picture darker and negative. This will be accompanied by almost complete loss of sync.

The next step is to convert to 625 lines. This is achieved quite simply by increasing the frequency of the line timebase from 10,125c/s to 15,625c/s. This can be done, in same cases, by readjustment of the line hold control. However, if the range is insufficient, the value of the series resistance is too big and should be replaced by a resistor of half the value. The line hold control may then need to be replaced by a 1M potentiometer to enable the lower frequency to be obtained as well. Setting the control is difficult unless equipped with an oscilloscope. (For those with a good ear, it is approximately the point where the line whistle becomes inaudible.)

The alternative, and certainly the most accurate way is to wait until signals are received, and then simply lock in a picture.

Unfortunately, the change in line frequency makes the readjustment of certain other controls necessary. Owing to the fact that the line output transformer is made to work most efficiently at 10,125c/s, on 15,625c/s the transformer works less efficiently and therefore the EHT voltage drops. Thus, the tube becomes more sensitive, the frame scanning has more effect and consequently the picture height doubles (approximately). The width would also increase were it not for the fact that the scanning coils do not respond as well to the higher frequency. Refocusing may also be found necessary.

It will be noticed when viewing a 625-line test-card, cramping on the left hand side will be evident. Readjustment of the horizontal linearity control should clear this, but will, of course upset the linearity on 405 lines.

The extent to which these faults occur will depend on the type of receiver used.

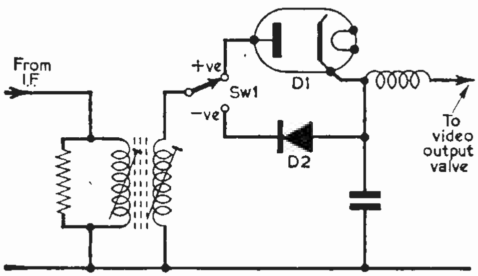


Fig. 2—The circuit of Fig. 1 modified by the addition of a switch and crystal diode to permit reception of signals with negatively modulated vision signals.

Reception

Because of the distance of the transmitters, continuous and reliable reception is impossible. Reception of signals from distant transmitters must be dependent on periods of good reception conditions. These come, usually in "batches", probably governed by solar activity, etc., similar to short wave reception. These periods may last two or more hours, then fade. It is important to be able to recognise such periods and to be able to find the stations.

Signals

The first sign will be a buzz on channel 2, between channels 3 and 4, or on channel 3. The buzz (which is of course the vision signal on sound) will increase in volume as time goes on. The picture will be found by tuning the fine tuner, or oscillator core towards the low frequency end of the band (i.e. towards channel 1). If the picture is very close to the local BBC channel, the two sync pulses will tend to oppose each other, preventing a weak signal from locking. A strong signal, however, will suffer from no more than patterning.

Times

Although reception *may* be possible at any time of the day, signals seem to be strongest in the morning between 10 a.m. and 12 noon. Viewing at this time has the advantages that, in most countries, test-cards are being shown, so making identification easy.

Programmes

The best time in the afternoon is between 2 and 3 p.m. Test-cards are still being shown, but Portugal (or Spain) starts what seems to be a schools' broadcast at about 2.30 p.m. (all times in BST).

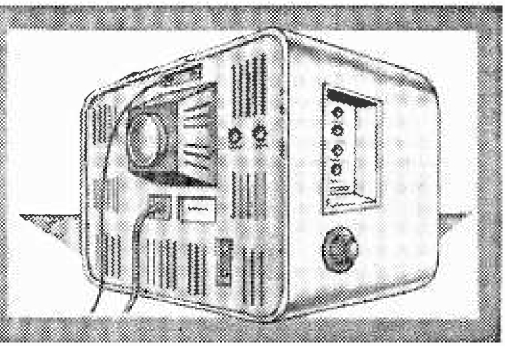
At about 4 p.m., a film is shown on Portuguese television. Often this is a British television film with the translated dialogue superimposed. Test cards then reappear at about 6 p.m. At 8 p.m., the programmes restart on Portuguese and Spanish television.

Reception Patterns

Reception at night seems to be more frequent though not as strong as day time reception. The reception of continental stations should be logged, carefully recording times, test-cards, and strengths so that some pattern of reception can be deduced and the best viewing hours found for your particular locality.

Finally, it must be repeated that reception of continental stations is unreliable, inconsistent and, to some extent, unpredictable . . . *the modifications described do not automatically provide another 7 or 8 programmes.* ■

Servicing Television Receivers



No. 75—EKCO T283 AND T284

By L. Lawry-Johns

THE T283 is a 14in, table model with a turret tuner loaded for the channels likely to be required. The T284 is the 17in. version using an almost identical chassis. The 14in. tube is a CRM141 and the 17in. a CRM171. Many similar models were marketed using different tubes, simplified line timebase, VHF facilities, a PY32 valve rectifier in place of the metal rectifier, a U26 in place of the U25, and so on. The Ferranti T1001 and T1002 did not have a flywheel sync circuit and used a PY32 but were otherwise similar in many respects.

Fault Diagnosis (T284)

Whilst on some receivers fault diagnosis, purely from the symptoms displayed, is relatively simple, one can easily draw the wrong conclusions with this range. For example, one could be led to believe that the tube is of lower emission than is in fact the case due to a slightly leaky EHT capacitor (C93). One could also well believe C93 to be shorted when in fact the U25 is at fault; that the U25 is at fault when the top of the line output transformer becomes conductive. Thus, a few simple tests may save a lot of time and money. This caution should also be applied to the heater circuit. The symptom of " no heaters alight " is extremely common and although a valve heater could be o.c., in most cases the series resistor, R131 (51Ω), is at fault and a replacement of preferably 10W rating or more will restore normal conditions. This resistor is wired in series with the thermistor R133. Here again, one can be misled as there are occasions when a section of R132, the mains dropper, becomes o.c. Despite these various possibilities, correct diagnosis can be made in a few moments, even without a meter. A simple neon screwdriver provides all the fault finding equipment necessary. First, it is applied to the chassis to ensure that the mains leads are properly connected. The neon must not light when touched to chassis. If it does, reverse the mains leads (or plug): The neon should light at each mains adjustment terminals, 1-11 but not 12. Point 12 is connected to the D.C. end of the metal rectifier and the glow will be rather dull. If all terminals cause the neon to glow, touch either side of R131. It must glow on one side since this connects to the D lead on the mains panel. If the neon does not glow at the thermistor end of R131, it is certain that R131

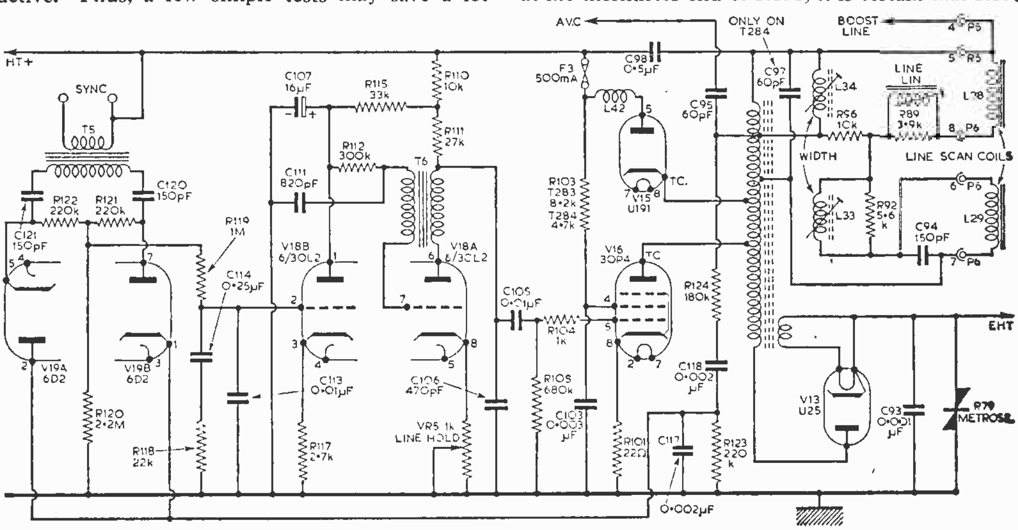


Fig. 1—The circuit of the line timebase.

is o.c. and inspection will probably show a discoloured patch on the body of the resistor denoting the point of fracture.

If, on the other hand, the neon fails to light at one or more terminals on the mains panel, say 9, 10 and 11, the 66Ω section between 8 and 9 is o.c. An o.c. section need not cause the heaters to go out as some sections are purely concerned with the A.C. supply to the metal rectifier, and if one of these sections is defective there will be no H.T. and thus, apart from the heaters lighting, the receiver will not operate.

Heater Failure

If all sections of the dropper are "alive", also R131 and R133, the trouble is almost certainly due to a valve heater becoming o.c. and the heater chain may be followed with the neon from valve to valve. The 6D2 and U191 valves seem most prone to failure.

EHT Failure

There is little doubt that the most frequent cause of trouble is in the EHT section. Whenever the symptom of "*sound, no picture*" is experienced, attention should be paid to the right side screened section. On most occasions the U25 may be found glowing blue and this can denote (a) a defective U25 (b) a shorted EHT capacitor or (c) conduction across the top of the transformer. The capacitor is easily checked by removal of the cap and if the blue glow dies down, the cap on the tube anode can be removed and the lead from the U25 connected directly to the tube (remove the circlip on the cap to allow its connection to the CRT). If the picture is restored, the capacitor C93 is, of course, most definitely at fault. It sometimes happens, however, that the defective capacitor causes damage to the U25 which necessitates replacement of both.

If direct connection from the U25 to the tube still causes a blue glow in the valve, it should be replaced. Whilst doing so, attention should be paid to the condition of the top of the transformer. Brown discoloration of the Perspex or more definite "scars" denote conduction, and replacement of the transformer is advised. It is possible to cut away the affected areas of Perspex and suspend the U25 "free", but this demands a good deal of care, otherwise severe corona will take place.

Careful soldering and sleeving at both ends of the valve is necessary, and even so, a discharge can occur later. Whenever the receiver is not the property of the repairer, a new transformer should be fitted.

Replacement Transformers

When the replacement transformer is not of the identical type to the original, attention should be paid to the clearance between the sides of the screening can and the side members of the transformers as close proximity can give rise to slight arcing and white flashes across the screen. Sometimes, on one particular type, the protruding ends of the 4B.A. threaded rod can be trimmed off, but it is occasionally necessary to leave the screening off completely and trust that no interference will be caused to neighbouring receivers.

Lack of Contrast

When plenty of brilliance is available, but the contrast is advanced fully, still leaving an absence of "attack" on black and white, the 30FL1 (V9) video amplifier and cathode follower is usually at fault and this can sometimes be interchanged with V17 (which is the sync separator/frame oscillator) without detriment to the sync or frame locking. If the contrast is thereby improved, a new valve can then be fitted when convenient.

Lack of Contrast and Brilliance

The effect of the controls should be noted and if advancing brilliance or contrast produces a negative picture of poor focus, it is reasonable to suspect the tube omission, but it is first necessary to ensure that the EHT is up to standard. Whilst a low emission U25 will cause the picture to expand and fade as the controls are advanced, it is possible that this valve may be in good order but loaded by excess current due to a leaky C93 EHT capacitor or a defective transformer. As previously stated, the

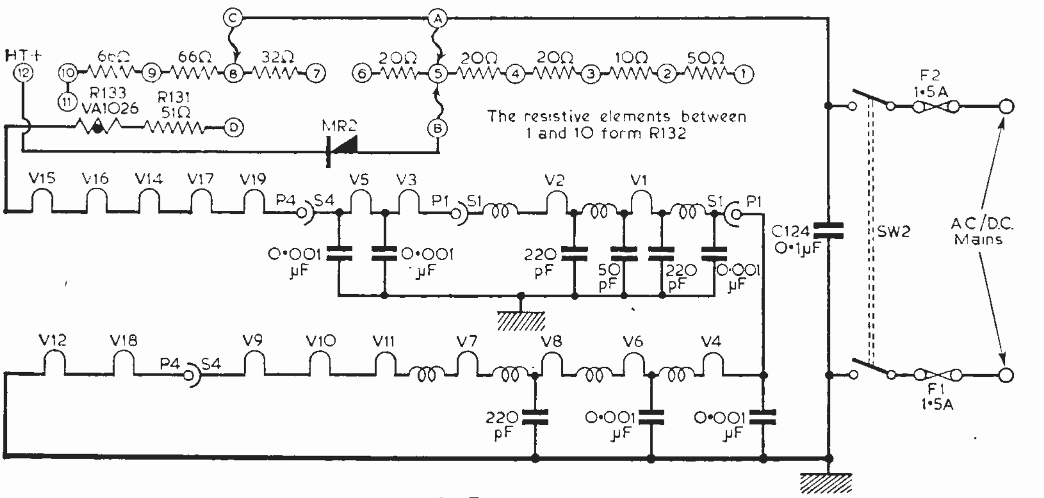


Fig. 2—The heater chain.

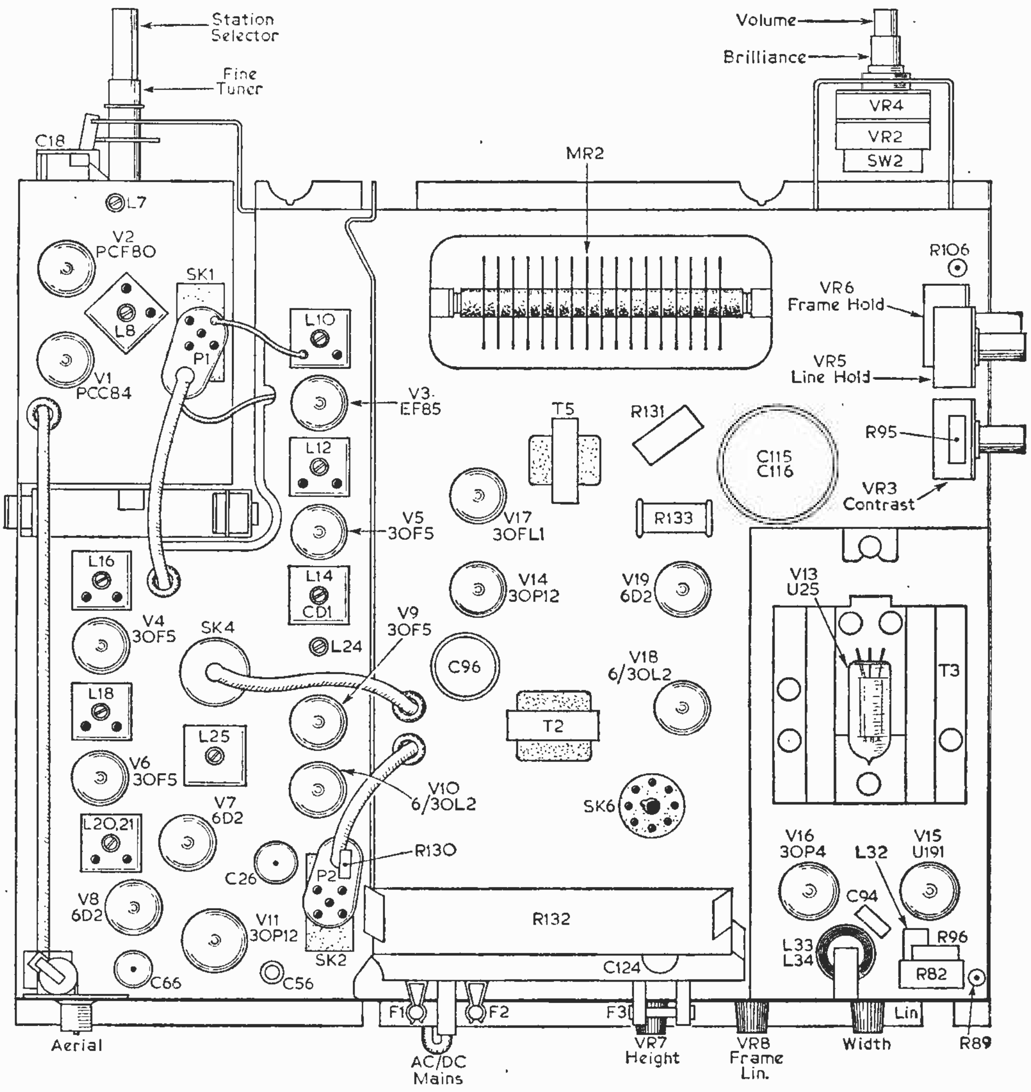


Fig. 3—The above-chassis layout.

capacitor may be bypassed by connecting the U25 lead direct to the tube and the transformer checked by inspection. Normal EHT should give rise to healthy arcing to a screwdriver blade placed near to either end (of the U25).

