Practical TELEVISION

MARCH 1962

1'9

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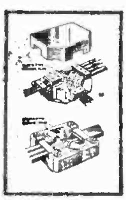

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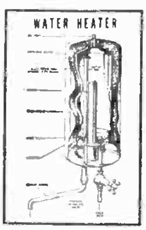

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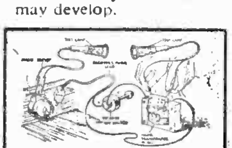

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Practical Television

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Contents

Television Developments

WHILST it would be wrong to try and anticipate the findings of the Pilkington Committee it is felt that the time is approaching when the transmitting authorities should be able to give us some indications as to possible definite developments which might be expected to take place in the television fields. Apart from the news that Bands IV and V are to be brought into use at a later date, no really definite construction data has, so far as we are aware, been made available for the man in the street. Details have, of course, been circulated to the trade in order that they may experiment with the design of receivers, but it is conceivable that when the findings of the Committee are made known, the present trends in receiver design may have to be modified. If the lines of experiment are unlikely to be changed, then some definite information should be made more generally available. Most of the bigger firms, in the course of their experimental and development work, make various discoveries which are of general interest, and they make these available to everyone by issuing what are known as Application Reports, and we do, in fact, publish extracts from these from time to time. It would be a good idea if the BBC and the ITA would produce some similar type of information so that experimenters other than those directly employed in the trade, could make experiments, or at least read and study the lines upon which development is proceeding.

Other than knowing that the N.T.S.C. system is being used as the basis for a British colour system, we feel that some further data should now be forthcoming. We also feel that a situation similar to that which arose originally when the Baird 30-line system was gradually supplanted by the present system of television should not again be tolerated, and we should not have to run two or more systems for various periods whilst the public judge which is the better system. A final decision should be made at a really high level and the system chosen should be introduced as a working arrangement which will not carry the risk of having to be modified at some future date because of improvements in circuitry or changes of technique, in the same manner as the line definition standards in use in this country.

NEW P.W. BLUEPRINTS

NEXT month sees the issue of the first of a new series of blueprints by our companion journal *Practical Wireless.* These new designs have been produced to cover the requirements of the absolute novice as well as the advanced constructor, and to this end they are produced in a double-sided form. On one side is a receiver for the beginner, whilst the design on the other side is for the more advanced constructor.

The first double-sided blueprint is presented with the April issue of *Practical Wireless.* The design for the beginner is a battery-operated S.W. receiver, and for the advanced enthusiast, a four-transistor portable. More free double-sided blueprints will be presented with the May and June issues of *Practical Wireless.*

Our next issue, dated April, will be published on March 22nd.

self-powered BAND I sound receiver

By J. B. Willmott

(Continued from page 238 of the February issue)

WHEN the signal has been amplified by V1 and V2 it is then passed via the R.F. transformer L5/L6 to the signal diode in V3 (see Fig. 1 last month), which is an EBC33 valve (a 6Q7 would probably work equally well in this position without change of circuit values). Demodulation takes place, and the A.F. voltage is developed across R6, which is returned to the cathode of V3. Filtering of the R.F. component is carried out by R5, C7 and R7, whilst C6 acts as D.C. blocking capacitor. The filtered A.F. signal is applied to the "top" of VR1, the volume control, the slider of which taps off the desired level of A.F. signal for application to the grid of the triode portion of V3. Considerable A.F. amplification takes place, and the signal is then conveyed by resistance-capacity coupling (R9 and C9) to the grid of the output valve, V4, which is a beam tetrode (6V6).

It will be noted that as no AVC is considered necessary in a simple unit of this type, the second diode of V3 is not used, and is connected to "earth". The output from V4 is fed by the conventional output transformer T1 to the loudspeaker. Top-cut tone control is provided for by C10 and VR2 in the anode circuit of V4.

The correct amount of fixed bias is provided for V1 and V2 by R1/C2 and R3/C4 respectively, and with only two stages of R.F. amplification, there is no danger of overloading, even when used very near to a Band I transmitter. Biasing for V3 and V4 is provided by R8/C8 and R11/C11, the capacitors being of the electrolytic type. In areas of high signal strength, the effect of omitting C11 can be tried, as this will provide a degree of negative feedback, with a consequent improvement in quality of reproduction, but of course with some loss of output.

Owing to the use of screened coils for the R.F. circuits, the prototype receiver was found to be completely stable in operation, without recourse to elaborate decoupling of H.T. supplies, or the use of heater chokes and decoupling capacitors, as was required in so many early TRF TV receivers. Resistors R2/C13 and R4/C14 provide the necessary amount of decoupling for the R.F. stages, and thus it can be seen that only a minimum of components is required, and wiring is quite simple.

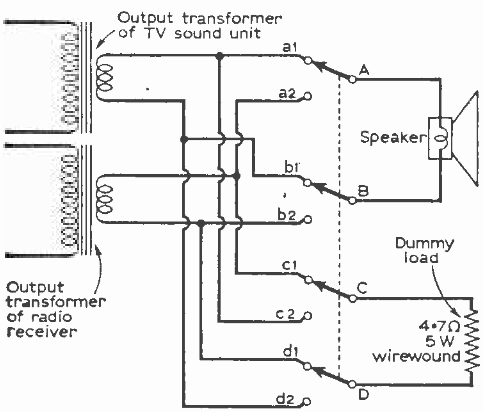


Fig. 3 (above)—The circuit switching to provide change-over of loudspeaker from the TV unit to radio output and dummy loading of the channel not in use.

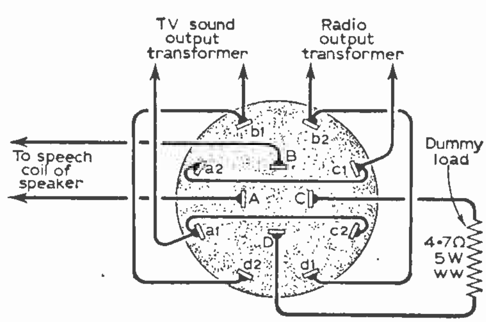


Fig. 4 (right)—The wiring of a 4-pole 2-way switch for the circuit of Fig. 3.

Short and direct wiring is of course essential, and the principle of " single point earthing " of screen and cathode decoupling and biasing components, as shown in the circuit diagram, is very important. Soldering tags are mounted on the valveholder fixing bolts as shown in Fig. 5, to facilitate this, and the wiring of the H.T. supply is made easy by the use of a tagstrip.

The Power Supply

The power supply should present no problems, and whilst the components used in the prototype are specified in the parts list, there is no reason why any similar suitable components should not be used, provided their physical shape and size allows for their being accommodated in the space available. The mains supply is fed to the correct tappings on the primary of T2 (via the on/off switch). Secondary windings provide the requisite 5V to feed the heater of the rectifier V5 (a 5Z4), and 6·3V to feed the heaters of the other valves, the total heater consumption of which (1·25A) is well within the transformer rating.

It will be noted that one side of each valve heater is earthed, and thus only one lead carrying the 6·3V supply has to pass from stage to stage. The H.T. secondary of T2 is rated at 250-0-250V, 80mA, and this again is adequate for the requirements of the circuit. Full-wave rectification, followed by smoothing by means of the L.F. choke L7 and double section electrolytic capacitors C12 A/B, ensures a satisfactory low hum level. It may possibly be found in certain districts that " modulation hum " is troublesome, i.e., " hum " is audible as soon as the receiver is brought into tune with the local BBC transmitter. This is easily cured by wiring a good quality mica capacitor of 0·002μF or 0·005μF (at least 750VW) between the end of the mains transformer primary which is connected to the on/off switch (the " bottom " of the winding as shown in Fig. 1) and chassis (earth).

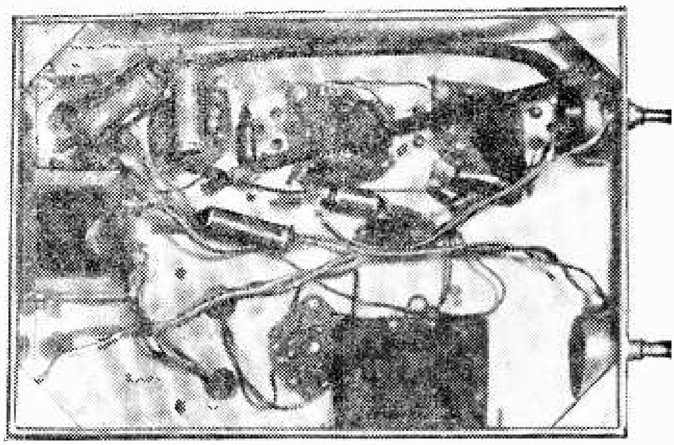
Coil Winding Data

Channel	L1 turns	L2 turns	L3 turns
1	2	7	3
2	2	6	3
3	2	6	3
4	2	5	3
5	2	4	3

Channel	L4 turns	L5 turns	L6 turns
1	8	3	8
2	6	3	6
3	6	3	6
4	5	3	5
5	4	3	4

Preparation of the Chassis and Mounting the Components

Work should be begun by drilling all holes in the chassis, using the dimensions shown in Fig. 2 (page 238 last month). The chassis is a standard size component, and can be obtained ready folded from advertisers in this magazine. The drilling layout is shown as it would appear when looking at the chassis from above, with the end and side runners opened out for clarity. It is a good plan to use the actual components as " templates " for marking out the fixing holes. These must be fixed so that their locating spigots are in the direction indicated.



An underchassis view.

The most tedious part of the drilling is without a doubt the provision of the " groups " of holes to accommodate the R.F. coils, and it is essential that this be carefully and accurately carried out, or trouble will almost certainly ensue from lead-out wires contacting the chassis, and as some of these wires carry H.T. voltages, serious breakdown could result.

In the writer's opinion, it is well worthwhile preparing a template from which to drill these "groups" of holes. A friend whose hobby lies in the realm of model engineering, was persuaded to produce an accurately drilled template in mild steel, about ¼in. thick. The central hole of each coil group was then drilled in the chassis, and the template rigidly bolted into position with a 2B.A. bolt and nut. The remaining holes in the " group " were then drilled, through the appropriate holes in the template, and the process repeated at each " group " position. The work thus proceeds rapidly and without risk of error, and if any further amount of TV construction is envisaged, the time in providing this template will be repaid over and over again.

The clearance size of all holes is clearly given in Fig. 2. Having completed all drilling, the first action can be to place rubber grommets in the three holes on the chassis top which convey leads to and from the mains transformer. A further grommet is required in the hole on the rear chassis runner which provides for the mains supply lead.

Mounting of the components can now proceed, and the following order is recommended. First mount the mains transformer, T2, on top of the chassis in the rear right-hand corner. This may have the various windings terminated by connecting tags or wires, and it should be mounted so that the connections to the primary winding are nearest the chassis rear. A soldering tag should be included on the right-hand fixing bolt at the front (nearest the end of the chassis containing the control spindle mounting holes), this will form a convenient anchoring point for certain secondary winding terminations which are ultimately connected to chassis (earth). Now mount the smoothing choke, below chassis, on the side runner, followed by the output transformer, on the rear runner, as shown in Fig. 5. Follow this by mounting the double section electrolytic C12A/B on top of the chassis, with its terminating tags projecting below chassis, using the standard type of fixing clip to secure it in place.

The international octal type valveholders for V3, V4 and V5 can now be fixed, taking care to orientate the locating spigots in the directions shown in Fig. 5. A 6B.A. soldering tag should be mounted (beneath the chassis, of course) on the fixing bolt nearest the locating spigot of the valveholders for V3 and V4. The valveholders for V1 and V2 can next be bolted in position (there are of the larger "B9G" pattern), and in this case, the valve retaining clips are mounted on the fixing bolts above chassis level, and a 6B.A. soldering tag below chassis on the bolt nearest the locating spigot.

The coaxial aerial socket is now mounted on the rear chassis runner, a 6B.A. solder tag being included on one of the fixing bolts; and the volume and tone controls are fixed on the front chassis runner (the volume control on the "V1" side of the chassis, and the tone control on the "V5" side. Tagstrips can now be bolted into the indicated positions, and this leaves only the R.F tuning coils to be mounted; these have been purposely left until last, as they require fairly careful handling.