Having cleared the EHT of suspicion the position of the ion trap magnet on the rear of the tube neck should next be checked although this is very rarely out of position on this model.

Having made these checks, the fitting of a 12·6V (or 13V) heater isolating transformer should be considered since it is a characteristic of these tubes that the heater resistance falls slightly giving rise to reduced voltage drop (across pins 1 and 12) and thus lower heat dissipation.

The provision of a transformer supplying the required 12·6V can make the most marked difference and tube replacement is thus rendered unnecessary for a considerable period. Suitable supply points for the transformer primary are the terminal to which lead A or C is connected and any chassis point. The existing leads to pins 1 and 12 should be removed and connected together and the C lead moved down one number (or the D lead moved up). It is usually unnecessary to apply more than 12·6V or 13V to the heater, but the extra boost tapping could be used to advantage when the tube really starts to lose emission.

(To be continued)

HOW TV SETS WORK - 2: The vision stages

(Continued from page 78 of the November issue)

HAVING now dealt with the components in the tuner unit, we turn our attention to the function of the many components which are featured in the vision stages of a typical receiver. In Fig. 2 is given a circuit embracing the common I.F. amplifier V3, the vision I.F. amplifier V4, the vision detector which, in this case, is an OA70 germanium diode, the video amplifier valve V5A, which feeds the picture tube, and the vision interference limiter V6A.

The AGC line is also shown, but the control potential which is applied to this is derived from the sync separator stage and the components in this section will be discussed in a future article in this series. It has been necessary to show the AGC line, however, for this is closely linked to the components in the control grid circuits of the controlled valves, including the tuner R.F. amplifier valve and the contrast control.

Common I.F. Amplifier Stage

The I.F. signals from the tuner are first applied to an "adjacent channel rejector" comprising L101, C101 and C102 and then fed to the common I.F. coupling transformer L102/103. The rejector is tuned by the core in L101 to a frequency corresponding to the adjacent channel *sound* carrier. In the case of a receiver with 38·15Mc/s sound I.F. and 34·6Mc/s vision I.F. the rejector would be tuned to 33·15Mc/s for minimum response in the vision I.F. channel.

Adjacent Channel Rejector Fault

If this rejector were out of adjustment or if there were trouble in the coil or associated capacitors, the adjacent channel sound carrier would show on the picture as closely-spaced, almost vertical lines, and if the adjacent station is providing a strong signal in the area then the sound modulation of the adjacent station may also break into the vision of the local station. The adjacent station in this respect is that station one channel *above* the required station.

Resistor R104 is a part of the rejector, while R105 feeds H.T. via L102 and part of L101 to the anode of the pentode of the frequency changer valve in the tuner. The decoupling capacitor for that circuit is C103. In the event of C103 developing a short-circuit, considerable power would be dissipated by R105 which would very quickly become red hot, shed its paint in smoke and then go open-circuit, thereby cutting off H.T. to the frequency changer in the tuner.

Common Stage AGC

The sound and vision I.F. signals appear across L103 and are thus applied to the control grid of V3 with C104 ensuring that the "earthy" end of the coil is at chassis potential to R.F. while giving D.C. isolation for the AGC voltage. AGC decoupling is provided by R106 in conjunction with C104 and AGC is applied to the grid of the valve through R106 and L103 from the AGC line.

The common stage is also biased by R108 in the cathode circuit and negative feedback is eliminated by the decoupling provided by C105. A small amount of negative feedback is purposely introduced by the unbypassed R107. The reason for this is to suppress changes of input capacitance of V3 owing to changes of bias by the action of the AGC. Without this negative feedback, the input capacitance of the stage would alter considerably with changes in bias and thus reflect across L102/103 giving undesirable changes in response characteristics of the tuned circuit. Since the suppressor grid of V3 is connected to chassis, this grid is also biased by the voltage drop across the cathode circuit.

R109 is the ordinary screen feed and decoupling resistor which works in conjunction with C106, the screen decoupling capacitor.

L104 is the common I.F. anode coil which would most likely be tuned to 37·25Mc/s for maximum vision response. R110 is a damping resistor of which the purpose is to provide the correct pass-band characteristics. Between points A1 and A2 is connected the primary of the sound I.F. transformer, which appears in a section of a circuit that will be investigated in a later article in this series.

H.T. voltage to the anode of V3 is fed through R109, R111, L117 (the sound I.F. primary) and L104, and an open-circuit in any of these would put both sound and vision out of action. Coil L105 in conjunction with C107, C109 and R112 comprise the sound rejector circuit. This is tuned to the sound I.F. for minimum response in the vision I.F. channel.

Sound Rejector Fault

If the sound rejector is out of adjustment or if there is a change in value or a fault in an associated component, severe sound breakthrough on vision will occur. Slight misadjustment, whilst not giving excessive sound-on-vision, may well cause after-shoot on the picture, resulting in black-after-white and white-after-black. Similar trouble could occur owing to alteration in value of the coupling capacitor C108, since this is fairly critical in relation to the alignment of L105 and L106.

Overload Control

L106 is the vision I.F. amplifier grid tuning coil which would be tuned to around 36·3Mc/s on sets with "standard" I.F.'s. R113 is the ordinary grid leak, while R198 and C171 form a grid current overload control. In the event of a momentary signal of fairly high level, such as is produced on changing channels, the vision I.F. valve is likely to overload. However, this is eliminated by the grid components, since on overload C171 charges by grid current and automatically biases the valve to a less sensitive condition. This is maintained until the charge leaks away through R198, during which time the normal AGC takes control.

Normal bias for V4 is provided by R114 which is decoupled by C110 to avoid loss of gain owing to negative feedback. The screen is fed and decoupled by R115 and C111. It will be noticed that the suppressor grid of V4 is connected to the AGC line instead of to chassis which is the usual arrangement.

Suppressor Grid Delay

The suppressor grid is arranged to act as an AGC delay "diode". Without such a diode, the positive voltage applied to the AGC line via the contrast control R130 would counteract the cathode bias of the controlled valves, and, in the event of there being no vision signal, their control grids would go positive. This, of course, would soon ruin the valves. The suppressor grid "diode" prevents this from happening, since this grid conducts when it goes positive and thus holds the AGC to the potential of the cathode of V4. C112 serves to decouple the suppressor from the R.F. point of view.

Vision Detector

The vision I.F. signals at the anode of V4 are developed across the final vision I.F. transformer, L107/108. These coils are tuned by their dust cores to about 36Mc/s. In the same screening can as the transformer is the vision detector diode W101.

The detector load is made up of R116 and R117 in series in this particular receiver (Ferguson 306T). In some sets R116 may be short-circuited, but the idea of using two resistors is to enable the load to be easily adjusted to the optimum conditions for the germanium diode used. The value is usually set at the factory for optimum overall transient response, but in service an improvement may be obtained, after the diode has been changed, by unshorting or shorting R116.

The vision signals are applied to the control grid of the video amplifier valve through an I.F. filter comprising L109, C114 and L110. R119 is simply a grid stopper included to prevent parasitic oscillations within the video band. Open-circuiting

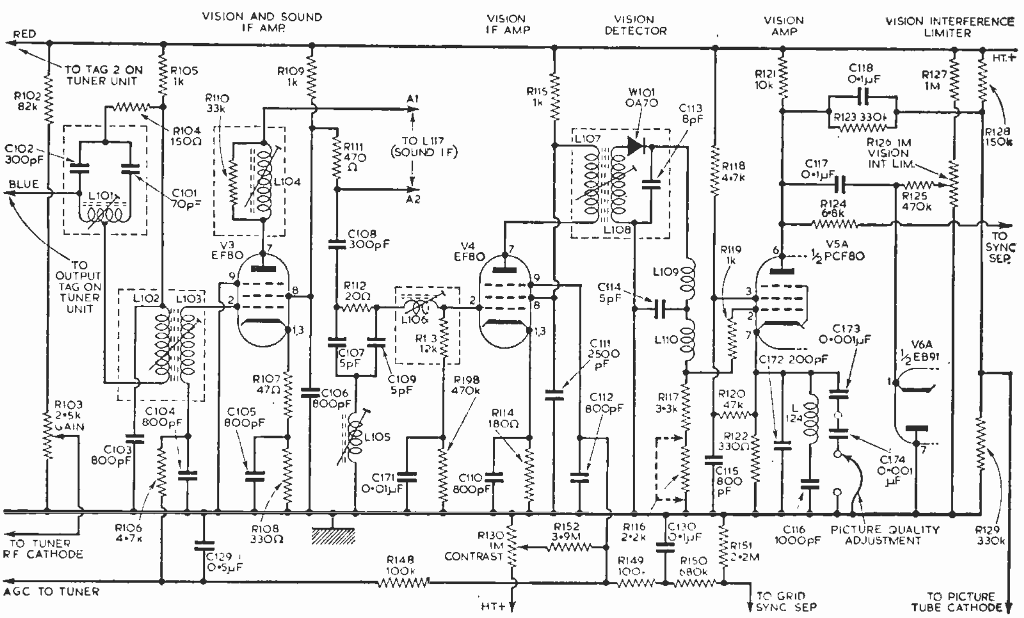


Fig. 2.—The vision stages of a typical receiver.

of either L109 or L110 would cut off vision completely, and these components are well worth investigating in the event of such a symptom.

Video Amplifier

Fixed bias for the video amplifier valve V5A is provided by R122 and the video amplifier response is corrected by C172, L124 and C116. However, further correction is provided by C173 and C174 which may be brought into circuit by the flylead of the "picture quality" adjustment.

There are three positions on this adjustment. One where there is no extra compensation, another which brings in C174 and the third which brings in C174 and C173 in series, giving a total value of 500pF. In certain areas, especially in Scotland and Wales, extra video correction is sometimes required on the BBC stations to eliminate "smearing". The "picture quality" control in such an event should be adjusted to provide the sharpest possible picture.

The screen grid of V5A is fed from a potential divider made up of R118 and R120, while C115 is the screen decoupling capacitor. R121 is the video amplifier load resistor and it is across this that the video signals are developed. If this goes high in value there will be excessive gain accompanied by poor definition and it may also be impossible to turn the brightness right off by the brightness control.

The video signals are directly coupled to the cathode of the picture tube through the potential divider network comprising C118 and R123. Such a network is used in most sets since it serves to reduce variations in brightness level, owing to passing aircraft, etc., by applying the full video output to the picture tube whilst attenuating the D.C. component. Resistors R128 and R129 stabilise the D.C. applied to the tube cathode.

Vision Interference Limiter

The video signal is also coupled to the cathode of the vision interference limiter diode V6A through C117. This diode does not normally conduct, but in the event of heavy bursts of interference, it does conduct and thereby effectively short-circuits the interference to chassis, so that its effect on the picture is minimised.

The level at which the diode conducts may be set by the interference limiter control R126 which makes the diode cathode more or less positive as required. R125 is the diode load resistor and R127 ensures that the correct range of positive adjustment is available on R126.

Contrast Control

Standing bias for the controlled valves is produced by the voltage drop across their cathode resistors as already described. In addition, these valves receive a negative bias from the AGC line depending on the strength of the aerial signal. The point at which the AGC takes over is governed by the delay given by V4 suppressor grid and on the setting of the contrast control R130. In this way, therefore, the contrast control varies the bias applied to the controlled valves but, in common to all sets using this kind of circuit, the contrast control only operates when the signal is sufficiently strong to produce an AGC voltage. If the signal is very weak then the contrast control will appear not to be operating. This is *not* a fault condition. The components on the AGC line, such as R150, R148, C129 and C130 are purely decoupling components, but if faulty could either result in failure of AGC or bending on vertical parts of a picture.

(To be continued)

New British Colour Television Tube

DEMONSTRATIONS of colour television in this country by the BBC and others rely on the only colour cathode-ray tube currently available—the American made shadow-mask tube. Its commercial history however is not encouraging. Since the American N.T.S.C. colour television system was launched eight years ago only about half a million colour receivers using this tube have been disposed of, and many of these have rapidly become unserviceable. In the same period more than fifty million black and white television receivers have been sold to the American public, i.e. a proportion of roughly 100 to 1.

Cost

Thorn Electrical Industries Ltd., in collaboration with their associates Sylvania Electric Products Inc., realised many years ago that the most important problems to be solved before commencing a colour television service was—and still is—the production of a colour television tube and receiver of adequate performance and at a reasonable price. In 1954 the Sylvania-Thorn Colour Television Laboratories were set up with the primary object of tackling this problem. By 1957, when the Sylvania-Thorn building at Enfield was opened, considerable exploratory work had been done in the examination of various possible receiver systems and the objective was becoming clearer. In the Autumn of 1958, the new "Zebra" System was demonstrated in embryo to the T.E.I. management, using experimental 14in. tubes made in the Enfield Laboratory. On May 1st this year, a full technical paper with demonstrations was presented to the Institution of Electrical Engineers in London, using British made 21in. colour tubes.

Phosphor Stripes

The new colour tube under development has a single electron beam, and has been named the "Zebra" tube because the screen consists of a series of vertical stripes of red, green and blue phosphors. In fact, the only difference between the "Zebra" tube and a normal black and white tube is in the structure of the phosphor screen, and since the colour stripes "add up" to white, it will give a perectly good black and white picture if driven from a conventional receiver. It follows therefore that the "Zebra" colour receiver will give an excellent black and white picture with no difficulty at all.

The potentialities for the future development of the "Zebra" tube and receiver are very great, although a great deal remains to be done before it can be considered ready for mass production. ■

TV TEST POINTS

By L. E. Higgs

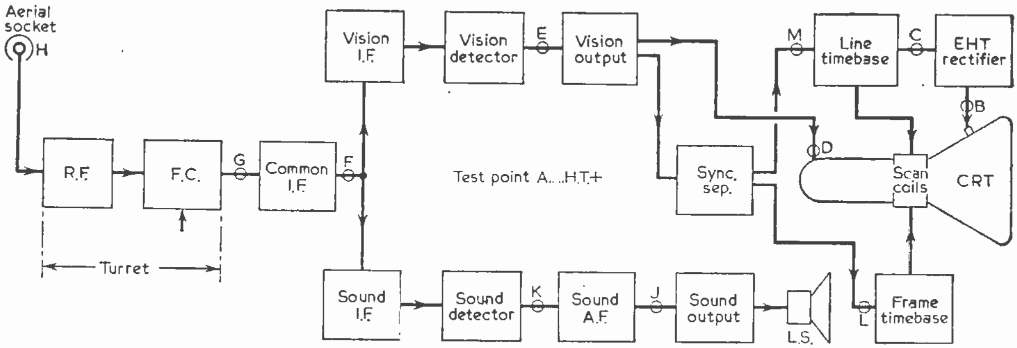


Fig. 1—A block diagram of a receiver.

A FEW key test points at accessible, easily identified, places on television receivers are the means of fast diagnosis by professional TV engineers and experienced enthusiasts. Because of the complexity of inter-connected circuits in television equipment, the newcomer, when confronted with a breakdown, is interested in tackling the fault but doubtful where to start. It is wise not to probe the various sections of a receiver at random without employing a correct approach, because parts of the set unaffected by the breakdown can be disturbed in the process. The beginner is often bewildered by the way in which the experts seem to find faults in very short periods, often without test equipment. However, most constructors know how to repair or replace a defective part once the problem of pinpointing its position in the maze of circuitry is solved.

The trick is to start thinking of TV sets as "blocks" and not worry about circuit detail. Consider the turret tuner, each intermediate frequency stage, the timebases, etc. as a box of circuitry with an input and an output. By understanding the results of simple tests (listed in the table on page 177) applied to the test points shown on the block diagram (Fig. 1), defective stages can be quickly isolated. Experience in finding these points and applying the tests suggested can be built up, before faults occur, by applying the tests to a TV receiver in normal working order and observing the results.

TV circuits vary from maker to maker and year by year, but the basic stage arrangements hold good for most models and the generalised block diagram (Fig. 1) will be found to cover the majority of popular receivers issued since 1955. Some will have two vision I.F. stages and others only one. Some may use a single self oscillating valve for the line timebase, but a fringe area model with flywheel sync might possess three valves. It makes no difference to our thinking in terms of "blocks" of circuitry; each is classed as one section—to be dissected into valves only when a fault is discovered in that section. The layout in Fig. 2 is to show where the test points can be found in a typical receiver. Points under the chassis are just as accessible as those above chassis in receivers with inspection covers, or open bases. Most of the underchassis points are control grids which are easy to remember and have no H.T. voltages on them. Places where tests are difficult to make or secondary in order of diagnostic importance have been omitted, such as between cascode amplifier and mixer in the turret tuner. *The object of the tests is to localise the defect to one stage and apply orthodox examination from there.*

Helpful clues to consider when applying the listed tests are the presence of line whistle, frame tick, speaker noises, all valve heaters alight, and indications from the raster. According to the symptoms, so the appropriate tests are selected, and the order of tests given in the table, while logical, need not be followed too closely. Study of the circuit block diagram, remembering that the signals travel from left to right, will suggest the appropriate tests. Examples of common faults, given at the end of this article, illustrate the various approaches.

Point A; H.T. + line

This most useful single voltage test can be made at the most accessible of many chassis points. Smoothing capacitor tags, fuse caps, or almost any red-coded wire will have H.T. present. Test with a voltmeter to chassis. A.C./D.C. receivers with half-wave rectifiers should have a minimum of 180V, and so should many A.C.-only receivers, but expect to find exceptions with full-wave rectifiers (giving 250V or more). A low voltage on the H.T. line can be due to a low emission rectifier or to a heavy H.T. current drain owing to a partial short circuit anywhere in the receiver. Lack of voltage can be due to a faulty or o.c. rectifier, wire-wound resistors, a blown fuse, or to faulty surge resistors (sometimes included on the mains dropper). The main H.T. line can be assumed in order if the raster is normal—but a branch H.T. feed might still be at fault.

Point B; EHT D.C.

Test at the CRT connector by drawing an arc to the blade of a screwdriver held well back on the insulated handle. If a spark is not produced, try with the connector removed to check whether the CRT is shorting the supply, in which case the EHT will reappear. The D.C. EHT spark should be $\frac{3}{8}$in. to $\frac{3}{4}$in. long and thin, blue and crackling. Lack of a spark with the EHT cap removed indicates no A.C. EHT input to the EHT rectifier or that the rectifier itself is faulty.

Point C: EHT A.C.

Test at the EHT rectifier valve anode as described in Test B but this time a sizzling violet arc about $\frac{3}{8}$in. to $\frac{1}{2}$in. long should be produced. Try also with the CRT cap off if no spark is produced with the first test. No A.C. EHT here indicates line output failure—possibly the line output valve, booster diode, line oscillator, line output transformer or associated circuitry.

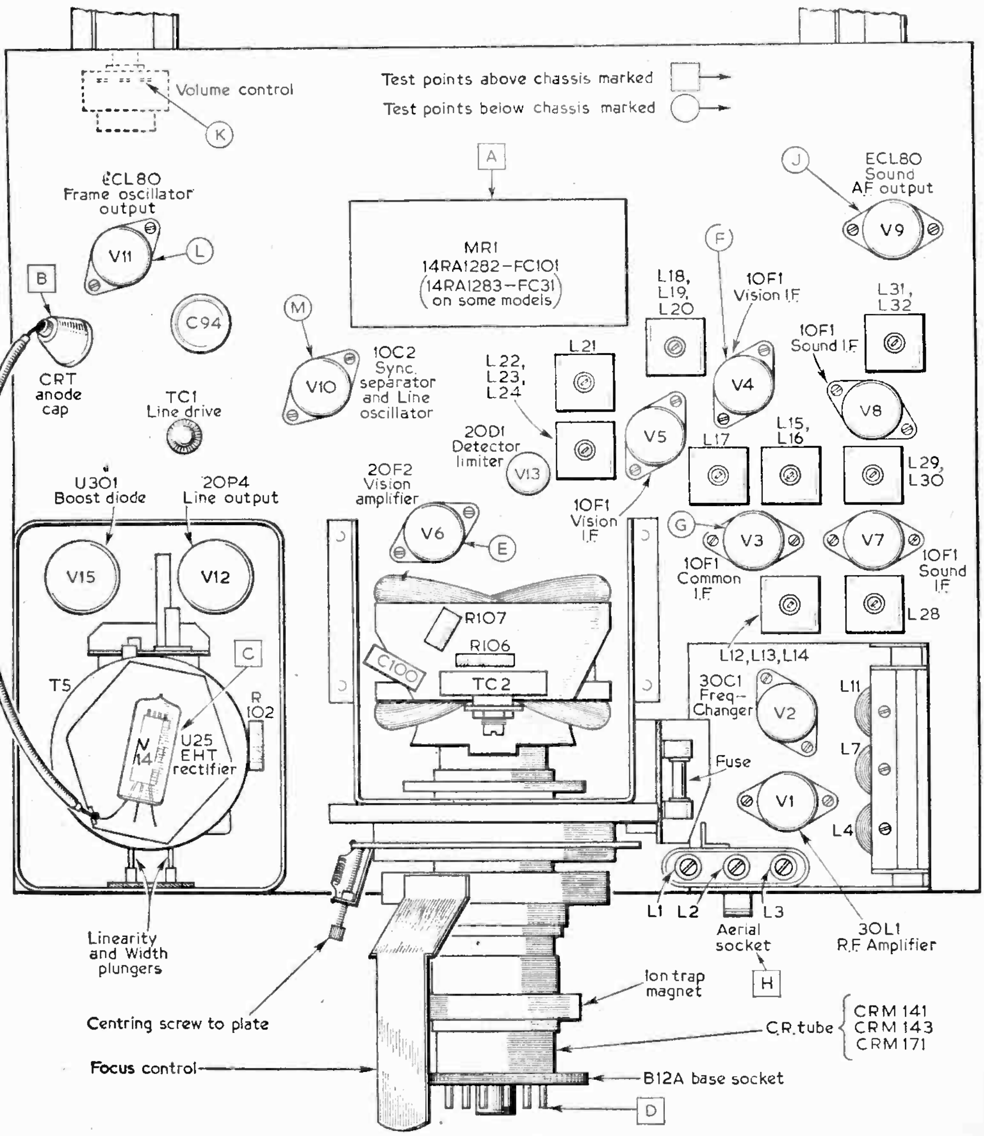


Fig. 2—Above chassis test points for a typical receiver.

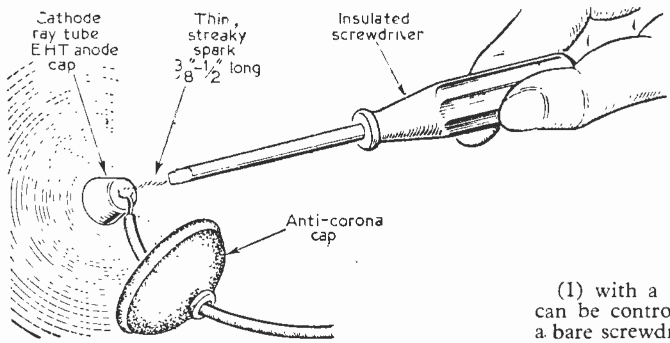


Fig. 3—Screwdriver EHT test (note that the screwdriver must be held so that the hand is well removed from the metal blade).

Point D; CRT Cathode

The cathode pin on the CRT base can be identified by its separate connecting wire usually isolated from other CRT base connections to reduce H.F. losses through stray capacity. The majority of picture tubes are cathode modulated as assumed here, but a few receivers in the past have employed grid modulation. The test to apply depends on the condition of the raster.

(1) with a normal raster in which the brilliance can be controlled, scratching the cathode pin with a bare screwdriver blade should produce a few weak spots of low brilliance on the screen.

(2) with no raster (EHT in order), momentarily short the grid pin to the cathode pin—if a bright raster appears, a bias fault exists.

(Continued on page 200)

TABLE I

Test Point	*Location*	*Quick test to apply*	*Normal Result*
		GENERAL TESTS	
All valves	Valves; CRT neck	Observe valve and CRT heaters	*All* alight
H.T.+	A—Smoothing capacitor tags	Measure D.C. volts	Higher than +180V; for majority of A.C./D.C. models
		PICTURE TESTS	
EHT D.C.	B—CRT anode cap	Draw spark with insulated screwdriver	$\frac{3}{8}$in. thin, blue, crackling spark (CRT cap removed)
EHT A.C.	C—EHT rectifier anode	Draw spark with insulated screwdriver	$\frac{1}{2}$in. thin, purple "sizzling" spark (CRT cap removed)
CRT CATH.	D—Tube base pins	Momentarily short circuit the cathode to the grid	Bright raster produced
Vision detector output	E—Video valve (g1)	Scratch the grid pin with a screwdriver blade	Random white spots on screen
Vision I.F. input	F—Vision I.F. valve (g1)	Scratch the grid pin with a screwdriver blade	Random white spots on screen; crackles from speaker
Turret output	G—Common I.F. valve (g1)	Scratch the grid pin with a screwdriver blade	Random white spots on screen; crackles from the speaker
TV input	H—Aerial socket	Substitute aerial which is known to be in good order	Normal picture and sound on both channels
		SOUND TESTS	
Input to output valve	J—Output valve (g1)	Touch the grid pin with a screwdriver blade	Low hum from speaker with crackle
Input to first A.F. valve	K—Live terminal of volume control	Touch the grid pin with a screwdriver blade	Loud hum and crackle from the loudspeaker
		TIMEBASE TESTS	
Vertical time-base input	L—Frame oscillator (g1)	Line the frame oscillator grid to the live volume control tag with a 100pF capacitor	Loud 50 c/s tick from speaker
Horizontal time-base input	M—Line oscillator (g1)	Link the line oscillator grid to the live volume control tag with a 100pF capacitor	Loud whistle from speaker

Television Filters

By T. Kemp

(Continued from page 152 of the December issue)

DIPLEXERS FOR TV AERIAL SYSTEMS

IN the first article of this series (December issue), we considered the basic conception of the various filters used both within the circuit of a television receiver and in external units for including in the aerial downlead. Several filters suitable for adjacent channel rejection, image rejection and sound rejection were considered in some detail.

In this article it is proposed to deal mainly with a filter which is possibly the most commonly used external to the receiver, namely the diplexer.

The Diplexer

As is well known, the diplexer is used to couple together to a common downlead Band I and Band III aerials. The advantages of this arrangement lie in the single download, and the ability to select either the BBC or ITA programme simply by the turn of the channel selector knob on the set. Most recent receivers feature a common aerial input socket, which means that without a diplexer it would be necessary to change from one aerial lead to the other when a change of programme is required.

This does not apply, of course, where the set features two aerial input sockets—for BBC and ITA—or where a converter is fitted for ITA which itself has its own aerial input socket. Neither does it apply where a combined Band I/Band III aerial is used, for here the signals are usually coupled at the aerials and the arrangement only requires a single downlead.

The sole disadvantage of the diplexer is that it has an insertion loss, but this is common to all filters and is of little moment in the majority of reception areas for there is usually sufficient signal adequately to outweigh the small loss, which rarely amounts to more than 2-3dB. Nevertheless, even this small loss can prove embarrassing where the Band III signal in particular is very weak. In such areas it may be worth considering the possibility of an aerial change-over switch.

A diplexer consists of two filters—a low-pass and a high-pass—coupled together. The low-pass section allows the passage of Band I signals with low loss while offering a high impedance to Band III signals and thereby suppressing the latter. The high-pass section, conversely, allows the passage of Band III signals with low loss while offering a high impedance to the Band I signals.

This method of discrimination between the two aerials is essential to prevent the signals in one aerial from being partially shorted by the terminal impedance of the other aerial. This is, of course, the reason why very poor results could be expected simply by connecting the Band I aerial in parallel with the Band III aerial. Not only will there be a loss of signal by adopting this method, but the impedance will also be considerably affected both at the aerials and the set.

In Fig. 3 (a) and (e) respectively (in Part 1), low-pass and high-pass T-section filters were shown. These are often combined, as shown in Fig. 8, to form a diplexer. The following design statistics are included for those wishing to produce a diplexer in accordance with the circuit of Fig. 8.

For a low-pass filter:

$$fc = 1/\pi\sqrt{(L1.C1)}$$
$$L1 = Ro/\pi \cdot fc$$
$$C1 = L1/Ro^2$$

For a high-pass filter

$$fc = 1/4\pi\sqrt{(L2.C2)}$$
$$L2 = Ro/4\pi fc$$
$$C2 = L2/Ro^2$$

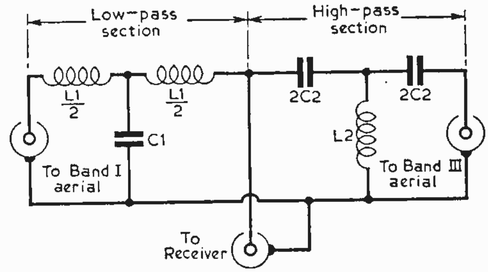
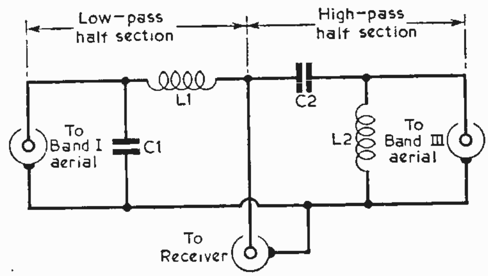


Fig. 8 (above)—Two filters (high-pass and low-pass) are combined as shown to form a diplexer. Full design statistics are given in the text.

Fig. 9 (below)—A practical diplexer can be produced by two half-sections without serious insertion loss.



The term fc is the cut-off frequency for the low-pass and high-pass sections as indicated. For minimum insertion loss it is desirable for the low-pass section to cut-off around 190Mc/s and for the high-pass section to cut-off around 50Mc/s. The term Ro is the input and output impedance of the two sections which, in most cases, will be equal to 75Ω (the characteristic impedance of the coaxial downlead and input impedance of the set).

It will be observed from Fig. 8 that the two inductors in the low-pass section each have half the value of that calculated, while the two capacitors in the high-pass section each have twice the value of that calculated.