Winding the R.F. Coils

Attention should now be turned to the manufacture of the three R.F. coils. These are wound on standard "Haynes" type formers. On examination, it will be found that each of the four corner holes in the base of the former contains a brass eyelet, and it is through these that the coil terminations pass. A 3in. length of 22s.w.g. tinned copper wire is passed through each hole, so that about half its length projects either side of the base, and is held in position with a small blob of solder on the upper surface of the eyelet (i.e., the side which will be inside the screening can when the coil is completed). Examination of the underside of the coil former will show the existence of reference numbers for each terminating lead, the corner leads being numbered 1, 3, 4 and 6;

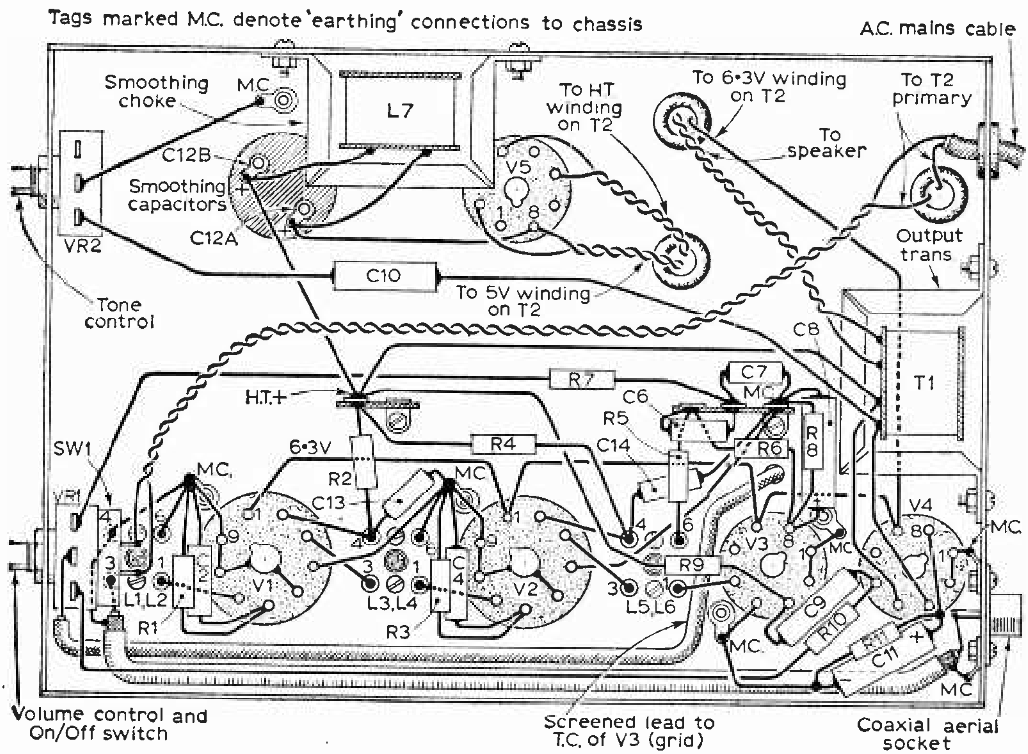
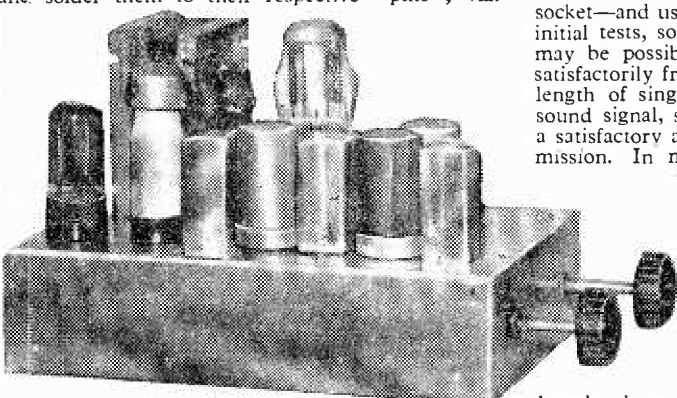


Fig. 5—The underchassis wiring.

numbers 2 and 5 are not used in the design under consideration. These numbers are referred to in the winding instructions, and this nomenclature must be followed.

Start with the aerial input coils L1/L2, which are wound in the following manner. Using 32s.w.g. double silk covered wire, and leaving some 2in. spare for connecting purposes, begin opposite pin 6, about 1in. up from the base of the former, and wind on the requisite number of turns for L2 as shown in the coil winding data table, spacing the turns by a gap equal to the wire diameter. Hold the wire firmly in position, and brush on a layer of coil dope. This will quickly dry and hold the winding firmly. Leave about 2in. of wire for connecting purposes.

Now proceed to wind the primary, L1, starting at pin 4, and placing the turns in between the bottom turns of L2, wind on the number of turns indicated. Fix with coil dope. When satisfied that correct number of turns have been wound, and that the windings are securely held by the coil dope, cut and clean the insulation from the ends of each winding and solder them to their respective "pins", viz.



A view of the finished unit.

bottom of L2 winding to pin 6, top to pin 1; bottom of L1 to pin 4, top to pin 3. Solder the small fixed capacitor C1 between pins 1 and 6 in such a way that it will not touch the inside of the screening can when this is fitted. Make absolutely certain that windings have been correctly terminated, then wrap one turn of oiled silk or cartridge paper around the completed assembly (to provide insulation between the windings, etc., and the screening can), and place in the screening can.

It is a good idea to mark the can "L1/L2" clearly for future identification, it is very easy to mix the three coils up if they are laid side by side on the bench in their unmarked state, prior to fixing on the chassis.

The construction of L3/L4 and L5/L6 can now proceed, in a similar manner, referring to the winding table for details of the number of turns required for each coil. Note that in the case of these coils, the tuned secondary winding is started at pin 6 and terminated at pin 1, and the primary (coupling) winding starts at pin 3 and terminates at pin 4, this latter winding lying between the bottom (earthy) turns of the tuned winding. Do not omit C3 and C5 across the secondary windings.

The prototype receiver was constructed to operate on the Peterborough transmitter, Channel 5, and the numbers of turns specified in the winding table were those actually used. The data for other channels has been arrived at by calculation, and with the variation of tuning available by adjustment of the coil cores, it should in every case be possible to tune the desired channel, provided the data is used and the windings neatly made and firmly secured. Having wound the coils, insert the iron dust core into each former, using a non-metallic tool (the sharpened end of a plastic knitting needle is ideal) until the core is just about to "engage" the top of the tuner winding in each case. Taking care that the orientation of each coil is correct, as shown in the under-chassis diagram (Fig. 5), they may now be secured by bolting them to the chassis.

Before proceeding with the wiring, it is a good plan once again to check the layout and position of all components so far fitted.

After the wiring has been completed and checked, the constructor may proceed with the alignment.

Alignment Instructions

Insert the TV aerial plug into the coaxial aerial socket—and use a good, efficient TV aerial for these initial tests, so that a strong signal is available. It may be possible later to make the receiver work satisfactorily from a simple indoor aerial, or even a length of single wire, but when searching for the sound signal, success obviously depends on having a satisfactory aerial on which to pick up the transmission. In many cases, the TV sound will be audible as soon as the aerial is connected, and in that case it is only necessary to screw in the cores of L6, L4 and L2 (in that order) to the position of maximum signal.

If, however, nothing can be heard at first, screw in each core by one turn, and listen carefully; if there is still no sound, screw in each core a further turn, repeating the process until the signal can be heard, then peak it up as required by adjustment of the cores. In the prototype receiver, operating at a distance of eight miles from the low power transmitter at Peterborough on Channel 5, using a single dipole aerial at roof level, more than ample volume was obtainable. If it is found that any of the coils fails to "peak" correctly, adjustment to the number of turns in the tuned winding is necessary. If the core is fully screwed in before a "peak" is reached, there is insufficient inductance in circuit, and the effect of adding one turn to the coil in question should be tried. Conversely, if the coil core has to be fully unscrewed in an attempt to find the "peak", a turn (or turns) will have to be removed from the winding in question. When correctly aligned, the receiver should give really good quality reception, and the tuning should be sufficiently sharp to prevent any trace of break-through of the vision channel (which sounds somewhat like a rough mains hum).

Mention was made at the commencement of this article of the use of a switch whereby the loudspeaker can be switched to the output from either this receiver, or one of the existing output channels of an already existing stereogram, and in Figs. 3 and 4 this is shown both in theoretical form and as a practical wiring diagram, using a 4-pole 2-way wafer switch. This can be easily fitted as an optional extra if so desired. ■

Telenews

Television Receiving Licences

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

Region	Total
London	1,952,323
Home Counties	1,635,147
Midland	1,746,962
North Eastern	1,861,786
North Western	1,522,623
South Western	999,136
Wales and Border Counties	703,800
Total England and Wales	10,421,777
Scotland	1,063,468
Northern Ireland	172,259
Grand Total	11,657,504

Outside Broadcast/Videotape Recording Vehicle

BUILT for use on the Continent of Europe is a Marconi mobile four-camera television outside broadcast and Videotape recording unit.

The unit has been manufactured for InterTel, N.V., a new television programme recording organisation operating throughout Europe.

The complete unit consists of two semi-trailer vehicles, one housing the camera channels and associated equipment and the other the Ampex Videotape recorders. Each is towed by a 7-ton Bedford long wheel-base tug.

Although in the form of two separate vehicles, each with its own prime mover, the television and Videotape recording units are designed to operate in conjunction whilst on the move.

InterTel, N.V., of Amsterdam, Holland, is the holding company of an international group of InterTel companies engaged in the production of television programmes on an international basis. These companies are at present located in Paris, Brussels, Munich, London and New York, and further ones will be incorporated in the immediate future in Rome, Madrid and Stockholm.

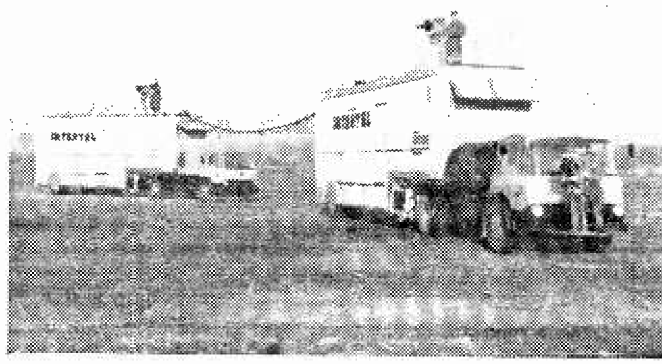
Wired Television for Newcastle

NEARLY 100,000 people will soon be able to receive good quality television pictures for the first time, when a wired television system now under construction just north of Newcastle-upon-Tyne comes into operation. Reception by normal outdoor aerials in this area is far from perfect, and in many places it is almost obliterated by massive steel pylons carrying National Grid overhead power transmission lines.

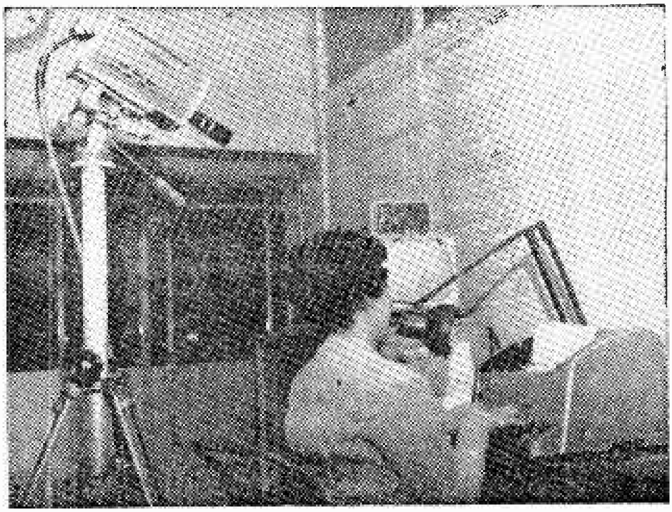
At first the systems, supplied by EMI Electronics Ltd. and operated by the Seaton Valley Relay Company, will be available to some 33,000 inhabitants of Seaton Valley and to some 11,000 in Newbiggin-by-the-Sea. At Seaton Valley future plans include extending the system to the new town now being built at Cramlington, where eventually a further 50,000 population, mostly overspill from crowded parts of Tyneside, are to be housed.

EMI'S wide band television system will be supplemented throughout by the Relay Company's existing four programme sound relay service which is being modernised and extended as the wired television system is developed.

When the new wired system is installed, all the existing aerials can be dispensed with, and viewers will be able to obtain high grade reception on their existing receivers of the BBC Northern TV programmes in Band I; ITV Border and Tyne Tees pro-



This Marconi mobile 4-camera television outside broadcast and Videotape recording unit is designed to operate whilst on the move, and a 20ft cable harness with special spring tension arrangements is used to connect the two vehicles.



A 27in. television screen which is linked to teleprinter equipment, came into experimental operation in January, at Paddington Station, London. The screen relays to travellers the latest information and arrangements.

grammes in Band III; BBC Home, Light, and Third sound programmes and Radio Luxembourg picked up direct and re-distributed at VHF in Band II. Signals will be transmitted from equipment at the base of a centrally situated aerial tower, along coaxial cable to the receiving sets in peoples' homes. EMI Electronics Ltd. will supply all equipment required for distribution.

Wired Television for Abingdon

RESIDENTS of Abingdon in Berkshire, a fringe area for television reception, have always been troubled by bad interference and fading pictures. Now Master Vision Ltd. — a group of local business and professional people —will use EMI Electronic's wide-band equipment to install a wired television system to overcome these difficulties.

EMI aerial arrays, mounted on a 164ft mast, will cover Bands I, II and III. Although Abingdon is over 50 miles from the nearest television transmitter, some 4,000 homes will be able to receive strong, clear pictures on BBC London and Midland TV programmes; London, Midland and Southern ITV; BBC VHF Home, Light and Third sound programmes, and Radio Luxembourg, which will be received direct and redistributed in the VHF band.

Signals picked up by the aerials will be approximately ten times stronger than those received on private aerials at roof height. When received by subscribers, along a protected cable route, they will produce very high quality vision and sound.

Viewers will also be relieved of the cost, erection and structural problems of individual aerials, both for present programmes and future developments. Extra Channels, colour television, pay TV and the much-discussed 625-line standard can all be received by the system.

Alteration to Trade Test Schedules

THE Independent Television Authority announces that trade test transmissions from its Croydon, Mendlesham, Caradon Hill and Stockland Hill stations are now radiated on half power on Friday mornings. These stations return to full power at 1 p.m. or the start of programme transmissions, whichever is the earlier. At the Black Hill and Durris stations trade tests are radiated on half power on Monday mornings, again returning to full power at 1 p.m. or the commencement of programmes. At these stations transmitters are operated in parallel and these arrangements are necessary to enable half the station to shut down each week for maintenance purposes.

During January there were no trade tests from the Croydon transmitter on Tuesday and Thursday mornings. On these days test transmissions commenced at 12 noon. This was necessary to enable aerial tests to be carried out in preparation for the construction of the Authority's new station at Fremont Point in Jersey.

Studio Equipment for Channel Islands

INDEPENDENT television will come to the Channel Islands —which have a population of 111,000—in the Autumn of 1962. Channel Television, contractor for the new station, which will serve the six main islands from St. Helier, Jersey, has placed the major contract for the supply of all the principal items of studio equipment with EMI Electronics Ltd.

These comprise two studio vidicon cameras, vision and sound mixing equipment, two telecine machines and most of the master control room equipment.

The telecine equipment will employ the same type of cameras as those used in the studios, which makes for flexibility and economy of spares.

This station will be the smallest in the British Isles and many items of equipment will be designed for operation by a minimum staff. For example, joystick control of the camera channels enables them to be operated from the master control room, instead of from the studio control room.

TV at Paddington Station

THE travelling public at Paddington railway station, London, can now read of any alterations made to the times of trains on a 27in. television receiver. The receiver is linked, by closed circuit television, to teleprinter equipment, upon which the alterations are typed, and therefore the public receives the information at the earliest possible time.

During the severe weather in January, when train services were disrupted, hundreds of passengers first learned of the delays from the receiver.

HOW TV SETS WORK - 4: The line circuits

(Continued from page 222 of the February issue)

WE now come to the line oscillator, line output, boost diode and EHT sections of a typical receiver, and in Fig. 4 is given the circuit of these stages. Here V5B is the line blocking oscillator valve (part of a triode-pentode), V7 the line output valve, V8 the boost diode and V9 the EHT rectifier valve.

Line Blocking Oscillator

Starting with the line blocking oscillator, we find that transformer T101 is the major component. This is called the "blocking oscillator transformer". It is this stage (V5B) which provides a suitable drive signal for the line output valve, so that the latter stage can cause the scanning spot of the picture tube to be deflected horizontally across the screen (to produce the scanning lines).

It will be seen that the primary of T101 is connected to the grid circuit of V5B while the secondary is connected to the anode circuit. The phasing of the transformer wiring is such that the valve is caused to oscillate. The coupling provided by the transformer is sufficient to cause vigorous oscillation.

When the set warms up after switching on, the current in the anode winding of the transformer rises, and a large voltage pulse is induced across the grid winding, which swings the grid positive. This results in a further increase of anode current and a rapidly increasing positive pulse at the grid. The resulting grid current in R131 charges up the grid blocking capacitor C120 and swings the grid negative. When there is sufficient charge in C120 the anode current is cut off. During the time that C120 is charging, the rate of change of current in the anode winding decreases and the grid drive collapses.

Repetition

The valve is now cut off and there is no current in the anode winding and no pulse voltage across the grid winding. This state of quiescence continues until the charge in C120 has leaked away through R131. As the charge in C120 decays, a progressive increase of anode current occurs again in the anode winding of T101, and the cycle of events is repeated.

During the time that V5B is in the condition of anode current cut-off, capacitor C121 charges through R135, and an exponential build-up of voltage begins across C121. However, before C121 has time fully to charge, V5B is caused vigorously to conduct, which immediately discharges C121. Thus, C121 charges through R135 during the quiescent periods of the "blocking oscillator" cycle, and the rate of discharge of C121 is controlled by the repetition frequency of the blocking oscillator.

How much charge C121 acquires when the blocking oscillator is cut off depends on the time-constant R135 and C121, and the time-constant is usually arranged so that only a small portion of the initial linear part of the charging cycle is used (see Fig. 5).

Two Time-Constants

We thus have two time-constants, that of the blocking oscillator proper and that of the anode circuit of the blocking oscillator valve. Let us deal with the former first.

So far, we have cited C120 and R131 as the blocking oscillator time-constant components. These govern the repetition frequency of the blocking oscillator. However, the speed at which the charge in C120 is exhausted is governed also by R132 and R133. It will be recalled that the charge at the grid side of C120 is negative. Thus, by applying a positive potential, the negative charge is more speedily overcome and the effective time-constant is increased.

This happens by virtue of R132 and the line hold control R133, and the amount of positive voltage applied to the grid can be controlled by the line hold control. The line hold control, in fact, serves in this respect as a "variable time-constant" control. Clearly, then, the repetition frequency of the oscillator can be adjusted by means of the line hold control.

Range of Control

So that sync may be achieved by the line sync pulses, the repetition frequency must be very close to 10,125c/s, and it should be possible to establish that frequency with the line hold control near to the centre of its range. If this does not happen, then the picture will not lock horizontally on the screen. We can realise now, then, that this could be caused by alteration in value of R131, C120, R132 and R133 (not so much the latter because it is variable).

Anode Circuit Time-Constant

The suppressed sawtooth waveform across C121 due to its small charge and subsequent discharge represents the drive signal for the line output valve. What happens if that time-constant alters?

Let us suppose that it increases, which is what usually happens owing to R135 or C121 increasing in value. C121 would start to charge through the increased value of R135, but before C121 arrived at the correct charge, the blocking oscillator would conduct and result in its discharge. Thus, the line drive signal would have insufficient amplitude to drive the line output valve fully, and a reduced horizontal scan would result.

Horizontal non-linearity may also set in because the user may endeavour to secure a full scan by advancing the width control in the line output stage as a counter measure.

Over-driving

Should the time-constant shorten due to R135 of C121 decreasing in value, a greater than normal charge would be present in C121 before the blocking oscillator resulted in its discharge. This would give a greater than normal line drive which, again may be incorrectly counteracted by retarding the width control. Non-linearity would be almost certain to occur in this case since C121 might charge towards the region of non-linearity.

The blocking oscillator is locked by the line sync pulses being fed to the anode from the sync separator stage, through C119. This is a line sync coupling capacitor, but if its value increases, impaired line lock is probable.

R134 and C175, across the windings of the line blocking oscillator transformer are linearity aids and are included to swamp production tolerances in the transformer itself. If the transformer is replaced and poor linearity is introduced, an improvement may be possible by altering slightly the values of R134 and C175 (mainly the former).

Line Output Stage

The line drive signal is coupled to the control grid of V7 through the coupling capacitor C123. If this is leaky, V7 will overheat badly and the horizontal scan will be affected. If it is low in value or open-circuited, the line drive signal will be reduced at the grid and insufficient horizontal scan will be the symptom.

R137 is the grid leak of V7, and if this goes very high in value or becomes open-circuited, a most peculiar modulation effect will appear on the line scan.

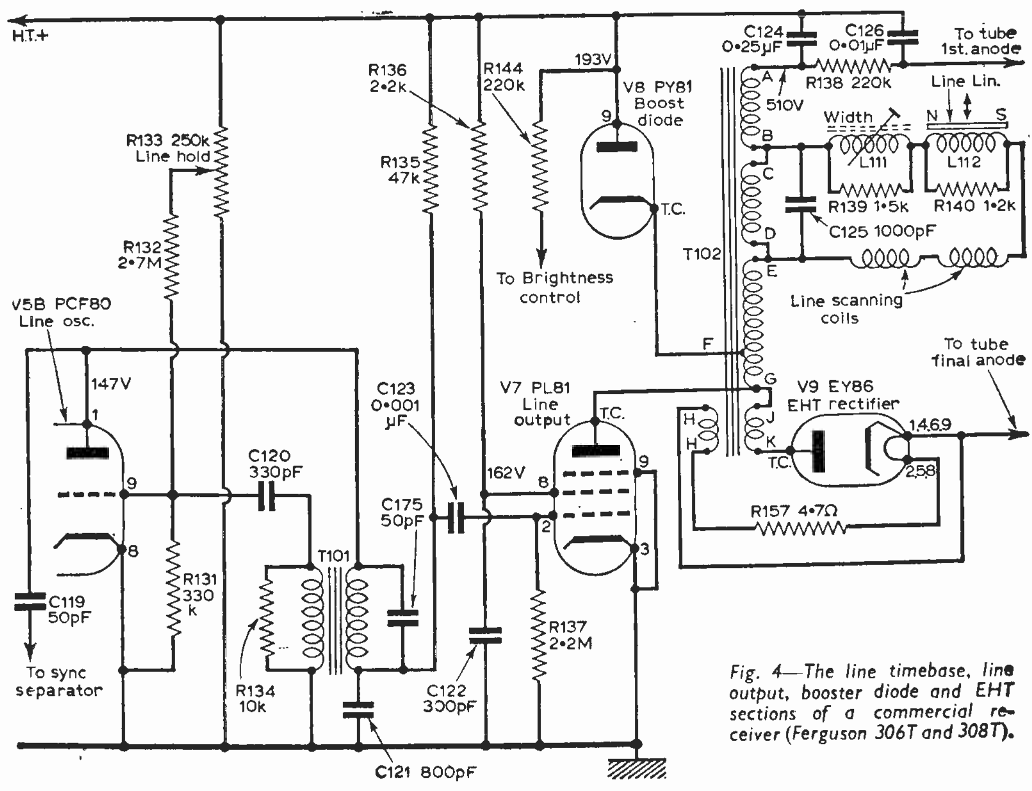


Fig. 4—The line timebase, line output, booster diode and EHT sections of a commercial receiver (Ferguson 306T and 308T).

The screen grid of the valve is fed with H.T. through R136, and by-passing at line frequency is accomplished by C122. R136 is a vulnerable fault point, since the resistor passes a fairly high pulse current. If there is an increase in value, the horizontal scan reduces as also does EHT voltage, and poor EHT regulation may be an accompanying symptom. Sometimes C122 develops a leak and results in similar troubles.

Bias Check

Grid bias for V7 is produced by grid current in R137 charging C123 (negative to grid). A good check for line drive is to measure the negative voltage at the control grid, relative to chassis, with a high resistance voltmeter. The actual reading obtained will very much depend on the resistance or sensitivity of the voltmeter, but quite a large deflection on the 100V scale should be obtained on a suitable meter when the drive is correct.

The major item in the line output stage is the "line output transformer", T102 in Fig. 4. The sawtooth drive at the control grid of V7 causes an increase in current through section G-F of the line output transformer (the booster diode is conducting D.C. to point F). This induces a sawtooth current in section C-D of the transformer and also in the line scanning coils. The scanning spot is thus deflected from left to right across the screen.

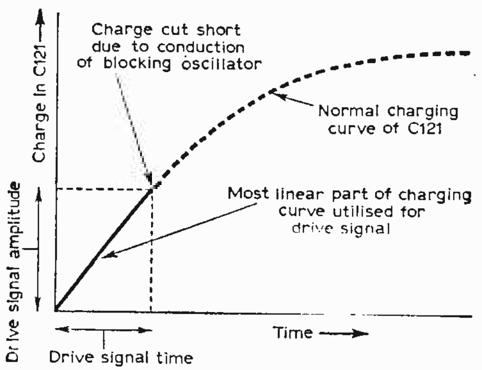


Fig. 5—The charge in C121 (Fig. 4) is cut short within the linear part of the charging curve by conduction of the line blocking oscillator.

Obtaining EHT

When the sawtooth is cut off several things happen. A large pulse occurs across section G-F which is stepped up by the EHT overwind, section J-K. The pulse is applied to the anode of the EHT rectifier valve, V9, and is changed to a steady D.C. voltage at the cathode. A smaller current pulse flows in winding H-H, and this is used to energise the heater of V9. A further voltage pulse occurs between point F of the transformer and the H.T. line. This pulse is rectified by tht boost diode V8 and charges the boost reservoir capacitor C124.