(To be continued)

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1A5GT	5/-	6AG5	3/6	6J5	4/3	6V6G	5/6	12BH7	10/6	35L6GT	9/-	DA90	2/6	ECC32	4/-	EL37	11/6	N37	11/-	SP41	2/6	UCH41	8/6
1C5GT	8/6	6AG7	7/-	6J5G	2/9	6V6GT	6/6	12C8	6/6	35W4	6/9	DAC32	9/9	ECC33	4/6	EL38	12/6	N78	15/-	SP61	2/6	UCL83	13/6
1D5	8/6	6AK5	5/-	3J5GT	3/9	6X2	6/6	12E1	16/6	35Z4GT	5/3	DAF91	3/6	ECC34	9/-	EL41	8/-	N108	16/-	SU2150A	4/6	UF41	8/6
1D6	9/9	6AL5	3/6	6J6	4/-	6X4	5/-	12J5GT	3/6	35Z5GT	7/6	DAF96	7/3	ECC35	6/-	EL42	9/-	N152	8/9	T41	7/-	UF42	5/6
1H5GT	9/9	6AM6	3/-	6J7	7/9	6X5G	5/-	12K7GT	4/9	42	7/6	DF33	9/9	ECC81	5/6	EL84	7/-	P41	4/6	TDD4	7/6	UF80	7/6
1L4	3/6	6AQ5	6/-	6J7G	5/-	6X5GT	5/6	12K8GT	11/-	43	7/6	DF91	3/6	ECC82	6/-	EL91	4/6	P61	2/3	U14	8/-	UF85	8/9
1LD5	3/6	6AT6	5/-	6J7GT	7/6	6Y6G	7/9	12K8	12/-	50C5	7/6	DF96	7/3	ECC83	6/9	EM34	8/6	PABC80	11/-	U18	8/-	UF86	14/6
1LN5	4/6	6AU6	7/6	6J8	8/6	7B5	12/6	12Q7GT	5/-	50L6GT	9/-	DH63	6/3	ECC84	7/-	EM80	7/9	PCC84	7/-	U22	6/9	UF89	7/-
1N5GT	9/9	6B7	8/6	6K6GT	6/6	7B6	9/-	12SG7	6/-	52KU	10/6	DH76	5/-	ECC85	7/9	EM81	8/9	PCC85	7/3	U24	15/-	UL41	7/-
1R5	6/-	6B8G	3/6	6K7	5/9	7B7	7/3	12SH7	4/6	53KU	10/6	DH77	5/-	ECF80	8/6	EM84	9/9	PCC88	19/-	U25	12/6	UL44	11/-
1S4	8/-	6BA6	6/-	6K7G	2/3	7C5	7/-	12SJ7	5/6	54KU	8/9	DK32	11/3	ECF82	8/6	EM85	10/6	PCC89	13/6	U26	9/9	UL46	9/9
1S5	4/9	6BE6	5/9	6K7GT	4/9	7C6	7/3	12SK7	4/-	61SPT	11/-	DK91	5/6	ECH21	12/6	EN31	16/-	PCF80	7/-	U31	7/9	UL84	7/6
1T4	3/9	6BG6G	12/6	6K8GT	8/9	7H7	7/3	12SN7GT	8/6	75	8/-	DK92	7/6	ECH35	9/6	EY51 small	8/-	PCF82	7/3	U35	11/-	UM80	9/6
2A3	7/9	6BH6	6/-	6L1	12/6	7K7	9/6	12SQ7	6/6	77	6/6	DK96	7/3	ECH42	7/9	EY86	8/-	PCL82	7/3	U37	26/-	UU6	19/-
2D21	4/6	6BJ6	6/-	6L6M	9/9	7Q7	7/6	12Z5	9/-	78	6/6	DL33	8/6	ECH81	7/9	EZ35	6/-	PCL83	10/6	U43	8/-	UU7	9/6
3A4	4/9	6BR7	9/3	6L6G	6/9	7S7	9/-	14S7	22/6	80	5/9	DL35	9/6	ECL80	7/-	EZ40	6/6	PCL84	7/6	U50	5/9	UU8	17/-
3A5	9/-	6BW6	7/9	6L18	8/6	7V7	6/-	19AQ5	7/6	83	9/6	DL82	9/-	ECL82	8/9	EZ41	7/-	PEN25	4/6	U52	4/9	UY1N	11/-
3D6	4/6	6BW7	5/9	6L19	12/6	7Y4	6/3	19BG6G	15/-	185BT	18/-	DL91	8/-	ECL83	12/-	EZ80	6/-	PEN45	7/3	U76	5/6	UY21	11/-
3Q4	7/-	6BX6	4/9	6LD3	8/-	7Z4	6/6	20D1	8/6	807(A)	5/6	DL92	6/-	EF22	7/-	EZ81	6/6	PEN46	5/3	U78	5/-	UY41	6/-
3Q5GT	8/6	6C4	3/6	6LD12	7/6	8D3	3/-	20F2	8/6	807(E)	3/9	DL94	6/-	EF36	3/3	GZ32	8/9	PL33	8/3	U191	11/-	UY85	6/6
3S4	5/6	6C5	5/6	6LD20	8/6	10C1	11/-	20L1	18/-	808	15/-	DL96	7/3	EF39	4/3	HL41DD	7/9	PL36	10/6	U281	9/6	VR105/30	6/3
3V4	6/9	6C6	4/9	6N7	6/6	10C2	13/6	20P1	9/9	954	2/-	EA50	9d.	EF40	13/6	HVR2	7/6	PL38	16/6	U282	15/-	VR150/30	6/9
5R4G	9/6	6C9	8/9	6P1	14/-	10C14	8/6	20P3	12/6	955	3/9	EABC80	7/6	EF41	8/-	K135	7/6	PL81	8/-	U309	7/-	W81M	11/-
5T4	8/9	6CD6G	21/-	6P25	8/6	10F1	5/9	20P4	17/-	956	2/6	EAC91	4/6	EF42	7/6	KLL32	8/6	PL82	6/9	U329	7/-	W76	5/-
5U4G	4/9	6CH6	8/3	6P28	12/6	10L14	7/9	20P5	15/-	5763	10/-	EAF42	8/6	EF50-BR	2/-	KT32	6/9	PL83	6/9	U339	11/-	W81	7/6
5V4G	8/9	6D1	9d.	6Q7G	6/-	10LD3	7/9	25A6G	8/-	9001	4/-	EB34	1/6	EF50-USA	3/-	KT33C	4/9	PL84	9/-	U404	6/-	X61M	11/-
5Y3G	5/9	6D2	3/6	6Q7GT	8/9	10LD11	13/9	25L6G	6/9	9002	4/9	EB41	7/-	EF54	3/3	KT36	9/-	PL84	11/-	U801	23/-	X63	9/6
5Y3GT	6/-	6D3	12/6	6R7G	6/-	10LD12	8/6	25L6GT	9/-	9003	4/-	EB91	3/6	EF80	4/9	KT44	6/3	PX25	11/6	UABC80	8/6	X65	11/-
5Y4G	11/-	6D6	4/9	6SA7	5/9	10P13	9/-	25Y5G	9/-	ATP4	2/9	EBC3	9/-	EF85	6/6	KT45	8/6	PY31	7/9	UAF42	8/-	X66	11/-
5Z3	8/3	6F1	4/9	6SC7	5/3	10P14	9/-	25Z4G	7/3	AZ31	8/-	EBC33	4/9	EF86	9/-	KT61	8/6	PY32	10/-	UB41	8/-	X76M	12/-
5Z4	11/-	6F6G	5/9	6SG7	4/9	10P18	7/6	25Z5	8/-	B36	8/6	EBC41	7/9	EF89	6/9	KT63	6/3	PY80	7/-	UBC41	7/9	X78	14/6
5Z4G	8/6	6F6M	7/-	6SH7	4/6	12A6	5/-	25Z6	12/-	C1C	7/6	EBC81	7/9	EF91	3/-	KT76	8/6	PY81	6/-	UBC81	10/-	X79	16/6
5Z4GT	11/-	6F8G	6/3	6SJ7	4/6	12AH7	6/9	27SU	25/-	CBL31	21/-	EBF80	7/9	EF92	4/6	KTW61	5/9	PY82	6/3	UBF89	7/9	X81M	9/-
6/30L2	9/-	6F12	3/6	6SK7	5/3	12AH8	9/9	30C1	7/6	CCH35	14/-	EBF89	8/6	EF95	6/6	KTW63	5/9	PY83	7/6	UBL21	14/6	Y63	6/3
6A6	7/6	6F13	6/9	6SL7GT	6/-	12AT6	7/6	30F5	6/9	CL33	11/9	EBL21	12/6	EK32	7/-	KTZ63	5/6	PZ30	9/6	UCC84	14/6	Z66	9/6
6A7	10/-	6F14	9/6	6SN7GT	4/9	12AT7	5/6	30FL1	9/6	CY31	7/6	EBL31	21/-	EL32	3/9	L63	5/6	R18	11/-	UCC85	7/9	Z152	4/9
6A8G	9/6	6F15	9/6	6SQ7	6/-	12AU7	6/-	30L1	7/-	D63	1/6	EC52	3/6	EL33	8/-	LN152	7/-	R19	11/-	UCF80	16/-		
6A8GT	13/-	6F16	8/6	6SS7	4/6	12AX7	6/9	30P4	12/6	D77	3/6	EC90	3/6			LZ319	7/-	SD6	8/6	UCH21	12/6		
6AB8	7/-	6F33	6/6	6U4GT	10/6	12BA6	8/-	30P12	8/-	D152	5/9	EC91	4/6										

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TRACING TV FAULTS

(Continued from page 91 of the November issue)

TIMEBASE CIRCUITS

By G. J. King

THE fault under discussion at present is "blank raster; sound normal"—last month, the procedure for checking the video stage was explained. If the video amplifier has been proved to be in good order, the fault tracing must be continued into the vision detector and vision I.F. stage. The detector rarely gives trouble, but sometimes the inductor between the vision detector and the control grid of the video amplifier valve (L4 in Fig. 5 November issue) becomes open-circuited. This can be proved simply by shorting out the inductor as a temporary measure. Certain resistors in some vision noise limiters tend to increase in value and upset the picture a little, but rarely does a fault occur in this section which completely removes the picture.

As before, the heater of the vision I.F. amplifier valve should be observed and the envelope finger-tested for temperature. If necessary, have the valve tested for emission and keep a good look out for charred resistors, and if any are found they should be replaced, as also should the associated decoupling capacitors.

Sync Faults

As was shown in Fig. 1, the composite vision and sync signals are fed from the video amplifier stage not only to the cathode of the picture tube but also to the sync separator stage. The sync separator eliminates the picture components of the signal and leaves only the frame and line sync pulses which are fed to appropriate filters and thence to the frame and line timebases to lock them.

Clearly, then, if the picture symptom is that of no frame or line hold we need to look no further than the sync separator stage for the trouble. The valve will possibly be low in emission or one of the associated resistors or capacitors will have failed.

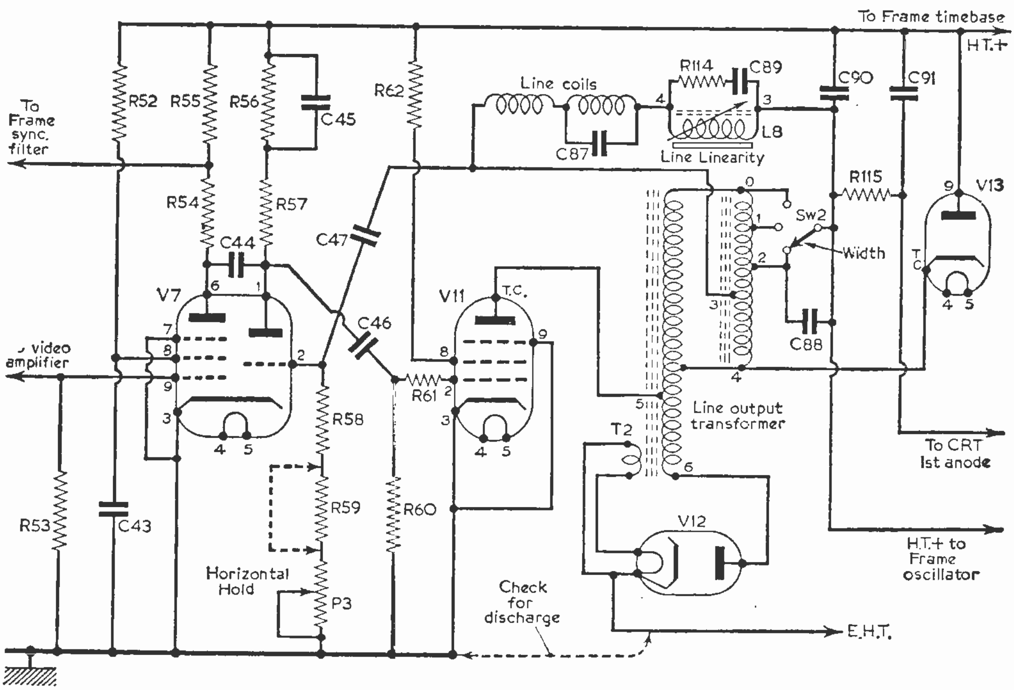


Fig. 6.—A line timebase circuit which includes a sync separator—built around the pentode section of V7.

Coupling Circuits

In Fig. 6 is given the circuit of a sync separator and line timebase section. The sync separator is built around the pentode section of the triode-pentode valve, V7, and the signals from the video amplifier are applied to the control grid of the valve, as shown. In most cases the signal is coupled via a small capacitor and this sometimes develops an open-circuit which cuts off the sync signals.

One of the anode or screen resistors may go open-circuit or high in value. If it goes open-circuit, the sync will fail completely, but if continuity is maintained, and it just goes high in value, the performance of the sync separator will be impaired and weak line and frame holds will result.

If only one hold is affected, say, the line hold, then it would follow that the sync separator is, in fact, working, but that the feed from the separator to the line timebase is defective. Fig. 1 showed that the line sync pulses are fed via a line sync filter (section 10D). In Fig. 6 this is made up in part by the resistors in the pentode anode circuit and by capacitor C44, the line pulses being applied to the anode of V7 triode which is a part of the line timebase itself. In nine cases out of ten, the trouble would lie in C44 or its equivalent in another circuit.

Frame Filter

The frame sync filter (section 10E Fig. 1) is usually more complicated than the line sync filter. The feed for this is taken from the junction of resistors R54 and R55 in Fig. 6 and fed to the junction of capacitors C73 and C74 in Fig. 7. In this circuit, V10 comprises the frame timebase, the triode being the blocking oscillator and the pentode the frame amplifier, and the frame sync pulses are fed to the blocking oscillator from the frame sync pulse filter through R94 and C77.

The frame sync filter is thus made up of rectifier MR2 and associated resistors and capacitors. If, therefore, the symptom is that of no frame hold, one need look no further than the frame sync pulse filter circuit, and invariably the small rectifier is to blame. Circuits differ, of course, among receivers, and there are occasions when a freak effect or unusual circuitry produces symptoms other than those which would be expected; misleading effects may also occur from time to time causing the experimenter or service technician to explore in a part of the circuit which is free from blame. Nevertheless, as these are rare cases they do not detract from the general principle of step-by-step diagnosis of faults which is being described.

Lock Range

While on the question of sync failure, one must always make certain that the symptom is not being caused by the inability of the appropriate hold or lock control to bring the timebase to the correct locking speed. If the lack of lock is caused by sync trouble, very careful operation of the hold control will allow the frame or line oscillator to be adjusted almost to the point of a stationary picture. This should happen well within the range of the control, but if it appears that the picture is trying hard to lock at the end of the travel of the control, and one has the feeling that if the control could be turned a little further beyond its stop the picture would lock, then the trouble is possibly in the timebase oscillator. The oscillator is going either too fast or too slow, which would indicate that one of the components associated with its particular hold control has altered in value—the resistor (if of normally high value) connected in series with the control often increases in value.

Width

Incidentally, it is interesting to note that the screen will indicate whether the timebase is running too fast or too slow by the picture height or width being expanded if too slow and contracted if too fast.