The charge is such that the side of C124 connected to the H.T. line goes negative with respect to the side connected to point A on the transformer. If all is well with the line amplifier, C124 charges to about 300V, and this, in view of the polarity mentioned above, is added to the H.T. line voltage, thus giving a little over 500V between point A on the transformer and the chassis.

This voltage is virtually a spare voltage derived from unwanted disturbances in the line output transformer. It can, in fact, be considered as a by-product which is obtained by employing a rectifier (boost diode) to damp oscillatory effects in the line output stage. The so-called "boost voltage" (the H.T. line voltage plus the voltage across the boost reservoir capacitor) is used in some sets to feed the frame timebase as well as for supplying the tube second anode potential. In the circuit of Fig. 4, it is used solely for feeding the tube second anode, and it does this through R138, which is a filter resistor, and across C126, which is a smoothing capacitor. The final anode of the tube is, of course, supplied by the high-voltage D.C. at the cathode of the EHT rectifier valve.

Also, when the sawtooth is cut off, the scanning spot flies back to the left of the tube ready to trace a subsequent horizontal line upon which one line of the picture is built.

A short in the boost reservoir capacitor would heavily damp the line output transformer and cause a very much reduced horizontal scan, and severe overheating of V8. Ultimately, either the transformer or V8 would fail. Open-circuiting would also produce a reduced horizontal scan accompanied by distortion, but V8 would run at normal temperature (which is quite high).

A short in C126 or an open-circuit in R138 would cut off the H.T. supply to the tube second anode and there would be no picture or raster (or a very dim, defocused picture).

The resistor in the heater circuit of V9 is simply to limit the heater current to prevent premature failure of the heater of that valve. Should the line oscillator and output stages appear to be working correctly and yet the EHT rectifier heater fails to light, even though the heater is intact, R157 should be examined.

R144 is effectively connected to the normal H.T. line and forms a part of the brightness control potentiometer—it is not really associated with the line timebase.

A certain degree of damping is provided by C125, and if this alters in value the EHT and pulse conditions will be disturbed. Low or excessive EHT or line scan would be the symptom.

Width Control

The width control provides a variable reactance or impedance to the sawtooth waveform current in the scanning circuit and thus controls the scan amplitude by controlling the scanning current. The shunt R139 damps resonance effects which might otherwise show up on the picture as alternate dark, and light vertical lines (or shading effects) at the left of the picture. R140 performs a similar function.

The linearity control provides selective reactance control due to a permanent magnet which can be rotated to provide varying degrees of core saturation. Thus, where the rate of change of the scanning current is in excess of that required for a linear scan, the reactance increases and slows down the rate of change, thereby effectively improving the line linearity.

(To be continued)

A Band V Receiver

THE PRACTICAL DETAILS OF THE CONSTRUCTION

By R. B. Archer

(Continued from page 235 of the February issue)

LAST month details of the construction of the coaxial lines oscillator were given.

Acorn Clips

In the prototype the acorn valve is secured in position by a choke of 18s.w.g. wire attached to the cathode pin and the chassis. Chokes of smaller gauge wire carry the heater current. However, it may well be desirable to use a tagstrip to mount the acorn; if care is exercised, it may be possible to solder the valve pins direct to the tag strip, but edge-gripping clips are recommended. Such clips may be obtained by dismantling a popular type of B8A valve-holder; although somewhat difficult to solder, the phosphor-bronze clips make an excellent contact.

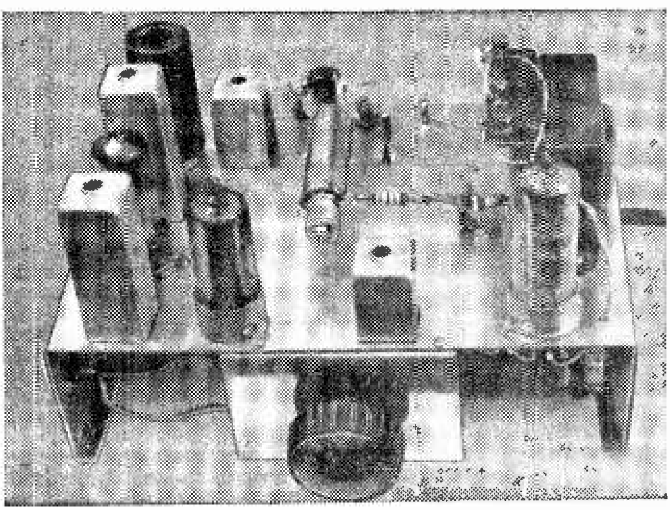
All the chokes in this receiver—L5, L6, L7, L8, L9 and L11—consist of 12cm. of 24s.w.g. bare tinned copper wire wound on an $\frac{1}{8}$in. drill as temporary former. The winding is pulled out a little and then compressed again; this gives an even spacing between turns of about half the wire's diameter—enough to avoid much self-capacitance. If the acorn is mounted by means of a heavy-gauge cathode choke, the length of wire needed is the same. Stand-off ceramic insulators may be used to carry the H.T. lead.

It will be noted that the oscillator operates with a choked cathode. This renders the circuit operation less dependent on circuit 'strays'. Because of heater-cathode capacitance, the heater leads have to be 'choked' also. They are made to have the same R.F. potential by virtue of the capacitor C6 (Fig. 1, page 184 of the January issue).

I.F. Alignment

Alignment of the I.F. amplifier follows normal practice, using an injected frequency of 40·15Mc/s. The next step is to align the oscillator. For this a signal generator will be needed unless the reader is very close to the transmitter. (The signal generator used by the writer was described by him in *Practical Television*, October and November 1959. This has had much use since it was built, and has proved to be very reliable; such an instrument is almost compulsory for any serious experimenter with Band V frequencies. Its only serious fault is slight detuning as maximum output is reached—but this is very seldom needed in actual practice.)

First, the coupling loop, L10, is arranged to be about 1in. away from the grid of the acorn valve. Its position will be adjusted accurately later. H.T. and L.T. supplies are switched on, and a five to ten minute warming-up period is allowed. The prototype requires seven minutes to reach a stable operating condition. The signal generator is set to 660Mc/s, and the coaxial lead is brought near L1—a separation of about 2in. will be found satisfactory in the inner



A top view of the completed receiver.

conductor of the cable projects about 1in. from the sheath. Modulation is switched on. The beehive trimmer is rotated, using a Perspex tool or a trimmer made of insulating material; at about half capacitance the signal will be heard. Adjust for maximum volume.

R.F. Alignment

Next, L1 and L2 are trimmed for maximum volume, C3 being practically at zero. Now C3 is increased a little, retuning L1 and L2 for maximum volume. As this operation proceeds the signal generator output will have to be much decreased, volume, or evidence of a double-humped response, is achieved. C3 should be decreased a little and L1 and L2 again retuned. C3 needs only to be a fraction of a pF to obtain correct coupling; coupling (KQ) should be about 1·3—just over critical—but since the Q of the resonant lines L1 and L2 is so high K will itself be very small.

Mixer Current

Finally, adjustment of the crystal current is made. This is to enable the conversion loss to be minimised and noise to be avoided. To measure crystal

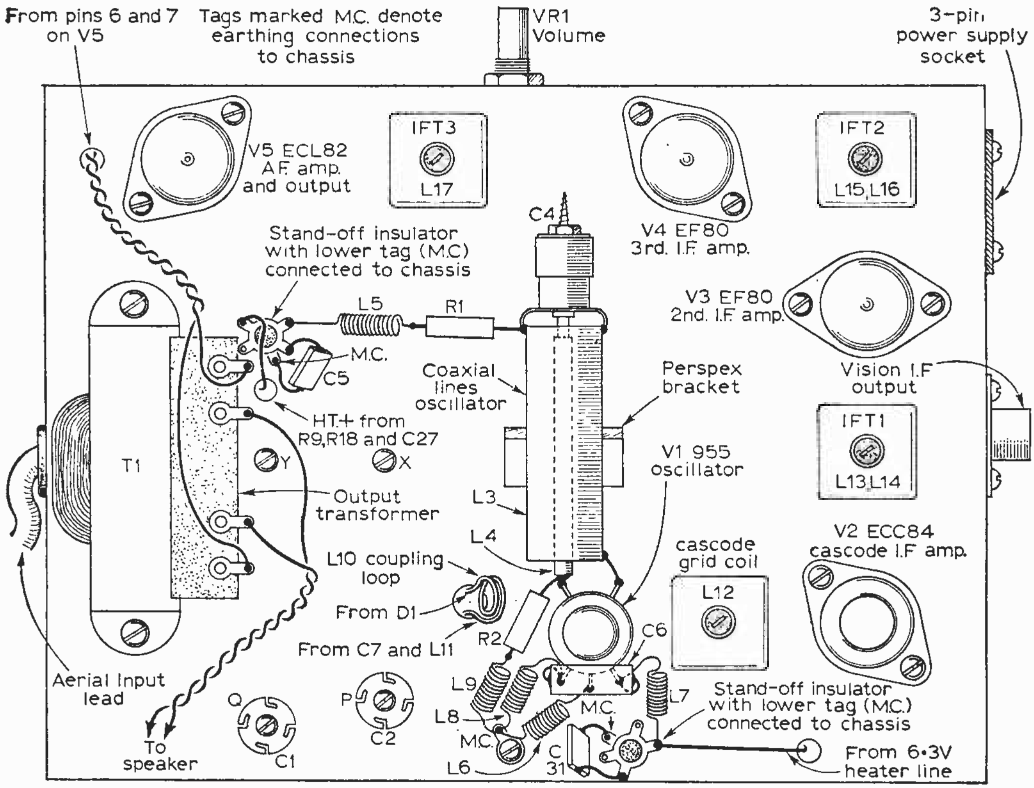


Fig. 6—Above chassis layout of components.

preferably by placing the coaxial lead much further from L1. Before C3 is increased more than a very little, the aerial input connection to L1 should be made, and L1 retuned. If it needs little or no retuning for maximum volume, a good match has been achieved. From this point, if the aerial is attached, it may be difficult to reduce volume sufficiently. If so, a short-circuit across the aerial will give little help, because of the inductance of the 'short' itself. It will be better to separate the signal generator from the receiver by putting it in the next room.

C3 may now be increased little by little, retuning L1 and L2 each time. As soon as a reduction in current, break the connection between L12 and chassis and put a 500pF capacitor across the break. Connect also a low-reading current instrument across these points and adjust the position of the coupling loop L10 until a reading of about 0·3—0·4mA is obtained. It will be found preferable to use an ebonite rod or Perspex trimmer to adjust L10. When satisfactory, remove the 500pF capacitor and the instrument, and earth the end of L12 again.

The final adjustment is now made by connecting the aerial, directing it towards the transmitter, and setting C4 for maximum volume. A final trim may be made on L1 and L2. ■

Intercarrier SOUND

By E. Murdock

IF a recommendation were made by the Pilkington Committee for a change of television standards this would almost certainly contain provision for frequency-modulated intercarrier sound. Indeed, there would be every possibility that the recommendation would be for the CCIR system.

This system uses 625 lines, has negative-going picture modulation, a wider channel width and vision pass-band than our existing 405-line system and so on. This article is not concerned so much about the vision side of the CCIR system, but it deals essentially with the sound side, which in itself is most interesting.

Existing Arrangements

In the existing British system the sound and vision carriers are separated by 3·5Mc/s — the vision carrier being the higher of the two. Both carriers are applied to the tuner and the local oscillator in the tuner is arranged to work at a frequency above the frequencies of the incoming signals so that the sound and vision I.F. carriers are interchanged—that is, the sound I.F. appears 3·5Mc/s *above* the vision I.F.

The frequency of the local oscillator in the tuner is adjusted in all recent receivers so that the so-called "standard I.F.'s" are produced. The sound I.F. is 38·15Mc/s and the vision I.F. is 34·65Mc/s, or frequencies very close to these.

These signals, of course, appear at the output of the tuner and are then conveyed to the sound and vision I.F. channels for individual treatment and amplification. The idea is shown in block form in Fig. 1. Here care is taken to keep the vision signals out of the sound channel by accurate alignment of the sound I.F. stage and to keep the sound signals out of the vision channel by sound rejector circuits.

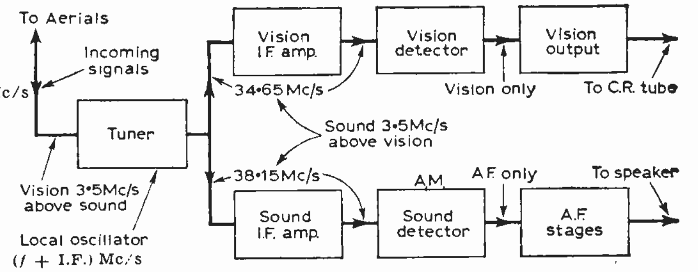


Fig. 1—A block diagram showing the standards adopted in the existing 405-line television system.

If the sound signal passes into the vision channel, it causes the picture to move in sympathy with the sound modulation because, for one reason, amplitude modulation is used. If the vision signal passes into the sound channel, it causes a disturbing buzz which tends to alter in intensity and tone with changes in picture content.

The CCIR System

In the CCIR system a greater separation is used between the sound and vision carriers, and the radiated sound carrier is *above* the vision carrier. The separation *differs between the various systems used* throughout the world. For example, in the American 525-line system the separation is 4·5Mc/s, in the Continental 625-line systems it is either 5·5Mc/s or 6·5Mc/s, in the French 819-line system it is 11·15Mc/s and the sound and vision carriers of some of the French stations are reversed, while in the Belgian 819-line system it is 5·5Mc/s.

The recommendation at the present time is for 6Mc/s, and it is on that basis that British manufacturers are producing dual-standard receivers.

F.M. Sound

In addition to the greater separation between the sound and vision carriers, the sound of the CCIR system is frequency modulated, and certain manufacturers feel that this will apply also in a new system launched in this country and as a consequence are producing receivers with F.M. sound facilities.

F.M. sound has many desirable features, including the possibility of better quality, less interference and less trouble from sound-on-vision effects.

Assuming that the change will be to full CCIR standards with the recommendations given above, then a block diagram of a suitable receiver may well look like that shown in Fig. 2. Here the local oscillator in the tuner is still operating at a frequency above the frequencies of the incoming signals which, again, reverses the I.F. carrier positions so that this time the vision is 6Mc/s above the sound.

The sound I.F. amplifier will remain almost the same as it is at present, while the vision I.F. amplifier will have a wider passband to accommodate the greater range of video signals which would be transmitted on the new system. The vision detector and video output stage would also be suitably modified to do full justice to the improved range of video signals.

The ordinary A.M. sound detector would be eliminated and its place would be taken by an F.M. detector of the ratio detector variety.

Intercarrier Sound

While the set-up in Fig. 2 would work adequately it would rarely be adopted except, perhaps, by experimenters. The trend is to use intercarrier sound, and all dual standards receivers are designed for this method of working.

A block diagram of the intercarrier sound system is given in Fig. 3. Here the vision I.F. stages are designed to pass not only the vision signals but also the frequency-modulated sound signals. The vision I.F. amplifier thus has two carriers to contend with, and these are passed to the vision detector.

The vision detector demodulates the vision signals in the ordinary way and passes the picture signal on to the tube in accordance with normal practice. However, the two carriers which are present at the detector become modulated, one with the other, because the detector is a non-linear device.

This means that in addition to the video signal at the output of the detector, there also exists a signal, the frequency of which is equal to the difference in frequency of the sound and vision carriers. This, we have seen, is 6Mc/s.

The 6Mc/s signal is now called the sound I.F. since upon it is superimposed the original frequency-modulation of the sound signal. In some sets it is passed along with the video signal through the video output stage and is extracted at the output and then applied to a separate 6Mc/s sound I.F. amplifier, as shown in the diagram.

In other sets, it may be extracted at the output of the vision detector, as shown by the dotted line in the diagram. If it is taken through the video amplifier, then that stage must have a sufficiently wide pass-band to allow its unrestricted passage, but this has the advantage that the signal is given a degree of amplification before it is applied to the sound I.F. stage.

If the signal is taken from the output of the detector, the video amplifier or output stage need not be quite so critical, but greater gain is then necessary in the sound I.F. amplifier section. Both methods are used in commercial dual-standard receivers.

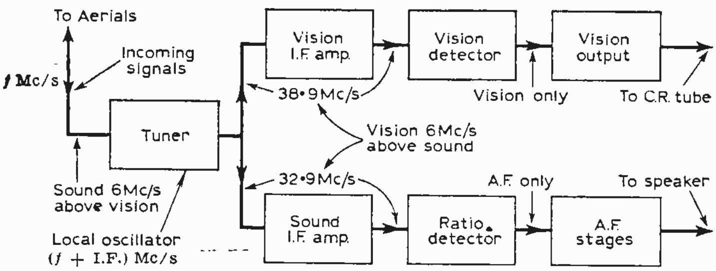
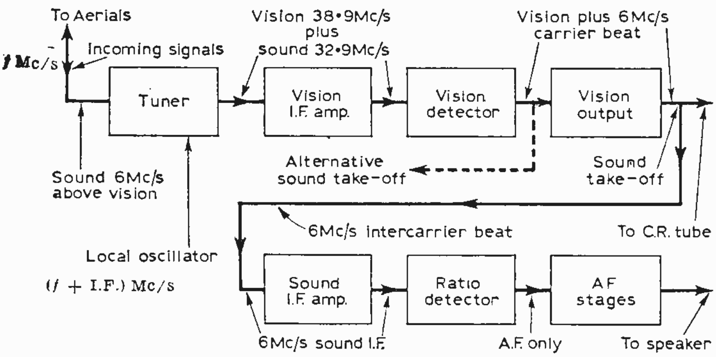


Fig. 2 (above)—The system of Fig. 1 altered to suit the CCIR standards.

Fig. 3 (below)—A block diagram of an intercarrier sound receiver.



It will also be appreciated, of course, that greater sound I.F. amplification is possible at 6Mc/s than at 32·9Mc/s with a given complexity of circuit. It is thus a fairly straightforward matter to amplify the signal through a single valve so that it is of sufficient strength to operate a ratio detector and to provide good amplitude limiting.

The fact that both sound and vision signals are passing through the vision I.F. stages is of little consequence because the sound signal is frequency-modulated, and will not cause sound-on-vision as with an amplitude-modulated sound signal. Moreover, the response of the vision I.F. stages is arranged so that only a limited amount of amplification is given to the sound signal with respect to the vision signal. The strength of the sound I.F. (6Mc/s) at the output of the vision detector is some twenty to thirty times less than that of the vision signal at the same point.

The intercarrier signal (6Mc/s) is suppressed either at the output of the video amplifier or in the tube feed circuit.

Advantage and Characteristics

The major advantage of the intercarrier sound system is the high stability of the sound channel. In ordinary systems the sound channel I.F. is governed by the tuner's local oscillator, and if this drifts then also does the sound I.F., necessitating re-adjustment of the fine tuning control.

This cannot happen with the intercarrier system because the sound I.F. represents the difference frequency between the sound and vision carriers, and these never drift since they are held correct at the transmitter.

To give some idea of the stability of the sound channel, the fine tuning control on an intercarrier receiver can be swung from one extreme to the other without any change in sound output. In the existing system it is customary to adjust the fine tuning control for maximum sound, consistent with minimum sound-on-vision at which point, if the alignment is correct, the best picture quality will also occur. With an intercarrier receiver the fine tuning is simply adjusted for the best picture quality. ■

Servicing Data and Modifications

SOME "TEETHING" TROUBLES OF NEW RECEIVERS AND HOW TO CURE THEM

By D. Elliot

(Continued from page 244 of the February issue)

WE continue this series with some information on early Ferguson models, notably the 991T series and others which incorporate so-called long time-constant flywheel synchronisation.

S-Shaped Verticals

Flywheel sync is incorporated essentially to reduce the symptoms of "line tearing" and "ragged verticals" which occur due to irregular "firing" of the line oscillator. Such trouble is caused by random noise and interference signals being superimposed on the tips of the line sync pulses. This happens primarily in areas of high interference and relatively low signal strength.

With flywheel sync, however, the line oscillator is frequency stabilised at the correct repetition frequency by a control voltage produced by the difference in phase between the line sync pulses and the line oscillator, so that as soon as

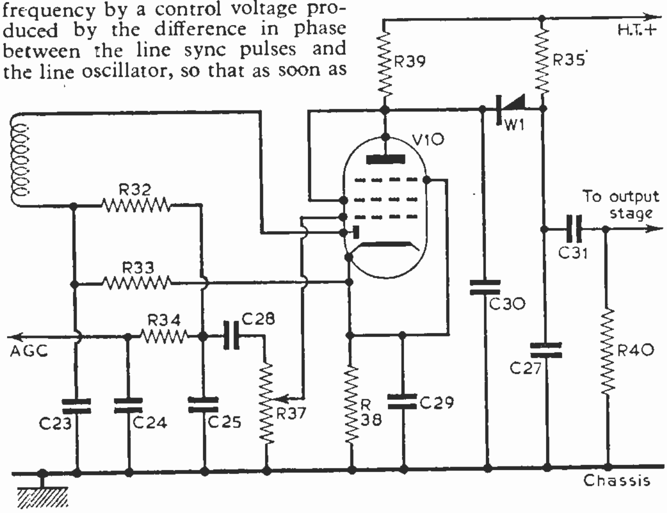


Fig. 5—A circuit for improving the sound interference suppression in Ferguson Models 941T and 951T.

the latter starts falling out of phase, a correction voltage is produced to bring the line oscillator back into step with the sync pulses. The line oscillator, then, does not rely on receiving every line sync pulse clearly defined and free from interference, which means that "line tearing" and "ragged verticals" cannot occur on such a receiver.

Unfortunately, flywheel sync brings in its wake slightly different problems. For example, any spasmodic change in the frequency of the power supply causes the line starting position to alter laterally. Moreover, any residual phase modulation of the line frequency, sometimes present on certain transmissions, produces an S-curve on the vertical parts of a picture.

Similar trouble can be caused by a fault in the receiver itself. A heater-cathode leak in a valve associated with the line sync and oscillator circuit can produce the trouble, as also can impaired smoothing of the H.T. line. Set faults, however, can be proved by reversing the mains plug. If the S-curve is "mirror-imaged" by such action, then the set is at fault, but if the curve remains the same which ever way round the mains is connected, the trouble lies in the transmission and there is little that can be done without altering the desirably long time-constant of the flywheel circuit.

It should be noted that certain old-style test equipment produces residual phase modulation of the type mentioned, but the trouble occurs only rarely on transmissions nowadays.

Several years ago, flywheel sync was very usual, but then its popularity waned. It is likely to come into mode again, however, should there be a change to CCIR transmission standards on UHF.

Alternative Picture Tubes—Ferguson 996T

Since we receive a number of queries concerning alternative tubes on the above receiver, the following notes should be of interest. The Ferguson 996T is equipped either with a Mullard MW43-64 or Emitron T/ASP4 picture tube. These tubes are not directly interchangeable, and where possible the replacement for which the set is designed should be used.

The neck of the Mullard tube is slightly shorter than that of the Emitron, and sets incorporating the latter tube have the dome on the cabinet back spaced off approximately half an inch by a ring of insulating material and set about one eighth of an inch lower than on receivers using the Mullard tube.

The Mullard tube is a pentode, while the Emitron is a tetrode, which means that the suppressor grid connection (pin 7) is omitted in the case of the Emitron tube. Further, the Emitron tube requires a little more focusing field (flux density) than the Mullard, and for best results the correct focusing magnet assembly should be employed When changing from a Mullard to an Emitron tube, it may also be necessary to replace the EHT lead, as it may now be of insufficient length. On no account should an attempt be made to lengthen the lead—it must be replaced as a whole.

Lack of Contrast control—Ferguson 203T Series

"Nine Star" models of this series use an EF80 valve (V7) as an AGC amplifier on vision. Under normal conditions this valve passes a very small mean cathode current, and due to this, an interface resistance develops between the cathode material and its support. This forms a degenerative resistance in series with the cathode and thereby lowers the valve's gain, showing up as failure of operation of the manual contrast control.

The trouble can be corrected simply by replacing the valve, but the apparently faulty valve should not be destroyed since it will work perfectly in another part of the set. Indeed, the trouble can be cured by interchanging the AGC amplifier with one of the EF80 I.F. valves, for example.

In order to prevent the trouble from occurring again, the heater of the AGC amplifier valve should be shunted with a 270Ω ¼W resistor, which enhances the balance between heater current and cathode current.

Improving the Noise Suppression—Ferguson Models 941T and 951T

Although the above are fairly old models, our records show that quite a number are in use still by experimenters. The circuit in Fig. 5 shows how the noise suppressor can be improved. V10 is the sound detector and audio amplifier valve, diode-pentode (Mullard EAF41 or EAF42), and in the circuit of Fig. 5, the noise limiter rectifier, W1, is connected after the A.F. amplifier. In the original circuit it was connected before the A.F. amplifier and directly after the detector. This modification is fitted in all 941 Models from serial number 15,101 and in all 951 Models from serial number 14,001.

Electrostatic Focusing—Ferguson Models 203T & 214T

Although early receivers of the above models incorporated magnetically focused picture tubes, later versions employ tubes with electrostatic focusing. To help service technicians and experimenters change from the latter to the former, should this be required, the circuit for electrostatic focusing is given in Fig. 6.