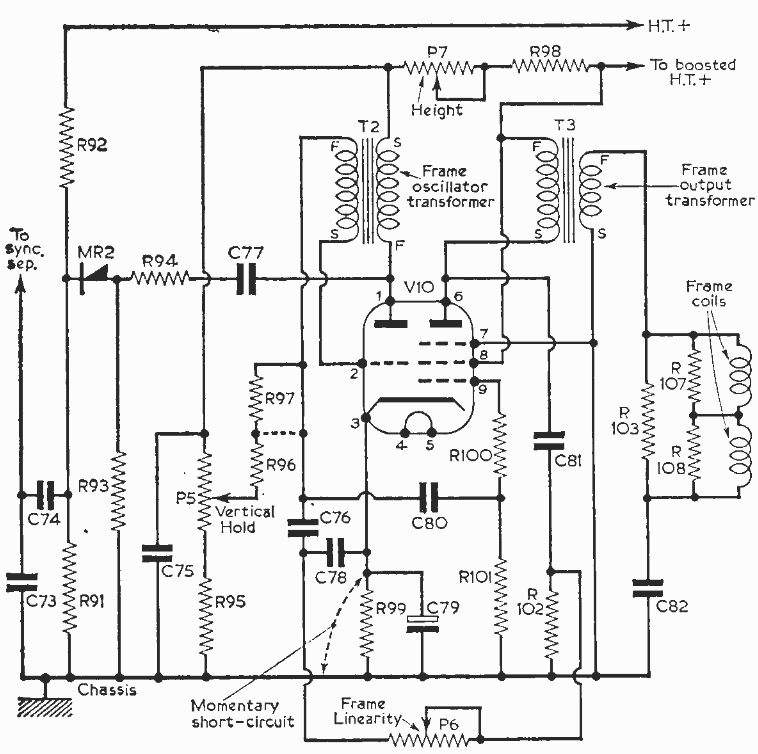


Fig. 7.—The circuit diagram of a frame timebase—the triode forms the frame blocking oscillator and the pentode the frame amplifier.

Some circuits feature an extra resistor in series with the frame and line hold control circuits, which can be left in circuit or short-circuited as required to give a balance of control at the approximate centre point. Such resistors are shown in Figs. 6 and 7 and are R59 and R97 respectively.

Sync Faults

The tell-tale symptom of "pulling on whites" usually originates in the sync separator stage. The effect is that certain white sections of a picture tend to pull to the right of the screen, and this pulling effect alters, of course, with change in picture content. The trouble is that the sync separator is letting through some picture signal as well as the sync pulses. The screen resistor R52 (Fig. 6) becoming extremely high in value can produce the effect, as also can misalignment of the vision I.F. stages and a fault in the video amplifier.

Timebase Faults

A common trouble is complete failure of one of the timebases. If the frame timebase fails, for example, the symptom will be a horizontal, sharply focused, bright line across the screen. By looking at this, one cannot be sure whether the fault lies in the frame oscillator or amplifier, but we can speedily check on this by applying a momentary short-circuit across the frame amplifier cathode resistor (or the common cathode resistor of the timebase valve—such as R99 in Fig. 7). This action will result in a current surge in the frame amplifier and if the stage is working will cause the horizontal line to move up or down slightly. This thus indicates conclusively that the frame oscillator is at fault. The valve should be checked, as also should the frame blocking oscillator transformer (if fitted).

If the amplifier is proved to be defective, a check should be made on the valve and the valve should be observed while working. If the screen grid is red hot, then we need look no further than the frame output transformer, the primary winding of which will be open-circuited.

In the line timebase, things are somewhat different, for if this fails then there will be no EHT and no symptom on the screen. There is one condition, however, that would produce a conclusive symptom, and that is a vertical white line on the screen. This would indicate that EHT is present and that the line timebase is working. It would also indicate that the trouble lies in the line scanning circuit, and the most likely cause would be a disconnected lead from the line coils to the line output transformer. It would, of course, be an utter waste of time to search around the line oscillator or output stages. as a failure here would deprive the picture tube of EHT voltage and the symptom would be that of a blank screen.

No Raster (Sound Normal)

If the symptom is, in fact. that of a blank screen we should first check the EHT voltage. Without instruments, this can be carried out by touching the blade of a screwdriver on the EHT connector on the picture tube and directing the tip of the screwdriver towards a suitable piece of metal work which is connected to the chassis. The screwdriver must, of course, be held by an adequately insulated handle and as far as possible up the handle—preferably with two fingers. The other hand should be kept well out of the way.

On modern sets, when the screwdriver is about an inch away from the chassis connection a vigorous discharge will occur between the tip and the chassis connection—that is, if the EHT is correct. If there is no discharge, then there is no EHT, and if the discharge is weak, the EHT voltage is low.

Assuming that EHT voltage is absent at that point, the screwdriver tip should be directed towards the anode of the EHT rectifier valve, but the blade must not be "earthed" this time. Under normal conditions, an arc of about 1in. will curve from the tip of the screwdriver to the anode point. If this happens, then the EHT rectifier valve is faulty, since pulse voltage is present at its anode but no EHT voltage is present at its cathode.

(To be continued)

THE ITV "LITTLE NETWORK" by Iconos

THE idea of an interchange of programmes between the smaller ITV programme companies has developed steadily, and a working arrangement has been agreed by Anglia, Southern, Scottish and TWW—companies which now have cable, microwave, or other facilities for sending back selected local programmes to the main network or to one another. The Independent Television Authority's lines department have followed a progressive plan in hiring more and more mileage of the very expensive Post Office coaxial lines and microwave links to make this possible and are entitled to a large share of credit for their good work.

It now remains to be seen if the public demand for these smaller station programmes is as ardent as for the regular top ten features from the four major contractors: ATV, A.R., Granada and ABC—TV. Up to now the only small contractor that has really clicked nationally is Anglia, with its superb plays, recorded on video tape and played back from Alpha, London. Little Ulster's magazine feature "Roundabout" has scored very high T.A.M. rating figures in its own area—higher than any other region—but the programme is purely local in its appeal. Considering the limited studio facilities available in UTV's Belfast Studio, this tremendous local populairty shows what can be done.

Two Modern Classics

Exchange of tapes and films between British and American television companies, and joint co-operative production of television productions to be shared are now becoming more common. Both ITV and BBC have arrangements of various kinds with American networks but the difference in line standards puts a limitation on the use of tape.

The best modern classics, for international television use, are still on film, 35mm and 16mm. Recent brilliant examples were "Grass Roots" and "Ed and Frank", a documentary reporting of life in American small towns, superbly produced by Denis Mitchell for the BBC. There is quite an opportunity for the exchange of really good films between the U.K. and the U.S.A. which deal with towns other than London and New York; Norwich, U.K. and Norwich Connecticut for instance; and Plymouth, U.K. and Plymouth, U.S.A. We see too much of the metropolitan scenes in New York, Chicago and London. Small town backgrounds give a freshness which is often quite delightful.

A Band V Receiv

A SOUND RECEIVER WITH PROVISION FOR FUTURE DEVELOPMENTS

THE writer was impressed at the 1961 Radio Show with the number of manufacturers whose advertisements implied that their current television receivers could be adapted easily for use with UHF transmissions, if and when they were introduced.

Parameters

It is perhaps useful to note that while the new frequencies in themselves may cause little difficulty, other factors may well influence profoundly the design of receivers intended to receive signals on Band V. Simple 'conversion' of frequency will not necessarily suffice, as the following considerations may show. Direct conversion on the lines of the early Band III conversion, will enable present receivers to be used if the present line frequency standards continue, and if present modulation standards are maintained — these include lower sideband transmission, sound frequency lower than picture frequency, and positive picture modulation. These derive from the fact that all modern receivers are designed for a vision I.F. of 34-38Mc/s, sound I.F. of 38·15Mc/s, negative-going line and frame sync pulses, and a nominal bandwidth of 3Mc/s picture. In fact, both the above assumptions are unwarranted by the information available at the time of writing. Until the Pilkington Committee presents its report nobody will be certain of the standards to be adopted on Band V.

The future of regular broadcasting on Band V may well be left for speculation; the present experimenter may prefer to concentrate on the current low-power transmissions on Band V—with an eye to the future, of course. A reasonable guess for the high-power transmissions, due to begin some time in 1962, is that they will be on the frequencies, and with the standards, which

1. All the following components are critical to the design and must be kept within 10% tolerance.
   (a) All inductances.
   (b) C1, C2, C7, C12, C15, C16, C19, C20.
   (c) C3 (this must also be of high quality and of small enough minimum capacitance).
   (d) R2, R3, R4.

2. So far as R5 and R6 are concerned, their values are less important than that they should be equal in value and matched if possible to within 2%—this should be possible to achieve by judicious selection of suitable resistors from 10% components.

The smaller of the two should be R5, so that the grid of V2 connected to their junction is positive rather than negative to the cathode of that half of V2. Grid current will then flow, and the voltage at the grid will be stabilised. Grid current of a small value does not affect the working of this half of the valve.

3. The remaining components are non-critical in nature, and the nearest reasonable values will often be suitable.

4. The suppressor grids of V3 and V4 must be connected to chassis.

5. Note than an underchassis screen plate is required across the valveholder of V2.

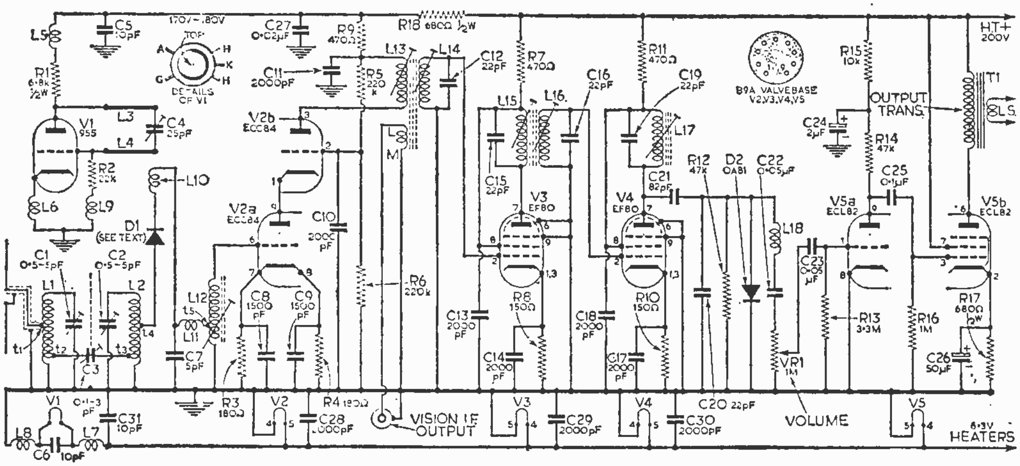


Fig. 1—The circuit diagram (excluding power supplies).

By R. B. Archer

the BBC used when experiments ended in 1958. It is doubtful at any rate whether the BBC will wish to retune the high-power klystrons then used until something definite is settled. The frequencies previously used were 654·25Mc/s vision, and 659·75Mc/s sound.

Results

It will thus be seen that the most obvious difference between next year's probable broadcasts and Channel 1 to 12 standards is the sound on the higher frequency. This indicates the probability that the higher vestigial sideband will be transmitted, with the carrier 6dB down near the lower edge, of the sideband. Present-day standards will thus be 'mirror-imaged'. However, if F.M. sound is transmitted, present detectors will make a poor show of receiving it, to say the least. Again, the present I.F.'s of 34·65Mc/s (vision) and 38·15Mc/s (sound) will not be suitable because these are separated by only 3·5Mc/s, whereas a separation of 5·5Mc/s, or thereabouts, will be needed. Sound-on-vision may well be a problem. As can readily be shown, the use of sound traps of any reasonably practicable design inevitably increases the response of the vision I.F. amplifier outside the pass-band. Thus, a vision I.F. amplifier in itself sufficiently selective to reject a frequency 5·5Mc/s remote from the vision carrier, may actually be badly impaired by the presence of sound traps tuned to reject a frequency 3·5Mc/s remote from the carrier. Obviously what is required may well be a completely redesigned receiver.

For the present, however, these considerations may be shelved, since the current low-power transmissions from Crystal Palace are on one frequency only and are amplitude-modulated. In describing a receiver for these broadcasts it has nevertheless been thought advisable to make some provision for the future, and consequently some design limitations have been accepted.

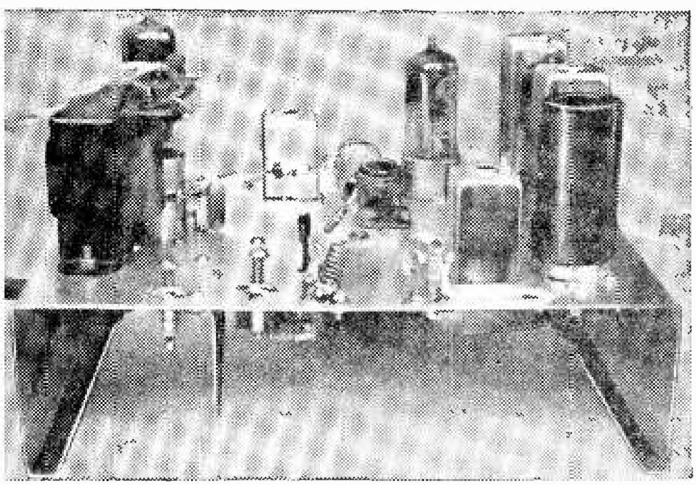
COMPONENTS LIST

Resistors:

R1	6·8k $\frac{1}{2}$W	R11	470Ω
R2	22k	R12	47k
R3	180Ω	R13	3·3M
R4	180Ω	R14	47k
R5	220k (matched pair)	R15	10k
R6	220k (matched pair)	R16	1M
R7	470Ω	R17	680Ω $\frac{1}{2}$W
R8	150Ω	R18	680Ω $\frac{1}{2}$W
R9	470Ω	VR1	2M (log)
R10	150Ω		

Condensers:

C1, C2	0·5pF—5pF tubular adjustable
C3	0·1pF—3pF airspaced adjustable
C4	25pF bee-hive type trimmer
C5, C6, C31	10pF silver mica
C7	5pF silver mica
C8, C9	1500pF ceramic
C10, C11, C13, C14, C17, C18, C28, C29, C30	2000pF ceramic
C12, C15, C16, C19, C20	22pF silver mica
C21	82pF silver mica
C22, C23	0·05μF tubular 250VW
C24	2μF electrolytic 250VW
C25	0·1μF tubular 250VW
C26	50μF electrolytic 12VW



A view of the complete receiver

In the first place, the oscillator has been made tunable over a wide range. If the present 405-line standards are used later, the first I.F. stage will be usable, in conjunction with the R.F. and oscillator stages, to convey a complete signal, via Channel I, to any receiver. If 625-line standards are used, the whole receiver will be usable as the sound receiver while either a poorish picture will be obtainable on most (slightly modified) domestic receivers, or a very good picture will be obtainable on a companion receiver specially designed. Of course, if colour should be transmitted, some more thought will have to be undertaken, but something will have been contributed to a colour receiver.

Design

This receiver is, of course, a superheterodyne. The local oscillator runs at a frequency of 619·6Mc/s, but the frequency is adjustable to 699·9Mc/s if this becomes necessary later on. The intermediate frequency, for the sound on 659·75Mc/s, is at 40·15Mc/s, which would enable a mirror-imaged but probably usable vestigal sideband to be tapped off for a vision I.F. amplifier, in certain circumstances as previously implied.

No R.F. amplifier is used, because it is likely that most experimenters will be unable to obtain the special UHF valves required. Instead, a band-pass input stage is used, employing tuned transmission lines; this stage feeds a silicon crystal into which is also passed R.F. current from the local oscillator. Mixing takes place in this circuit.

Because of the absence of an R.F. stage the first I.F. stage employs a low-noise cascode amplifier; the remaining two I.F. stages use conventional pentodes, the noise contribution of which is of negligible importance. Because the current low-power transmissions are amplitude modulated, a simple crystal detector is used, but room has been allowed for a phase discriminator to be substituted later, if it is needed. The audio amplifier is of conventional design.