It will, of course, be appreciated that focusing magnets are not required with electrostatic tubes and no external focusing controls are provided. The focusing electrodes are incorporated in the tube and the "pre-set" focus adjustment is mounted on the side of the tube support. This adjustment is not usually critical and need only be altered when fitting a replacement tube.

It will be seen from the circuit that the focus electrodes may be connected to the H.T. line, to the boost H.T. line or to chassis, depending on the setting of the plug/socket arrangement.

Picture shift is accomplished by a special control which clips over the tube neck, rather like an ion trap magnet, and consists of two steel pole pieces and a cylindrical magnet. The picture may be shifted over the screen as required by rotating the complete assembly on the tube neck and by twisting the knob at the end of the control.

Varying Brightness—English Electric T40 Series Receivers

Random variations of brightness are sometimes caused or aggravated by the receiver's ability to handle the D.C. component of the vision signal fully. Fig. 7 shows a method of reducing the

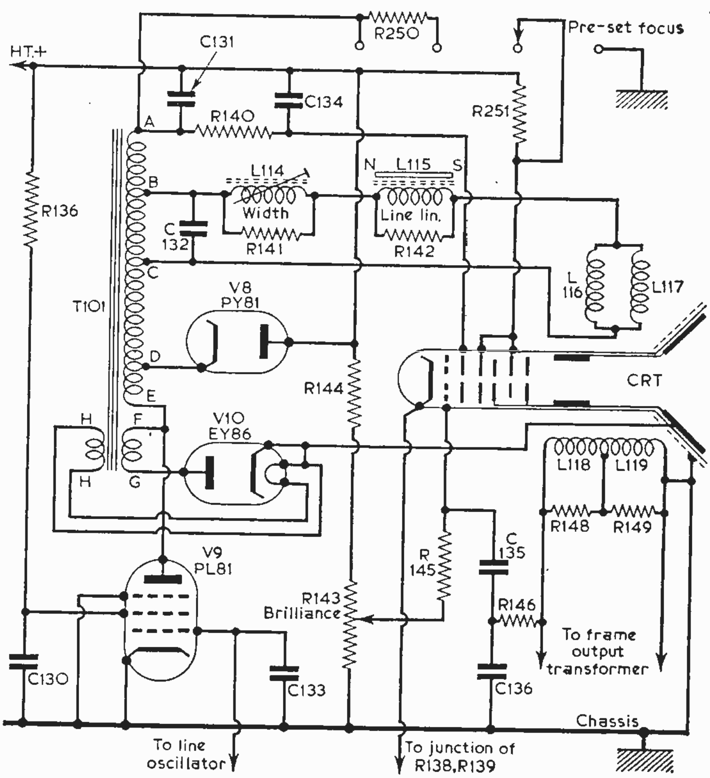


Fig. 6—The use of an electrostatically focused CRT in the Ferguson 203T and 214T series.

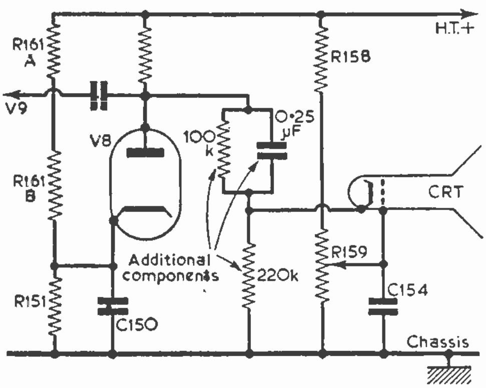


Fig. 7—Reducing the D.C. component of the vision signal in English Electric T40 series. This modification reduces random changes in brightness.

effect at the expense of a very small loss of finer "shadow" details.

The additional network, as shown, is connected in series with the tube cathode lead and can be fitted without removing the chassis from the cabinet. The white lead from the tube cathode should be cut about 2in. from the point where it leaves the main chassis, and the two resistors and capacitor should be assembled on a tag strip and secured at the rear of the I.F. chassis. To avoid hum pick-up and instability, the 220k resistor should be "earthed" at the tag strip and not at the picture tube.

Corona in English Electric C45 and C46 21in Sets.

EHT flashover or corona sometimes occurs around the picture tube mounting in early versions of the above models. This symptom appears to be more troublesome in locations where the receiver is subject to a certain amount of dampness or humidity.

The picture tube is already encased around the flare by a polythene sheet, but by the introduction of an additional double-thickness polythene sheet, turned up 2in. at the bottom, as shown in Fig. 8, the trouble can nearly always be eliminated.

It is sometimes possible to obtain a kit of parts from an English Electric agent, including a specially treated plywood cradle, securing strap and polythene sheets.

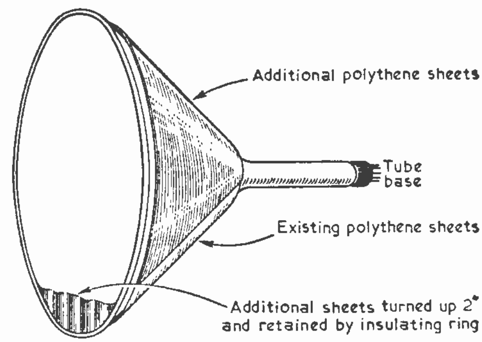


Fig. 8—Eliminating corona on 21in. English Electric models C45 and C46.

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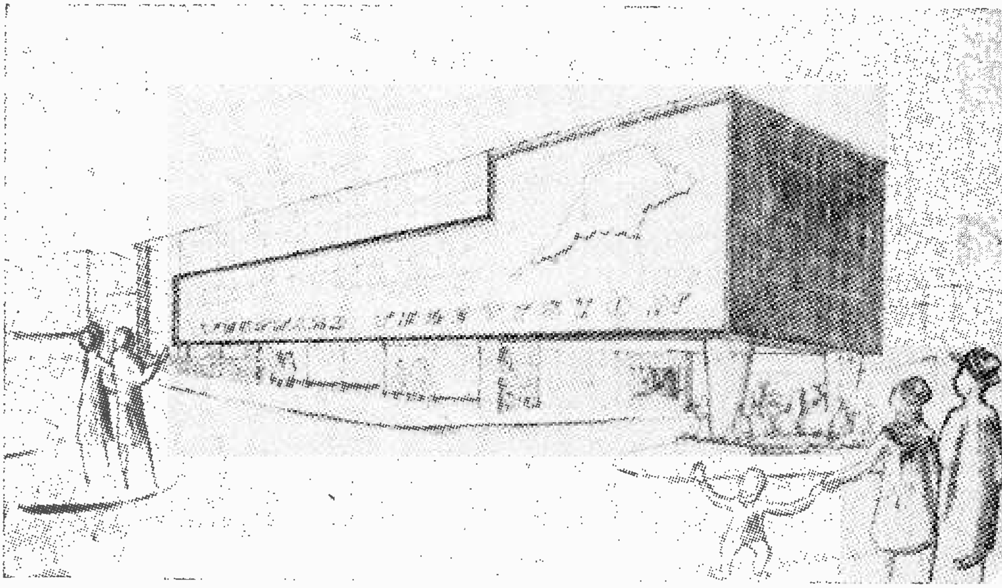


An artist's impression of the Westward Television Centre in Plymouth.

WESTWARD TELEVISION

its development and progress

WHEN the war ended, the City of Plymouth was in a distressing state. Few of the impressive buildings in the shopping centre survived the blitz. The huge department stores were razed to the ground; the municipal buildings and the churches were badly damaged, but Derry's Clock, a famous landmark for 99 years, survived.

It was around this clock and the restored civic buldings that the new Plymouth was planned, and in Derry's Cross, the "Piccadilly Circus" of Plymouth, Westward have built their television centre and studios. Little more than eighteen months ago, Derry's Cross overlooked a piece of derelict ground, bisected by a road which, it was proposed, should be removed in the reconstruction plan.

The Time Factor

Almost everywhere in any television station, you are faced by clocks, large, small, illuminated, silenced, synchronous and slaved. But the most menacing of all are the large slave clocks with pulsed minute and second hands. The second hands of these clocks are the controlling influence of any station. Working on a time schedule to the nearest second is a fundamental requirement of any television network, but particularly the commercial stations, where interchange of programmes and insertion of commercials involves simultaneous switching operations in many Post Office and programme company's centres.

The clocks start ticking long before a station opens, however. From the moment the ITA awards a regional concession to the selected syndicate, the fight with time begins. Probably in no regional area to date has the fight against time been so fierce as in the South West, where Westward have now completed a new, purpose-built television centre in the heart of Plymouth. It takes much longer to build new premises than to convert existing premises, and there lies the danger if the completion date is definitely fixed and immovable.

The First Stage

Even before the Westward group—headed by Peter Cadbury — had secured the concession, the syndicate decided to build new studios rather than convert an old building, and the architects had prepared preliminary plans and perspective drawings of the proposed buildings. These drawings were exhibited to the ITA and were part of the evidence produced to show the ambitious intentions of the winning syndicate (of the fourteen applicants). A splendid site had been reserved near the Continental Hotel, not far from the Post Office Telephone Exchange, through which all vision and sound signals would come from the ITV network (via Bristol). In the reverse direction, these signals integrated with the local production and commercials, would return on separate lines, to the Plymouth Telephone Exchange, to be fed to the transmitters at Stockland Hill (near Axminster) and Caradon Hill (near Liskeard).

The Second Site

The site seemed a good one, but before any building was started the Estates Official of the Plymouth Corporation came forward with the offer of an alternative site, fifty yards from the one originally selected, but of a very different character. This new site, vaguely earmarked for a civic theatre to be built some time in the future, had a frontage on Derry's Cross. But there was one disadvantage to this site: the end of Millbay Road, A38, together with telephone, electric power and other services underneath it, cut right across the frontage of the site and this road could not be closed to the public until September 1960. It was unthinkable to lose this wonderful frontage, but impractical to delay commencement of building construction until this date.

The outcome of a very lengthy debate one night at Plymouth between the architects and executives of Westward was a somewhat unconventional layout—shown in Fig. 1—which would allow the studios and technical area and production offices, etc., to be built at the rear of the new site, clear of the public road, and for work on these to commence as soon as the plans were passed by the City Council. The "front office block" could follow, work to commence as soon as the Millbay Road section was closed and the public services under the road removed. The front office block and the technical area would be joined by a wing containing canteen, dressing-rooms and a few administrative offices.

Unexpected Advantages

In the meantime, a number of additional advantages for this site had become apparent. It was in the heart of the "theatre precinct" of Plymouth, very close to the Civic Centre, the A.B.C. Cinema, the Drake Cinema and the department stores. These were all within 1,000ft and could be covered for outside broadcasts without the use of an O.B. truck. On the adjoining site was the Plymouth

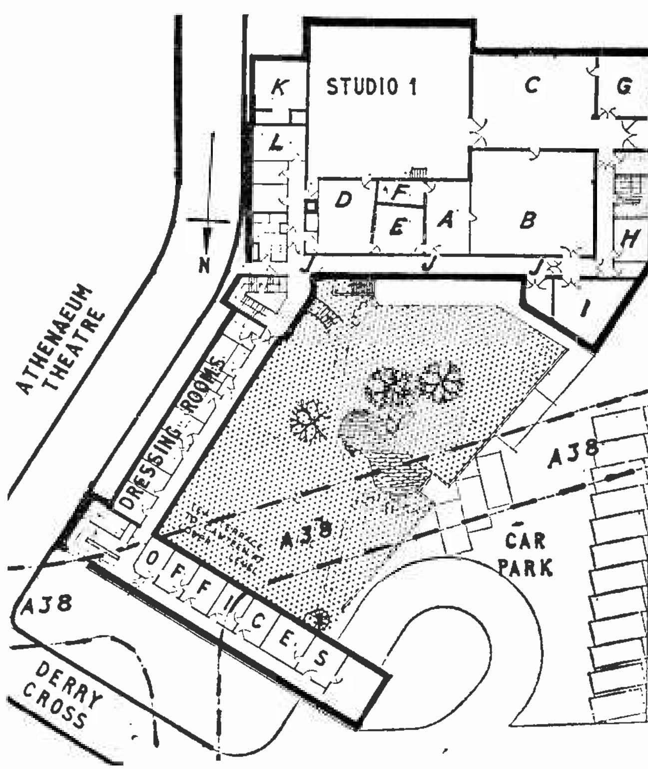
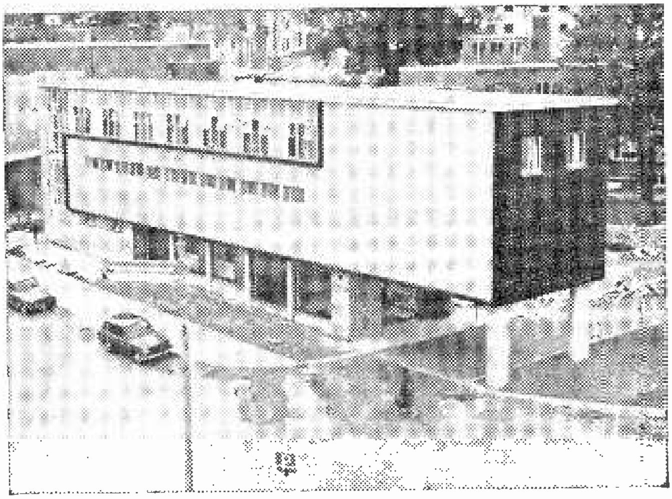


Fig. 1—A plan of the television centre:

A—Master control room,
B—Technical area,
C—Scene dock,
D—Studio 2,
E—Studio 2 control room,
F—Announcers,
G—Carpenter's shop,
H—Drawing office,
I—Technical maintenance,
J—Public viewing corridor,
K—Oil storage,
L—Green room.



A view of the front of the television studios when nearing completion.

The first step was to proceed with the planning of a modern regional television studio centre and technical area layout. This is where the past experience of the architects, Treadgold and Elsey proved most valuable. This firm had previously designed Pontcanna studios at Cardiff and Arno's Court Studios, Bristol, for TWW. A plan was evolved which provided a main studio (50ft x 50ft), a presentation studio (23ft x 17ft) and an announcer's booth (14ft x 8ft), with studio control rooms, master control, telecine and film departments all grouped in convenient relationship. Advantage was taken of the considerable slope of the ground, which was 22ft higher at the back of the site than at Derry's Cross frontage. The main studio was planned to be built at the rear of the site, partly below the ground level but still leaving a 28ft gap between it and Notte Street for future expansian. The film department was to be directly below "telecine", with a hoist between. Production and technical offices were to be grouped around the technical area. This rear part of the premises was completed in time for the opening of the station but the remainder of the premises have only recently been finished.

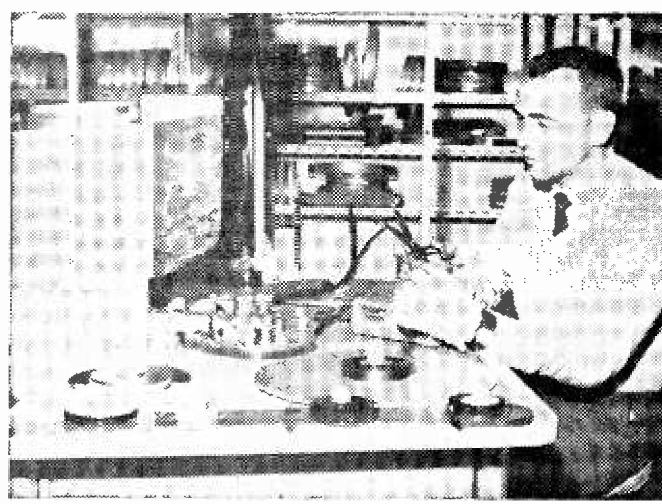
Institution and Devon and Cornwall Natural History Society, who were putting up an impressive building to house lecture rooms, library, photographic dark rooms—and a small theatre seating 356 persons.

The construction of this theatre—the Athenaeum —had only just commenced and the Plymouth Institution Management Committee were willing to make structural modifications in the interest of its regular use for television.

Westward suggested the provision of a modern revolving stage and a compound orchestra lift which virtually added an 8ft apron to the front of the stage; also the provision of additional power supplies for lights, permanent camera, sound and control circuits and even a clock slaved to the master clock system in the Westward building!

This was agreed to and finally, it was decided, that if the Athenaeum was to be regularly used by Westward, an underground connecting passage should be built to enable artists to walk straight from their dressing rooms in the Westward building to the stage of the theatre.

All of this was a most valuable excursion into supplementary facilities.



A Westward Television film editor at work in one of the film cutting rooms.

The Challenge

The fact that the plot of ground chosen for the Westward building faced the busiest thoroughfare in Plymouth was a challenge for the architects to design a frontage which would fit in with the enlightened architecture of the reconstruction area of Plymouth, to harmonise with the dignity of the Civic Centre, without clashing with the gay façade of the Drake Cinema, nor the contemporary loftiness of the big stores in Royal Parade. And—at the same time, to preserve a functional up-to-date building.

Technical Facilities

A wing joining the studio block with a front office block, houses the restaurant on the lower ground floor, dressing rooms on the ground floor and a number of offices on the first floor. The front block contains reception and the sales department on the lower ground floor with the administrative offices above.

The main television equipment contract was arranged with Marconi's Wireless Telegraph Ltd.,

(Continued on page 292)

transistorised SYNC Separators

By G. J. King

NEWLY DEVELOPED CIRCUITRY IN MODERN RECEIVERS

BASICALLY, the requirements of a transistorised sync separator are exactly the same as those of a valve equivalent. The stage is required to eliminate the picture content of the video signal and provide at its output sync pulses of suitable amplitude and polarity for locking the frame and line timebases.

To do these things successfully, the transistor employed should possess a reasonable switching performance and a high current gain factor. Care should also be taken to avoid overloading the base circuit with excessive video input signal, as large signals are likely to cause "bottoming" of the transistor, resulting in undesirable hole storage effects and a lengthening of the output pulses, thereby making frame pulse separation difficult. Very large input signals may also cause direct feed-through of the picture signal via the collector-to-base capacitance. In the majority of cases, however, these troubles are automatically prevented by the receiver's vision AGC system.

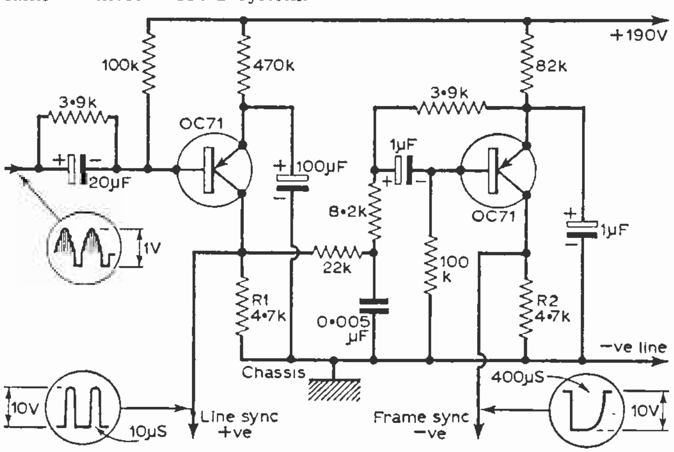


Fig. 2 (above)—The Mullard circuit using two transistors.

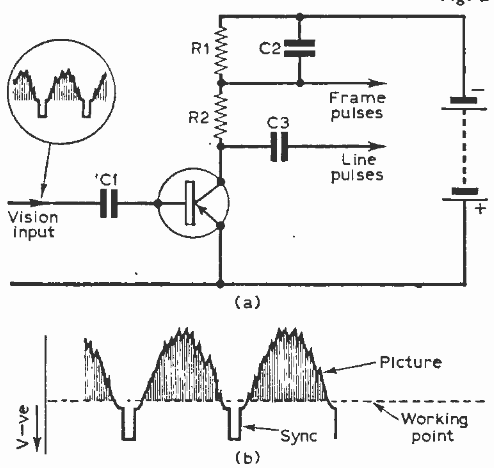


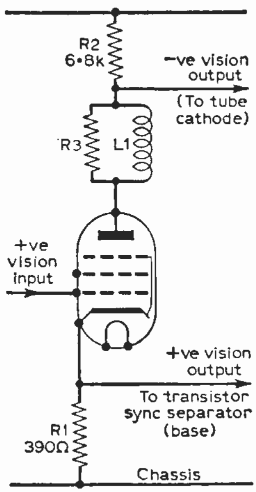
Fig. 1—The basic transistor sync separator circuit.

Basic Circuit

The basic circuit of a transistorised sync separator stage is given in Fig. 1(a). On negative-going sync pulses, capacitor C1 charges via the base-emitter junction of the transistor, and the resulting charge biases the transistor to the working point as shown in Fig. 1(b).

This means that collector current flows only during the negative-going sync pulses, the transistor being effectively switched off during the picture signal. Sync pulses thus occur only across the collector load resistors R1 and R2. The differentiating circuit comprising R2 and C3 passes only the line sync signals, while the integrating circuit of R1 and C2 produces frame pulses only, which, of course, is the usual method of sync pulse separation employed in most valve circuits.

It will be observed that the transistor requires a positive-going picture signal, which is the opposite to valve arrangements. However, a suitable signal of correct polarity can be obtained from the cathode circuit of the video amplifier valve.



The Mullard Circuit

The Mullard circuit (Fig. 2) uses two transistors. This is highly stable and will provide line and frame sync pulses suitable for most types of timebase generator. A composite video signal of one volt peak-to-peak is required for the best operation, but the circuit will lock a raster with an input signal as low as 30mV.

Sync pulses of 10V amplitude are produced under ideal signal input conditions, the line pulses being positive-going and the frame pulses negative-going. Coupling to the appropriate generators should be by way of a capacitor—about 47pF for line and 680pF for frame are suitable. With multivibrator types of generator, the sync pulses are best injected into the cathode circuit rather than the grid.

Fig. 3 (left)—One method of obtaining a positive-going picture signal.

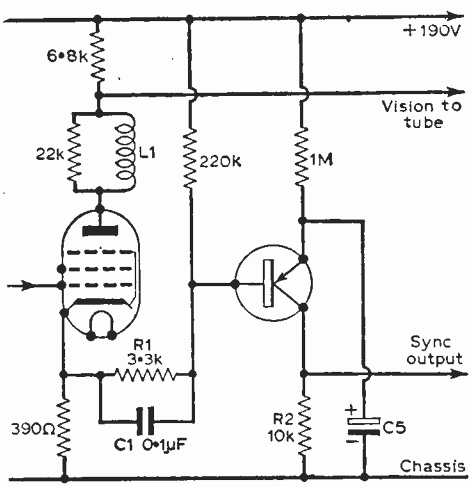


Fig. 4—The transistor sync separator as used in recent commercial receivers.

Again, a positive-going picture signal is required at the input (negative sync), and this can be obtained from the cathode circuit of the video amplifier valve as shown in Fig. 3.

Here R1 is the cathode biasing resistor which is normally by-passed by a small capacitor for compensation. The capacitor should be removed, and if this results in excessive overshoot or poor video response (impaired picture definition) the load R2 should be altered in value as a compensating measure. If the response is still poor, anode compensation, such as L1 and R3, should be tried.

The value of R1 will also have an effect on the circuit operation, and this should be as near as possible to the value shown.

Commercial Circuit

The arrangement used by Invicta is shown in Fig. 4. Here just one transistor is employed as the first sync separator. This is followed by a valve sync separator for obtaining line pulses of the correct phase for operating the sync phase-splitter stage for the "auto-sync" circuit. A further valve is used for separating the frame sync pulses and for phase correction.

Nevertheless, the circuit of Fig. 4 reveals how the video is coupled from the video amplifier to the transistorised sync separator. Although there is no by-pass condenser across the video amplifier valve cathode resistor, a certain degree of compensation is provided by C1 and R1 in the base circuit of the separator proper. This is a very interesting circuit and performs remarkably well in practice.

Both this and the Mullard circuit operate from the normal H.T. line of the set. This is why the transistors may appear to be inverted; the collector loads in Fig. 2 are R1 and R2, while in Fig. 4 the load is R2—connected, of course, to the negative chassis. The transistors are effectively operating in the "earthed emitter" mode, with C5 in Fig. 4, for example, taking the emitter to chasis. ■

WESTWARD TELEVISION

(Continued from page 290)

who supplied five 4½in. image orthicon cameras, a vidicon camera, special effects equipment, etc.

Local Programmes

The anxiety of the early days of Westward, with temporary offices for staff, improvised hook-ups for wiring, the continuous tattoo of hammering, the perils of cement dust on the equipment should be over now, but Westward have already commenced the construction of additional premises on the Notte Street side of their building, mainly to cope with the constantly expanding staff required to produce more local programmes. Under the guidance of Stephen Mitchell and W. H. Cheevers, several local programmes have achieved high ratings for non-peak periods of the evening, notably "Spin Along", "Ordinary People", "Westward Diary" and a very well-edited local news service, with film inserts.

A few weeks ago, film scenes of a big warehouse fire in Plymouth were on the Westward News within forty minutes of being photographed. Not much time for processing, editing and adding a commentary, with all technicians clock-watching to complete a red-hot news assignment by 18.06 hours precisely! ■

Underneath the Dipole

A MONTHLY COMMENTARY

By Iconos

AT last I have caught up with the BBC's television jubilee film, "Television and the World". I missed a couple of showings of it on my home receiver, but saw it at last in a private cinema in Wardour Street. The occasion was a special viewing to the members of the Society of Film and Television Arts, when the director, Richard Cawston, also addressed the audience and answered questions. On the comparatively large cinema screen, this fine television film held my attention throughout its 85 minute run—and brought home more than anything I have yet seen or read, the almost terrifying impact of television throughout the world.