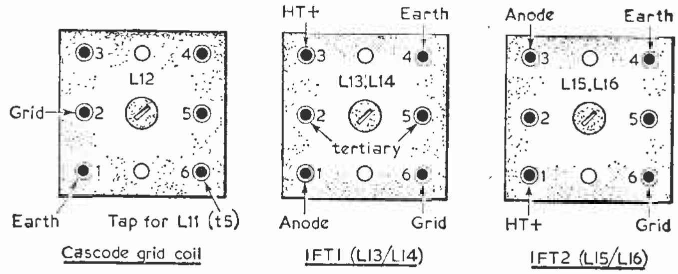


Fig. 2—Details of the coil base connections.

TABLE OF INDUCTANCE WINDINGS

Cascode Grid:

10 turns 28s.w.g. enamelled copper wire spaced by thickness of 34s.w.g. wire, tapped at 2 turns from earthy end for crystal diode connection.

Cascode Anode:

P. 10 turns 28s.w.g. enamelled copper wire spaced by thickness of 34s.w.g. wire.

S. 6 turns 24s.w.g., close-wound, spaced 1·2cm from anode winding; C=22pF.

Tertiary (for lead-out of vision signal eventually): $1\frac{1}{4}$ turns thin insulated wire over H.T. plus end of primary (i.e. nearest to grid winding).

I.F.T. 2:

P. $6\frac{1}{2}$ turns 24s.w.g. close-wound.

S. 6 turns 24s.w.g. close-wound.

Capacity=22pF (each winding).

Spacing 1·2cm between ends of winding.

3rd I.F. anode inductance:

5 turns 24s.w.g. close-wound; C=22pF.

All above on 0·27in. diameter formers, in screened can with VHF, purple coded, dust cores (Aladdin).

Note: L12 and L13, L14 and L15 need a long former and a long can ($2\frac{1}{2}$in.).

L11 and L16 need only a short former and a short can ($1\frac{1}{2}$in.).

L12 and L13, L14 and L15: in each case, P and S are wound in the same direction on the former. The 'inside' of each winding is of low R.F. potential—one to H.T. plus, the other to chassis.

L18 consists of 60 turns of 38s.w.g. enamelled wire wound on a $\frac{3}{16}$in. diameter former or $\frac{1}{4}$W resistor; no dust core is required.

Circuit

Fig. 1 shows the circuit diagram. The oscillator consists of a coaxial lines oscillator. L3 is the outer of the coaxial tubes and L4 the inner conductor, while C6 is an air-spaced bee-hive type trimmer of maximum capacity 25pF. Details of the construction will be given later. The valve used is a 955 acorn triode, and the mixer consists of a silicon crystal. In the prototype, a government surplus crystal CV291 (a low-noise type) was used, but any microwave crystal can be used; CV103, 253, 291, 364 and 1844 are manufactured by AEI Electronic Apparatus Division, Carholme Road, Lincoln. The mixer crystal is coupled to the oscillator by means of a loop of wire placed close to the coaxial assembly.

Aerial Circuits

The input circuits comprise a tuned-lines band-pass assembly; coupling between the elements is capacitive, via C3 and each is tuned by a 0·5—5pF capacitor, C1 and C2. The aerial co-axial input is tapped direct on to L1, while the silicon crystal is tapped on to L2 at a suitable point.

L11 is a small choke which, together with C7, isolates the R.F. and oscillator stages from L12, the inductor tuned to the I.F. of 40·15Mc/s. A tap on L12 enables the low impedance of the crystal circuit to be matched to the input resistance of the first I.F. amplifier.

L12, the input, and L13, the output, of the cascode first I.F. amplifier, are tuned by stray capacitances only. Damping is not artificially introduced in this receiver because only sound is to be received. Later, it may be necessary to add damping for the bandwidth required.

Neutralisation

However, the circuits L12 and L13 are essentially broad-band in nature; L12 is damped by the input resistance of V2—about 22k at 40Mc/s—while L13 is damped by the output impedance of the valve. The only other points of interest in the cascode circuit are the absence of neutralisation—it was found unnecessary—and the reduction of cathode impedance by the use of parallel resistors and associated decoupling capacitors. These are connected to the two cathode pins.

The rest of the receiver is conventional in design. Layout is by no means critical, provided the usual precautions against stray capacitance and inductance are observed. In the cascode stage it is usually important to keep the output anode connection 'out of sight' of its cathode pin.

(To be continued)

Telenews

Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of October, 1961, in respect of television receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London	1,959,025
Home Counties	1,617,101
Midland	1,742,199
North Eastern	1,855,099
North Western	1,517,371
South Western	991,211
Wales and Border Counties	699,044
Total England and Wales	10,381,050
Scotland	1,050,812
Northern Ireland	170,164
Grand Total	11,602,026

Closed-Circuit TV at Dental Exhibition

Visitors to Claudius Ash, Sons & Co's stand at the Dental Trade Exhibition at Alexandra Palace, from October 23rd to 27th, had close-up views on TV screens of small items of dental equipment being demonstrated in a studio at the end of the hall.

Two of EMI Electronics Ltd's closed-circuit television cameras televised a complete range of new dental products from the studio to a 24in. receiver in a private theatre on the stand.

In this way it was possible for a much larger number of visitors to view the demonstration in comfort than could be arranged if a live demonstration were given in the restricted space on the stand.

The Selkirk Station

The Independent Television Authority is using for the first time at its Selkirk station a 200ft. section of a 300ft. mast (specially designed to be dismantled quickly) which is normally kept in reserve for emergency use and which can be erected in about 10 days.

The temporary mast at Selkirk was erected during November and broadcasts the programmes of Border Television Limited, relayed from the authority's station at Caldbeck, near Carlisle. A permanent 750ft. tower is being built at Selkirk, but the use of the temporary mast enables viewers in the eastern borders to see Independent Television programmes several weeks earlier than would otherwise be possible.

The signal radiated from the temporary mast is on the same channel as that from the permanent tower, i.e., channel 13, vertically polarised. The effective radiated power is 4kW over a semi-circular arc of mid-bearing due East from the 200ft. mast.

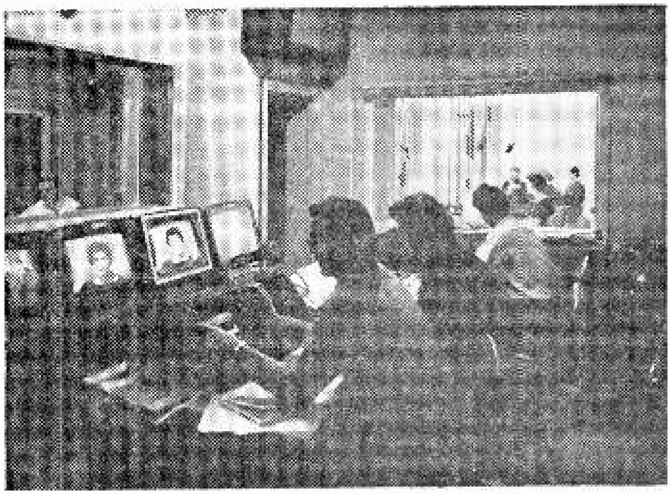
The estimated total coverage, up to and including the fringe area, of the temporary mast and aerial is 59,000.

Colour TV at Cologne and Aldermaston

Leading West German industrialists, television executives and doctors saw a demonstration of EMI Electronics Ltd's colour television system at Cologne, on Monday and Tuesday, October 30th and 31st.

Two days earlier, EMI colour TV was used for a rather different purpose at the Atomic Weapons Research Establishment at Aldermaston, when the apprentices held their annual Parents' Day.

Physical training displays, a mechanical engineering exhibition, and a satirical revue figured in the day's varied programme. The revue was televised in colour from the studio to a nearby auditorium where parents watched the show.



This picture shows the studio control room at the Television Centre, at Belfast, of Ulster Television Ltd., the independent television programme contractors for Northern Ireland. Ulster TV have recently placed an order with Marconi's for the supply and installation of new studio equipment.

Royal Ceremony on Closed Circuit TV

On October 25th, Queen Elizabeth the Queen Mother opened a pair of memorial gates and unveiled a plaque in the entrance hall of the Post Office Savings Bank at Blyth Road, Hammersmith, London. As the dais, around which the ceremony was centred, was on the fourth floor of the building, the gates and plaque were televised over a closed circuit system to monitors all over the building.

The ceremony, which took place in the restaurant at the Blyth Road headquarters, marked the centenary celebrations of the Post Office Savings Bank. So many people wanted to see the ceremony and hear the Queen Mother's speech, that it was decided to hold it on the fourth floor where as many as possible of the special guests could be accommodated.

These events, together with the Royal arrival and speeches which took place, were covered by five closed circuit television cameras operated by Rank Precision Industries mobile TV team. As well as the special guests in the restaurant, 2,000 Post Office employees in other parts of the building were able to watch the ceremony on TV monitors, together with staff on each of the seven floors at Charles House, Kensington. A further 1,000 employees also saw the ceremony relayed to them by microwave link in Ruskin Avenue, Kew, and at Bromyard Avenue, Acton. A total of 57 monitors were in use.

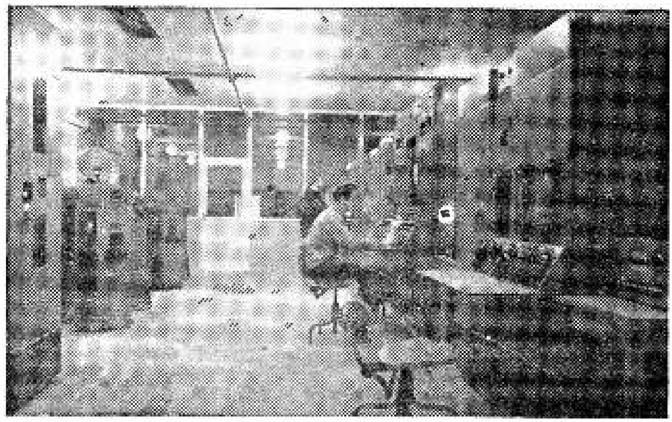
A sound only relay was transmitted by G.P.O. cables to St. George's Road, Harrogate, where loudspeakers were installed in six large rooms by Rank Precision engineers from the Leeds depot.

Television Celebrates its Quarter-century

In an honoured place at Marconi House, Chelmsford, overlooking a works area where the most modern television transmitters are tested, stands the final amplifier of the vision transmitter which carried the world's first permanent high-definition television service *(see also page 191)*.

A quarter of a century ago—on November 2nd, 1936 — the BBC began transmitting programmes from Alexandra Palace. At the onset two rival systems, the Baird and the Marconi-EMI, were used on alternate weeks to judge under practical conditions which was the better; in the event the prize went to Marconi-EMI, and as from February 6th, 1937, the system continued alone.

The Marconi-EMI team of engineers, who for some years previously had laboured on the project, had no precedents to guide them in the design of television stations; and yet the standards devised well over a quarter of a century ago still carry what is generally conceded to be the best television service in the world, while the transmitters and aerials continued to give service until 1956, only retiring when the BBC station at Crystal Palace began operation in that year.



Four Telecine equipments and an RCA television tape recorder form part of Westward Television's technical area. The master control can be seen in the background.

Channel Islands TV Station

The contract for the installation of a 450ft. tower and aerial array in Jersey for the Independent Television Authority has been awarded to EMI Electronics Ltd.

The tower will be equipped with a highly-directional Mesny aerial array with a 22ft aperture. The special array for Jersey, which will be horizontally polarised, will transmit on Channel 9 in Band III.

ITV network programmes will be relayed from the EMI aerials at Stockland Hill, Devon, and Caradon Hill, Cornwall, to a Post Office receiving station at Alderney, then passed on by microwave link to Jersey for retransmission over the local EMI aerial.

Programme contractors for the new station will be Channel Islands Communications (Television) Ltd. Transmissions are expected to start in the latter half of 1962.

Extensions for Northern Ireland Programme Contractors

An order for a new studio and an extension to the Master Control Room, has been placed with Marconi's, by Ulster Television Ltd.

The contract covers the supply and installation of telecine equipment, three broadcast vidicon cameras, a sound control desk, a vision mixer and a new type of presentation mixer for the master control room, together with various items of ancillary equipment.

The programmes will continue to be radiated by the ITA Transmitting station at Black Mountain, near Belfast — itself an all-Marconi installation.

Colour TV system shown in Milan

Following recent demonstrations in Europe, one of EMI Electronics Ltd's colour television systems was demonstrated at the Instrument and Automation Exhibition in Milan from November 7th to 12th.

One complete stand in the space allotted to the Italian agents of EMI was set aside for the demonstration.

New Tubes for Old

By J. K. Hobson

SIR,—I have read one or two articles in your magazine, in which one is told to rejuvenate an old tube which is nearing the end of its useful life by running it from a transformer which has the function of driving the heater at a percentage above its normal rating. I was told some time ago of another idea for carrying out the same purpose, only in this case it was to be used with a tube which had passed beyond the stage at which the above-mentioned arrangement was carried out. Here one had a tube which had practically given up the ghost entirely, but a new spell of activity could be obtained by driving the heater at very much above its rating. The idea, as it was explained to me, was to take a D.C. source of over 100V (an H.T. battery for instance) and to attach two leads to the positive and negative ends. A clip was fitted to one of these ends which was then clipped on to one of the heater pins of the old tube. The remaining wire was then taken (the covering of course being removed to expose the bare wire), and this was then very carefully held and swept across the exposed tube base pins so that it made, very momentarily, contact with the remaining heater pin. This application of a high voltage for an infinitesimally short time was supposed to burn off the deposit of the heater and rejuvenate it. Has somebody been pulling my leg, or is this a legitimate "trade secret"?—D. E. Winnington (Bradford).

[The above letter, published in our July issue, is only one of the many similar we have received. We therefore asked one of our technical staff to write an explanatory article on this subject.—Ed.]

A READER'S letter, published in the July issue, asks whether the application of a high voltage momentarily to the pins of an old TV tube is a "leg-pull or trade secret".

The description given in the letter is hardly likely to increase the emission from a worn tube, and provides a good risk of burning out the heater.

Flashing Off

A similar procedure however, is used, to "flash-off" conducting debris lodged across the narrow gap between the grid and cathode of picture tubes, that cause a characteristic severely smudged, over-bright picture (see Fig. 1).

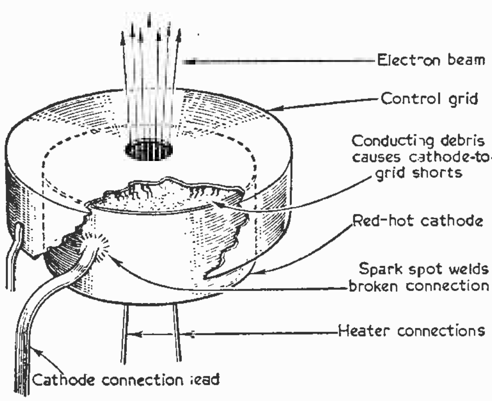


Fig. 1.—The structure of the cathode of a CRT.

Heater-to-cathode leaks are usually intermittent and the first test to try when the picture suddenly smudges and brightens (completely or in horizontal strips) is gently to tap the neck of the tube. Sometimes the short-circuiting material will drop away and there will be no further trouble. It is an advantage with table models to tap the tube neck while the receiver lies on its face. This gives the lodged debris the opportunity to fall away towards the face of the tube.

Pemanently lodged shorts can be flashed off, but with the following safeguards: the tube should be completely disconnected from the receiver by withdrawing the base connector and connecting all electrodes except the first (control) grid together. Notice that by shorting the heater pins together there is no risk of open-circuiting the heater (Fig. 2). A relatively high voltage supply of limited current is now applied between the control grid and the shorted pins. This sparks, or flashes away the conducting material. The current must be limited by a resistor or the spark may be so great that it has the opposite effect and welds the two electrodes permanently together.

A 90V H.T. battery with a 10k resistor in series can be used as the supply or a $4\mu F$ capacitor charged up to 180V from a TV H.T. line and discharged. Again too large a capacitor will only weld the electrodes together or completely disconnect one or more.

Cathode-to-grid Short

Tetrode cathode ray tubes with permanent cathode-to-grid short circuits can still be repaired for a longer life by strapping the cathode and grid pins together and transferring the grid lead to the g2 pin—the g2 H.T. supply is disconnected from it (Fig. 3). Nearly always, it is necessary to raise the maximum grid voltage to the tube by inserting a fixed resistor (R) in the earthy end of the brilliance control of one half the value of the brilliance control or of the same value, in order to raise the bias.

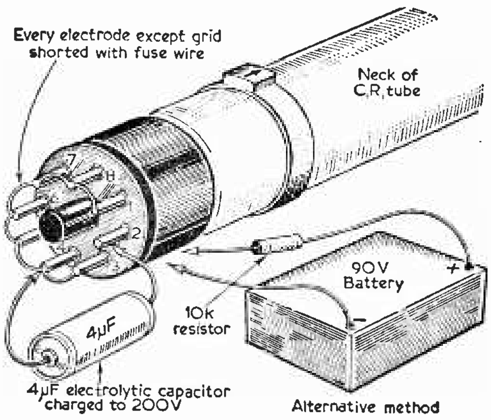
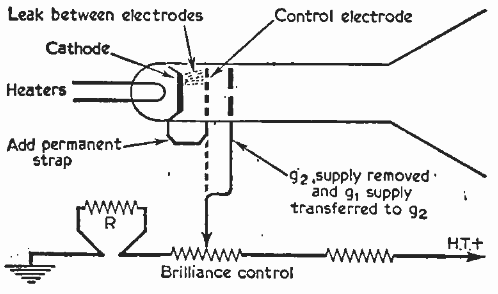


Fig. 2 (above).—"Flashing off" grid/cathode shorts.

Fig. 3 (below).—Running a tetrode tube as a triode. This overcomes permanent grid/cathode leaks.



The brilliance with this arrangement is about 50% of the normal—but it is a good "first aid" repair for a tube that would have otherwise been discarded.

Rejoining o.c. Cathodes

When a normally good tube fails suddenly leaving a pale synchronised blank raster unaffected by either brilliance or contrast controls then there is every possibility that the thin metal weld to the red-hot cathode thimble (see Fig. 1) has broken off by constant flexing as the cathode heats and cools.

Rewelding

Check that the control grid and cathode voltages and video drive are present before replacing the tube for a substitution check. Normally a replacement tube is required—but some tubes can be saved in the following way. Examine the red-hot cathode through the glass neck of the tube with a watchmaker's glass and look for the broken connection. If there is a very close gap between the break then an attempt to reweld them can be made by discharging a 16μF capacitor between the dead cathode pin and grid. It is important to connect the charged-up capacitor with the positive end to the control grid. The tube has to be heated normally in order to provide electronic coupling across the gap; it is essential, therefore, that the grid is connected to the positive of the discharge source.

The capacitor when connected between grid and cathode as shown, may not immediately discharge —depending upon the distance between the broken cathode gap. The tube neck can be tapped and if needed the tube turned in various positions until a spark takes place inside the tube neck. This shows that the gap has been bridged and if lucky the spark has spot welded the joint together. The tube can be tested with a picture—and if the fault recurs when the tube is tapped then another attempt can be made with a larger capacitor, but 32μF at 200V is the maximum safe value.

Reconditioned Tubes

The methods outlined above have given good results for periods of a few minutes to several months depending on the make of the tube, its condition, and age. In these days of comparatively cheap reconditioned tubes with long guarantees, there is little point in trying to prolong a weak emission tube which is due for replacement, but, where a bright picture from a good tube is at stake, this kind of repair can give extra time until a replacement tube is needed.

A FILM SHOW

Another film show has been arranged in collaboration with Mullard Ltd. It will be held at Caxton Hall, Westminster, and readers are invited to send for their free tickets which are now available from these offices. The films will be shown on Friday, February 2nd, 1962, and the programme will begin at 7.30 p.m. When applying for tickets, enclose a stamped and addressed envelope (at least 3½in. x 6in.). Mark your envelope "Caxton Hall" in the top left-hand corner.

The films to be shown are *Special Quality Valves*, which deals with valves made to withstand vibration and shock, and *Transistors*, which deals with the "everyday" uses of transistors.

Underneath the Dipole

A MONTHLY COMMENTARY

By Iconos

TELEVISION news and magazine items on film are not always of top photographic quality, especially during these dark wintry days. The cameramen have to shoot the pictures under the most difficult conditions, almost always on 16mm film, which is processed and edited in its negative form and made into positive electronically on the telecine equipment.

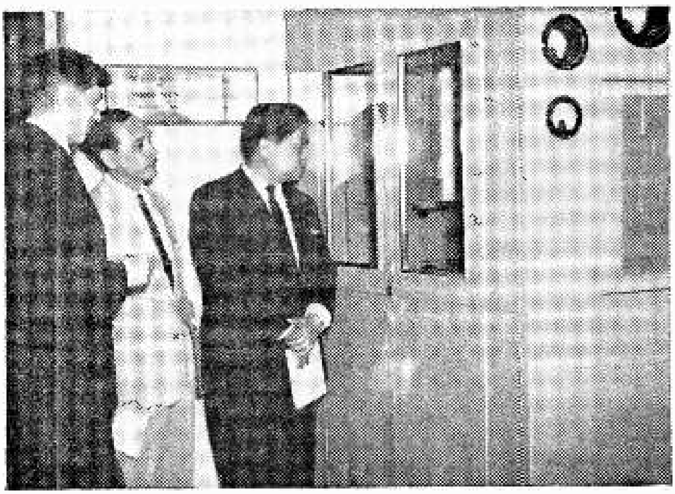
The national news, whether on the BBC or from the Independent Television news, usually contains master shots only of the filmed items and calls for the minimum of handling and joining in the editing process. But the BBC and ITV local regional news is necessarily more detailed and often comprises quite elaborate sequences on film, all of which have to be edited as quickly as possible as they come from the developing machines. They are in what is known as a "green" state and are not thoroughly dry. Therefore they pick up dust and are much more easily scratched than film which has been dried out for several days.

Cleaning by Sound

The problem of eliminating these scratches and dirt has been tackled by the BBC and other organisations in various ways. The negative is waxed, lacquered or polished after passing the scratched film through pads which are moistened with a cleaning solvent. But a much more modern approach for film cleaning, has recently been perfected, in which the film is passed through a solvent which is agitated electronically. Vibration of the cleaning fluid by crystal transducers oscillating at about 40kc/s results in thousands of minute bubbles circulating around the film, bursting on it and bombarding it. This extraordinary treatment by shock waves provides a most effective scrubbing action and when dried, even the dirtiest film looks bright, clean and polished. The British Colour Film Services' "Ultramatic" system uses carbon tetrachloride as a solvent, and the Lipsner - Smith "Ultrasonic" system, along the same main principles, uses methyl chloroform. Vibration of cleaning fluids has been used for some time in the watch making industry and, more recently, in the optical industry for cleaning lenses. Its application to film cleaning has been instantly successful and several film laboratories have already installed it. The manipulation of film generates static electricity, which attracts dust, especially in the minute scratch grooves caused when running through telecine machines, editing equipment and projectors. Now, both the film laboratories and the telecine users will be able to keep their valuable negatives "whiter than white". Some of the original Edison Kinetoscope negatives of 1898 were put through the ultrasonic cleaner and surprisingly good prints were subsequently obtained. In some cases, a protective surface of wax or lacquer is applied after the cleaning process. Where this is not done, the negative is put through the ultrasonic cleaner after every few prints have been made.

Come Dancing

Outside television broadcasts of inter-regional dancing contests make good soothing television entertainment and have been more or less the monopoly of the BBC for many years. One of the best broadcasts of this type was the third heat in the nation-wide amateur ballroom dancing contest in which West Scotland beat the South by a few points. The use of $4\frac{1}{2}$in. image orthicon cameras eased the lighting problems for the cameraman, and wonderfully



In an honoured place at Marconi House, Chelmsford, overlooking a works area where the most modern television transmitters are tested, stands the final amplifier of the vision transmitter which carried the world's first permanent high-definition television service. It was on November 2nd, 1936, that the BBC began transmissions; the transmitter was in service until 1956.

impressive long shots are obtained of groups of dancers forming and reforming in patterns with great precision and gracefulness. It is a delight to watch, after a viewing diet of jive, and rock and roll performed by rather grim-faced teenagers in scruffy-looking clothes. By contrast, the wide swinging skirts of the ballroom competitors and the immaculate evening dress of their partners was a delight to watch. Nevertheless, credit must be given to the producers and technicians who cut from camera to camera at just the right moment, the use, with great discretion, of the zoom lens, and the well-timed comments of Alex Macintosh (Glasgow) and Martin Muncaster (Southsea), local comperes under the chairmanship of Peter West in London. Credit must also be given to the central control in London, where signal sources from North and South are skilfully integrated with outputs from local studios, film and captions.

Backward Bending

In "Panorama", "Tonight" and similar topical magazines, including schools programmes, the BBC often gives the impression of bending backwards to give the other fellow's point of view. Sometimes, they bend so far backwards that the subject under discussion takes on a kind of "sour grapes" flavour! Richard Dimbleby's examination of the merits and demerits of British automobiles as compared with American and Continental cars was an exposition of backward-bending which must have astonished and dismayed members of the British motor industry. I don't think this would have happened in any other country in the world — and it certainly wouldn't have happened here on ITV. Snippets of film were included of men-in-the-street giving their opinions of British versus foreign car design, the most aggressive (and therefore the most impressive) being the pro-foreign buyers of cars. I must say that if I was considering the purchase of a new car — well — I would probably change my mind and carry on with the old one after viewing this kind of discouraging broadcast.

Optical Effects

The magic optical effects achieved these days on both films and television have reached a wonderful state of perfection. Very few television studios are now without their special effects panels, enabling an amazing variety of picture wipes to be carried out, electronically, from straight "push-overs" with one scene literally pushing the preceding scene on one side out of the picture, to complicated changing kaleidoscopic patterns of triangles, circles and saw-edges. A show notable for the excellence of this type of optical work is ATV's "Pencil and Paper", the popular quiz programme. In this programme it is used as a connecting link in a most effective manner. The makers of filmed commercials for ITV companies make great use of such devices, but these are carried out photographically. On occasion, the marrying of cartoon and live action photography has been successfully carried out in feature films by Halas and Bachelor and by Walt Disney. Many of the highly original optical tricks in commercials and documentaries are the work of Guild Television Service, who have also been responsible for the animated symbols of some of the programme companies.

Tape versus Film

A few months ago, video tape recording seemed to be the answer to all the problems of television studios and it was confidently predicted that, with few exceptions where re-editing was necessary (such as for quiz shows) it would replace film recording. But this has not happened. The BBC have made such strides in the recording of pictures on 35mm and 16mm film that a high proportion of their recorded programmes are again on film. The "Science on Saturday" series, "Meeting Point" and "Dr. Faustus" were examples of 35mm film recording, while "Gamble for a Throne" and "Bengo" were recorded on 16mm film. The great advantage of film recording is that it is a medium which allows precise editing to be done instead of the instant decisions which have to be made by the television director or vision mixer when video tape recording is carried out. A further advantage is that film has a world currency, unhampered by incompatibility of 405, 525 and 625 recordings on magnetic tape. Recording on television tape is regarded more or less as "live" television, enabling programmes to be canned up in a complete unit, available for transmission as required. Thus, studio stage space can be more easily organised and the settings for several episodes of a TV feature need not be constructed and demolished so often. Two or three episodes of a series can be recorded in one day. But each is regarded in the same way as a live transmission and subsequent editing or retakes for actors' "fluffing" of dialogue is strictly forbidden. Video tape recording is quite an expensive procedure, adding about £100 to the technical cost of each show—even though it may save money in other ways.

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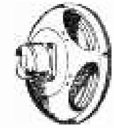

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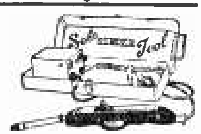

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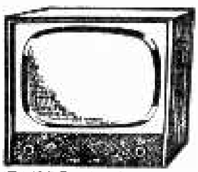

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Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents.

SPECIAL NOTE: Will readers please note that we are unable to supply Service Sheets or Circuits of ex-Government apparatus, or of propietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.

VALVEHOLDER TROUBLE

SIR,—I wonder if any of your readers can help to solve a little difficulty which I am experiencing with some valveholders? I have a commercial receiver (a type no longer manufactured) in which a printed circuit board is employed. The valveholders in three instances are of the ceramic type, without skirts, and the valves do not appear to sit properly in them. Occasionally there is a crackling from the set and marks appear across the screen which are stopped by moving the valve in the holder. It appears that the valve sockets are not gripping the pins and in spite of bending them and cleaning, etc., the valve still causes periodic trouble. I hesitate to remove the holder as there are so many connections to unsolder, so perhaps someone may have experienced similar trouble and can recommend a satisfactory solution. —G. BARKER (N.W. 9).

TELEVISION AERIALS

SIR,—Mr. Bates asks in the August issue how to receive stations which are using horizontal and vertical polarisation—without using two aerials. I think he will find that in many cases two aerials must be used, but he should not overlook the possibility of using one aerial mounted in a sloping direction. A position exactly midway between vertical and horizontal is not essential, but a point nearer one than the other. This will pick up both transmissions, but the length to which the aerial is cut may not be productive of the maximum signal on one of them. Again a compromise must be effected, so therefore he should experiment in this direction, cutting the length to suit the weakest station, then tilting the aerial to produce the maximum results.—F. RAEDER (Bermondsey).

EXPERIMENTAL LAYOUTS

SIR,—When reading the various articles in your paper I often feel tempted to try out an idea, but always feel that I may meet some snag which I cannot overcome, and therefore waste my time. In your article on transistor tuners I liked the circuit which you gave on page 554 (August issue) and decided to try this out in spite of the risk. I found several items I needed in my spares box, visited a local surplus store for a few, and found several spare transistors which I decided to try. I finished the set, checked the wiring, and plugged in three of my transistors, and as I expected, nothing happened. I changed one of the transistors and was greeted with some sort of result on sound. After less than ten minutes' experiment the tuner worked and gives most satisfactory sound signals—better, in fact, than the set I am at present using, and I intend to replace this. I must admit that this is the first occasion on which I have had success and it is most gratifying and has greatly increased my enthusiasm. I shall try more circuits now, and feel that the most important thing in trying out circuits is to make sure that all the parts are sound and to be most particular with soldering. — T. YOUNG (Belfast).

CHANNEL CHANGING (F. R. OLIVANT) AUGUST ISSUE

SIR,—The solution of this problem is so simple that it does not need any expert knowledge or aptitude. Most of the Cyldon tuners as supplied by the set manufacturers have at least nine (sometimes ten) open positions—i.e., no wafers. All Mr. Olivant needs to do is to turn the set upside down, remove the clip-on bottom of the tuner case, unclip (carefully) the wafers from station nine and replace them in station twelve, and then clip the bottom back. Recently I have done this on at least ten O.A.P. sets, and without exception I have always found these stages open, which leads me to believe that set manufacturers deliberately dismantle them. Also, it is my considered opinion that the twelve-station turret is a uselessly expensive piece of equipment which could be replaced by a more economic three or twin position arrangement. The Fireball is, of course, another cup of tea. I wouldn't advise tampering with it if it is functioning properly.—A. E. CLARKE (S.E. 28).

TRI-COLOUR C.R. TUEES FOR THE EXPERIMENTER

SIR,—It is well known that amateurs often help in solving some of the teething troubles of new techniques by their continued personal research and reports on their work. There must be numerous such amateurs willing to undertake some field work in colour television, and there appears to be ample technical know-how on this subject in Britain. The major handicap to amateurs would appear to be the non-availability of a suitable colour C.R.T., and although it is appreciated that the American shadow mask tube may prove too costly to import for such experimental work, I'm sure there would be a fairly large response from amateurs if we produced a similar tube ourselves and put it immediately on the open market, like we do in respect to modern electronic valves.—K. R. CRASKE (Lincoln).

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 200 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

BUSH TV 24

Could you please give me some advice on my receiver? The fault appears in the form of multiple images. I can reduce the number of images down to two but with the picture seeming to circle round sideways with reduced picture width. I would be much obliged if you could give me any information which would help cure this fault.—B. G. Brailey (Purfleet, Essex).

If VR5 is in order, check R20, C16, R17 and the adjustment of TCI. If the PL81 is overheating, check C17 for leakage. Also check C21 if necessary.

PHILIPS 14467-45

This receiver has a tuner fitted. When the set is switched on for about half-an-hour the picture starts to expand and contract slightly (horizontally). This happens on both channels. Can you please help me with this matter?—D. Brown (Belfast).

This effect could be due to a low emission EY51 (on the line output transformer) if the picture expands on bright scenes. If it contracts on bright scenes, check the PL81 and PY81.

McMICHAEL MP17

The picture on this receiver is cramped at the bottom. I have replaced the PCL82 but the fault persists. Could you tell me the most likely cause?—D.N. (Neath, Glamorganshire).

The valve concerned is the PCL82 on the right-hand panel. You should check the 100μF electrolytic on the left side of this panel, and the centre 0·02μF if necessary.

MARCONIPHONE VT156

I am having rather a lot of trouble with my receiver. There is no EHT, and the EHT valve —an EY86—does not light. I replaced the EY86, the line ouput PL36, and the PY81 boost diode. Still there is no EHT. I then decided to change the line output transformer, but the fault still remains. I would be grateful for your advice and suggestions to any of the possible causes. —G. H. Scott (Eastleigh).

You do not say whether the H.T. voltage is normal or not. It is quite likely that the PY32 H.T. rectifier could be low if the H.T. has not been checked. If the H.T. is up to standard (about 190—200V) note the effect of removing the EHT clip from the tube or check for a spark with the top cap off the EY86. Also check the 0·25μF boost capacitor and the 2·2k resistor to pin 8 of the PL81 (or PL36 if this type of valve is fitted). If this valve glows red hot, check the PCF80 below the screened section.

COSSOR 948

The line hold on this set is very critical. It will lock in two places—both very close together. V8 and C61 have been changed, but the condition which has been constant for at least six months now, remains unchanged.—L Gazard (Bristol).

R74 could be defective and often is, but if this control (250k) is in order, check R72 (220k) and R71 (2·7M).

WESTMINSTER WE/5917

When first switched on the picture on this set is dim and elongated, leaving a 3in. gap at each side. After about five minutes or so the picture assumes a more normal shape, but there is still about a $\frac{3}{8}$in. gap at each side of the picture. I have changed a PY32. — J. Laine (Barrow-in-Furness).

The symptoms suggest a low emission PL81 or PY81, but the ECL 80, to the left of screened compartment, should be checked. Also check the 3·9k resistor, which goes to pin 8 of the PL81, via a 220Ω resistor.

PYE VO9

There is no EHT present on this set but the sound is satisfactory. The EHT rectifier was changed, but with no effect. The cap was removed from tube, but the EHT still does not appear. A line whistle is present and the tube filament lights up. I would appreciate your comments on the possible causes of the above trouble.—C. Embray (London).

Check the PY81 efficiency diode and the 0·25μF boost capacitor. If both are in order, it is reasonable to assume that the line output transformer is at fault with shorted turns.

MURPHY TV V214

Always on switching on, the picture appears as a wicker-work pattern. A slight turn of the line hold control brings the picture back to normal. The picture continually develops an unstable lock and so I constantly have to adjust the line hold. I would be very grateful for any advice you could offer.—W. Bates (London).

A slow heating line output valve is the possible cause of your trouble. If the 20P4 checks faulty try and replace it with one coded " GP ".

ENGLISH ELECTRIC T41

The fault on my set is constant shimmering on the frame. Both the oscillator and output valves

(Continued on page 199)

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Covers all channels Band I and III also VHF/FM. I.F. 33-38 Mc/s. Operated by 5 press buttons. Complete with valves 30L15 and 30C15. Overall measures: 5 x 4½ x 2¼in.

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1S5	5/3	6SL7GT	5/9	35A5	14/-	ECC83	7/-	KT63	6/6	U301	18/9
1T4	3/6	6SN7GT	4/9	35L6GT	8/3	ECC84	8/3	MU14	6/6	UABC80	6/6
1U5	5/9	6U4GT	9/9	35Z4GT	6/9	ECC85	7/9	MX40	9/6	UAF42	8/3
3A5	9/-	6V6G	4/6	35Z5GT	8/3	ECF80	7/6	N18	7/-	UB41	8/6
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5V4G	7/6	7B6	9/-	CL33	12/3	ECH81	7/9	PCF82	8/-	UCC85	7/-
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6F13	10/-	12Z3	7/6	DL92	6/-	EM34	6/9	PY82	6/6	UY41	6/6
6F14	10/-	14S7	19/6	DL94	7/-	EM80	8/-	PY83	7/9	UY85	6/6
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(Continued from page 196)

have been replaced. Could you please give me some idea which component may be giving the trouble?—J. P. Simpson (Grantham).

On a tag strip near the V9 (ECL80) base is a pre-set 50k resistor. This is the interlace control. It should be adjusted to give a steady picture with the odd (thin) lines showing between the even (thick). If this has no effect and V9 (ECL80) and V11 (PL82) are in order, check the effect of both linearity controls and change the associated 0·1μF capacitors if necessary.

COSSOR 937

When I increase the brightness the picture turns hazy and fades, but comes back again when I reduce the brightness. The sound is perfect.—J. McFarlane (Glasgow).

You should check the setting of the ion trap magnet, the C.R. tube emission, and the PL81 line output valve (21A6) which may have become low in emission and its screen grid dropping resistor.

PYE FV4C

When I switch my receiver on, a thin bright horizontal band first appears on the screen, which slowly opens to a full-size picture. After the picture has opened, it remains perfect for the rest of the time it is on. Could you tell me the cause of this and the cure, if any ?—J. H. Edwards (Essex).

The symptoms of your fault suggest a slow heating PL82 frame output valve, which is clipped to the outside of the EHT box.

PHILIPS 2168U

Would you please advise me as to what could cause the trouble I have with my receiver. The set was working correctly when suddenly the picture and raster disappeared. The sound remained. On checking the line output valve—PL36—it was found to have an internal short between grids—pins 4 and 5. A new PL36 was fitted and the set worked well for about five minutes when suddenly the raster collapsed into a vertical line and then disappeared, this time the sound also went, and there was no line whistle. On checking, it was found the H.T. voltage was down by about 20. Removing the top cap connection of the PL36 restores the H.T. and sound. The PL36 has been tested and is all right. It would seem as if something is drawing to much current. Is it possible that the line output transformer is at fault? I have the circuit diagram for this set.—W. H. Collins (Harrow).

The fact that the sound fails has little significance since the A.F. amplifier is fed via R26 from the boosted H.T. line. You should check V10 (PY81), V11 if necessary (ECL80), R75 and the line output and boost line components, C63, C504 etc.

SOBELL T225

I recently moved from London to Clevedon. Could you advise me on how to retune my receiver to receive Wenvoe? What type of turret tuner would I need to receive TWW? — G. G. (Cleveland).

The R.F. amplifier (V1-EF80) is on the rear centre of the chassis, the frequency changer (V2-ECL80) is on the left as viewed from the rear. The coil cores L1, L2 and L3 are the aerial and R.F. adjustments spaced along the rear edge between V1 and V2. Turn these in (clockwise) about 6 or 7 turns. Unscrew the trimmers on the chassis immediately in front of V2 and then adjust L4 through the hole on the rear left side of the chassis for maximum Channel 5 sound. Readjust L1-L2 and L3 for optimum sound and vision. Use a Cyldon P16H or Brayhead 16S tuner unit for any conversion, replacing V1 by the R.F. plug and V2 by the mixer plug or adaptor. Note that V2 is an ECL80 not an EF80 and the mixer plug or adaptor must therefore be wired accordingly i.e., anode pin 6 not pin 7.

FERRANTI 24K6

There is no EHT on this set. The cut-out/fuse disconnected the anode lead from the PL820 and in the PL820 cathode wiring continually blows. I inserted a meter and received full deflection. The line and frame time bases are in order.—V. Stephens (Cardiff).

You should check the PL820 and ECL80 valves by substitution. If the cut-out continues to open, check the 330k resistor associated with the blocking (ECL80) transformer, the 0.05μF coupling capacitor (which may be leaky) and the regulation components—including the EB91 delay diode (V10B).

HOME CONSTRUCTED SET

This is a home built television receiver using a T901A tube (16in. metal cone). The scanning components are Allen which were popular a few years ago and the receiver uses a mains transformer with a separate 6.3V winding for the tube heater. I now wish to change to a more modern aluminised all glass 17in. tube and would be glad if you would recommend a suitable tube. I realise I shall have to change the mask and mounting arrangements but wish to retain the same scanning components.—G. Shepherd (S.E.11).

A 17in. tube such as the Mullard MW43-64 or MW43-69 may be used without changing any components, merely modifying the EHT connection, earthing the outer coating and connecting pin 7 to pin 10 or pin 11.

PETO SCOTT TI511

A short while ago the picture went blank; there was no brightness just a blank screen. Although the sound was all right I suspected the EY51 and replaced it with a new one, but I also found that the condenser on the wire from the EY51 to the C.R. tube was burnt out. I asked the dealer when buying the new EY51 about it, and he told me to cut the condenser out as it would not matter. I wanted to replace it and would like to know its value. With the new EY51, the set went reasonably well for a few days, and then the picture started to get darker and out of focus until finally I could hardly see it at all. I turned the brightness control up, the picture comes on faintly, but, on advancing the control further, the picture goes blank again. I suspected the EY51 and replaced it again with another and the same thing happened

again. I put a new tube in about 2 years ago.—J. Firmin (Brentford).

The EHT capacitor is rated at 500pF 20kV working. It is apparently leaky but if a replacement does not clear the condition, check the setting of the ion trap magnet on the rear neck of the tube and the line timebase valves—PL81 etc.

ALBA T644

I should like to know the value of the dropping resistance to the screen grid tap of the PL81 valve on the above set.—W McShane (Co. Durham).

The screen resistor to pin 8 of the PL81 has a value of 15k.

MULLARD MTS 501/15

I wish to convert the above set for Band III. I know that the I.F. frequencies are 13·4M/cs vision and 9·9Mc/s sound; could you please suggest a suitable turret tuner?—D Rain (S.W.17).

A suitable tuner unit is the Cyldon U10L. This has UCC84 and UCF80 valves and two plugs terminating the supply and I.F. leads, the R.F. plug replaces the first (front left) UF42 valve and the mixer plug the second UF42. State channels 1 and.9 when ordering.

PHILIPS 1726UF-15

On reading the article, ' Using Coaxial Stubs ' by P. Rules in the July edition of P.T. I would very much appreciate more advice on my set. I am using an ordinary coaxial cable to the two pin aerial socket, with the inner conductor to one pin and braiding to other pin, I get quite a good picture and sound but a lot of patterning and other interference (I do not want to pull down the aerial to fit a twin feeder if it can be avoided). If I fit a matching stub as Mr. P. Rules suggests, will it be correct to solder the inner conductor to one pin and braiding to other pin of the aerial socket? I have also been told there is no suitable converter for the above set (to Band III), but would like your advice on this also.—H. Day (Biggleswade).

To avoid patterning the screening of the coaxial should also be connected to the body of the plug or to the slot into which the body extension fits if a metal plug is not used. There is no real need for matching, but a stub can be tried, connected as you suggest. A suitable tuner unit would be the Cyldon P10L or Brayhead 10S. These have an R.F. plug and mixer plug or adaptor. The R.F. plug replaces VI EF80 (front) and the mixer plug or adaptor replaces V2 EF80 second from front.

TV TEST POINTS

(Continued from page 177)

(3) uncontrollable brilliance; test the grid and cathode voltages with a meter. Bias faults can be due to shorted electrodes in the CRT, a fault in the brilliance control circuit, incorrect video valve potentials, or oscillation in the vision amplifiers.

Point E: Video Valve Grid

Situated under the video valve base, the grid pin can only be identified from correct base information for the particular valve type employed. Scratch the grid pin lightly with the tip of a screwdriver and a splash of white spots should appear on the raster at the time of contact. Failure to produce spots indicates a defective video stage (the CRT being assumed in order). If the tube circuit is untested, then the fault lies between point E, the CRT and its supply circuits.

Point F; Vision I.F. Valve Grid

Grid disturbance testing here will produce brighter spots than at point E and in so doing prove the vision I.F. stages to be operating. Crackles will be heard in the sound during this test. The previous vision tests described should have been made first. This test can only show whether the stage is dead or not, which is all that is needed for fast fault finding. Severe off-tuning, instability, or low gain cannot be deduced without localised tests with a signal generator and meter.

Point G; Common I.F. Amplifier Grid

This point may not exist on models where vision and sound are taken separately from the turret. The stage amplifies both vision and sound together in a wide band common amplifier. Disturbance testing this grid produces loud sounds and flashes of spots on the screen. The valve can be identified on unfamiliar chassis by the output cable or connections from the turret which usually terminate at a tuned inductor (often in a screening can); the valve fed from it is the common I.F. valve. Obviously, lack of results here but results from the previous point F show this stage to be at fault.

Point H: Aerial Input

This is the most accessible point of all. Correct results from the earlier points up to G but no result here show the turret to be defective. The effect of a substitute aerial should be determined because many TV complaints are found to be a faulty aerial or cable that the owner refuses to countenance as possible—until another aerial is tried. Too often it is assumed that because a new aerial installation has been erected with brand new materials according to the maker's instructions it is perefect and beyond doubt. Siting alone can ruin a picture if the aerial is set up in a bad position.

(To be continued)

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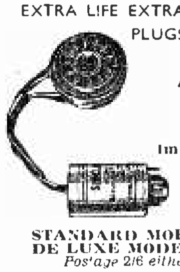

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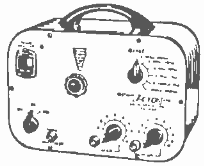

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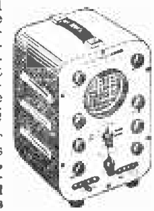

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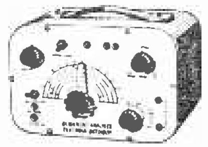
TYPE MC12



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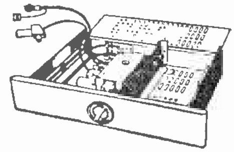

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To suit the above. 200-250 v., 6/-, plus 2/- P. & P.

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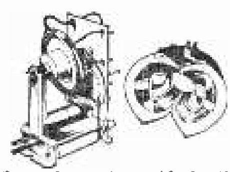

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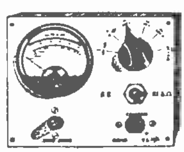

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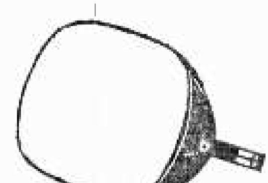

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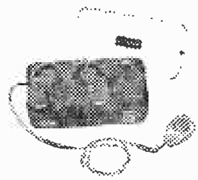

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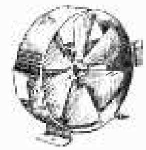

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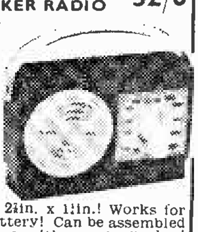

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