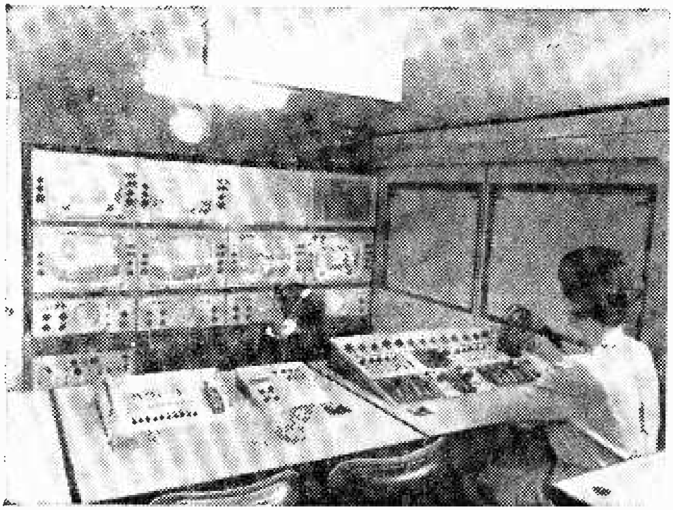
It is never too late

From the quiet Italian village, where we were shown the old folk, sat in front of a communal television set, learning to read and write, instructed by a patient and understanding teacher, in a programme called "It is never too late", Richard Cawston's film toured us around the army-operated TV station in Thailand, the brash commercials of Brazil, the 24-hour multi-channel service of Westerns in the USA, to the highly commercial mass production of portable transistor TV sets in Japan; and then back to England to the opulence of—yes—the ITV as well as the BBC Television centres. It was a most absorbing film essay, a real classic which demonstrated the hypnotic power of a medium that could become the greatest monster in the history of communications—if wrongly used. And the recurring fusillades of revolver shots from Western film sound tracks, heard in every part of the world, reminded one that action pictures have a greater mass appeal than words. The varieties of studio installations and equipments shown were of great interest. In the discussion afterwards, Richard Cawston, who wrote and directed the film, referred to the superiority of British equipment, acknowledged even in the USA to be the best. British 4½in. image orthicon cameras with British lenses are used in many of the leading studios there.

TV Architecture

One of the eye-openers in "Television and the World" is the different treatment applied by architects in the design and construction of new buildings for television.

All of these new purpose-made buildings are functional, utilising steel and concrete, and, no doubt, plastics and similar modern materials for fittings and decor. But some architects have appreciated the fact that because a structure is functional, it will not inevitably be beautiful. The brief views we had of the exterior of the Rome studios were superb examples of pleasing building lines applied to an obviously well-engineered interior layout. Some stations in which the transmitting mast arose from out of the studio building were impressive. Equipment layouts, too, varied a great deal, and the best looking seemed comfortable and pleasant to work in. The few shots of new British television studio exteriors were not at all impressive, with the exception of the BBC's Television Centre at White City. Let's face it—Britain was the first in television and most of the buildings are improvisations, conversions from warehouses, cinemas or theatres. Nobody appreciated just how big television would become in those early days, and in any case, building new from the ground took too long. The fine Granada studio premises at Manchester — probably the finest modern building in that city—and the much smaller Westward building at Plymouth—show that it can be done, and in their own way, take their places besides the wonderful BBC building. For the best improvision of an existing building for television, I would give the "Oscar" to Anglia Tele-



An interior view of the mobile outside broadcast vehicle which has been equipped for Telefis Eireann, the Eireann television service, by EMI Electronics Ltd.

vision, who virtually removed the inside of the Old Agricultural Hall, situated in the very centre of Norwich, without making much alteration to its external appearance. But the inside of the building is now a model layout, with three good stages and a superb engineering layout.

BBC Progress

I wonder if the BBC's "Television and the World" and many other good things television-wise that this colossus of an organisation has produced in the last year or so would ever have emerged if it had not been for the stimulus of competition with the ITV programme companies! In fact, the BBC TV owes a lot of its liveliness and vigour to this competition. The BBC seem to have captured a large proportion of week-end viewers, with the exception of the period when "Sunday Night at the London Palladium" is on, according to the T.A.M. ratings. The Equity strike has had its influence, of course, with the gradual disappearance of live plays and series, that is to say, video-taped television plays, which are virtually the same in production and style as if transmitted live.

They do have a presence and dash somewhat different from the television film dramas and comedies. America is the home of films produced in film studios for television as distinct from live television, made with television cameras and recorded on video-tape. Hollywood is experiencing a boom in this type of film production at the moment. Large studios like Warner Brothers and M.G.M. have about eight film units working on television films and television series, compared with about two units on feature cinema films. These films have a large showing in the hundreds of television stations in the USA and many of them entirely recoup their production costs before being offered to Britain or any other countries. Public taste in England may be influenced in this direction, owing to the temporary shortage of "live" TV plays and their substitution by both old and new films.

"Tempo"

"Tempo", ABC-TV's programme about art, films and the theatre, produced by Kenneth Tynan, has been sniping at the film industry. Quite a salvo of sneers was discharged in the programme which featured John Osborne, who remarked that film booking for the main circuits was largely in the hands of two illiterates! Another statement was that "There is also the special stimulus of the unique awfulness of most British films and the unfunny comedies about leaking houseboats and medical students". Almost at the same time, a weekly critical summary of all the London theatrical shows, published in one of the Sunday newspapers of which Mr. Tynan is the principal theatre critic, aroused the wrath of the West End theatrical managers' association to such a degree that they withdrew all advertising from this particular publication! "Tempo" is a angry-boy viewpoint of the offerings of show business, a strange product to come from ABC, whose basic assets are in the hundreds of large cinemas in all parts of the country and also in the huge and well-run ABPC film studios at Elstree. In any case, it is quite absurd for anyone to "knock" British film producers at a time when their reputation throughout the world has never been so high.

Sidney James

BBC's "Citizen James" series could not be said to have achieved a resounding success, when it first started. But there has been a steady improvement in the story, script and direction, and the combination of Sidney James and Sidney Tafler has now settled down in splendid form. The richly corrugated face of Sidney James, re-cast into a character slightly reminiscent (but only slightly) of the part that Tony Hancock used to play, fills the home screen in a most welcome fashion. We are now all very much on his side. One of the best "Citizen James" episodes was that broadcast on Christmas Day, with James the victim of his uninvited party guests. Credit must be given to the producer, John Street, and scriptwriters, Dick Hills and Sidney Green.

Censorship

The British Board of Film Censors is pretty liberal in outlook these days. The "U" "A" and "X" certificates are handed out to film makers according to a new code which is far removed from that of only a few years ago. George Redford or T. P. O'Connor, the Chief Film Censors of years ago, would have blushed at some of the films which are now released generally to the cinemas. The BBC is fairly broadminded in these matters, too, and occasionally an item comes through which seems hardly the type of entertainment for the family circle. On the other hand, the ITA is comparatively strict. When a programme company puts out a "Movie Magazine", "Close Up", or "Stars in the West" type of programme which includes clips of films on general release, these clips which are taken from "X" certificate films are scrutinised very carefully by ITA officials.

Television Filters

By T. Kemp

(Continued from page 228 of the February issue)

TELEVISION filters can often assist to suppress R.F. interference at the receiver itself, notably when the unwanted R.F. signal falls outside the major response of the receiver and yet is of a frequency which coincides with a spurious response of the receiver.

Pattern interference often results from an unwanted signal gaining admittance to the receiver along with the vision signal. An unwanted R.F. signal may also cause whistles on sound, but owing to the wider pass-band and response of the vision channel, patterns on vision are usually more troublesome than whistles on sound and more difficult to eliminate.

Interference Within the Pass-Band

When pattern interference is experienced by a group of viewers in close proximity using different sets, one can be almost certain that the frequency of the unwanted signal falls within the vision channel to which the sets are tuned. In such cases there is little that can be done at the set itself by way as a palliative, since the interference has a frequency similar to that of the wanted signal.

About the only thing that can be done is to contact the interference-investigation department of the Post Office so that the source of interference can be traced and eliminated. Full details of the type of interference and the number of viewers affected should be given.

Interference Outside the Pass-Band

When only one receiver is affected and other nearby receivers are completely free from the disturbance, the interfering R.F. signal is probably removed in frequency from the vision pass-band, but is entering the affected set by way of a secondary channel or spurious response. Not all sets have the same intermediate-frequency and oscillator-frequency, which means that secondary channels of one set may differ considerably in frequency from those of a different set.

A common secondary channel corresponds to the intermediate-frequency, but although the response to signals on that frequency is very low, a very strong interfering signal at the I.F. may well gain entry into the vision I.F. channel and cause pattern interference. As illustrated earlier on in this series, most receivers feature an I.F. rejector in the aerial input circuit, but unless this is tuned accurately to the interfering signal it will have little or no effect in attenuating the unwanted signal.

Image Frequency

Another secondary channel corresponds to the "second channel" or "image frequency." As an example, an old set with sound and vision I.F.'s of 9·5Mc/s and 13Mc/s respectively would have its local oscillator working at approximately 32Mc/s when tuned to Channel 1 (the fact that the sound I.F. is below the vision I.F. means that the local oscillator is working below the signal frequency). This means that an unwanted signal falling in the region of 19Mc/s will beat with the oscillator signal and still produce the intermediate-frequency. This spurious 19Mc/s response is called the "second channel" or "image frequency."

The vision second channel of a more modern set with sound and vision I.F.'s of 19·5Mc/s and 16Mc/s respectively would fall around 77Mc/s when tuned to Channel 1, for here the oscillator frequency is above the signal frequency since the sound I.F. is above the vision I.F.

With really up-to-date sets using the standard I.F. (vision 34·5Mc/s and sound 37·5Mc/s) the vision second channel falls around 114Mc/s for Channel 1, for here again the oscillator frequency is above the signal frequency, being in the region of 79·5Mc/s when the set is tuned to Channel 1.

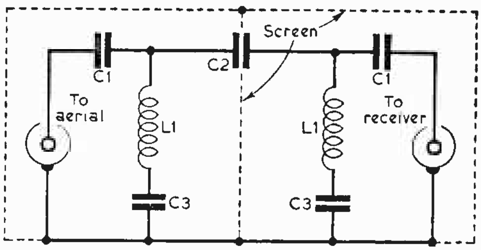


Fig. 15—The circuit of a practical high-pass two-stage filter. This is designed for 75Ω coaxial cable and to provide the characteristics of Fig. 16, the components should have the following values: C1, 68pF; C2, 33pF; C3, 500pF; L1, 0·24μH (produced by 7 turns of 16s.w.g. tinned copper wire on ¾in. former).

Finding the Second Channel

The second channel frequency can easily be discovered for any set by subtracting twice the I.F. (sound or vision as the case may be) from the receiver's primary response (e.g. the sound or vision frequency to which the set is tuned) where the local oscillator frequency is below the signal frequency, and by adding twice the I.F. to the receiver's primary response frequency where the local oscillator frequency is above the signal frequency. The local oscillator frequency is always below the signal frequency when the vision I.F. is above the sound I.F. and above the signal frequency when the vision I.F. is below the sound I.F.

There are other spurious responses due to harmonics of the local oscillator and so on, and the spurious responses possessed by any set can be exhibited by injecting a strong signal from a signal generator into the aerial socket and then tuning the generator over the various ranges. Excluding signal generator harmonics and the set's primary acceptance, the second channel response should quickly be established, as also should the I.F. response. Apart from these, other relatively weaker responses may also be observed due to the I.F. being produced by the generator signal and harmonics of the receiver's local oscillator.

The chief offenders, like the second channel and I.F. responses should to some extent be taken care of by the relevant rejectors in the set, but if such responses appear to be unduly strong the rejectors may require to be tuned more accurately.

How Patterns are Caused

Pattern interference is caused by an interfering R.F. signal heterodyning with the vision carrier. This produces a difference or beat frequency, which, while being within the response of the vision I.F. channel, arrives together with the normal modulation at the picture tube. In effect, the difference frequency is like modulation to the tube—a modulation that produces patterns instead of pictures.

The formation of the pattern superimposed on a picture is dependent on the difference frequency. For example, if the difference frequency is in the region of 2·5Mc/s the effect is to break up the line structure into a series of dashes with a consequent reduction in picture definition.

A slightly lower difference frequency produces a set of vertical bars, while a set of horizontal bars indicates that the difference frequency is below the frequency of the line timebase. The gentle drifting and twisting nature of some patterns means that the frequency of the interfering signal is itself somewhat unstable and is likely to emanate from a radiating television set or some other unstable R.F. source rather than from another transmitter.

Should the interfering signal itself be modulated by hum, within the main pattern are produced smaller subsidiary patterns within dark bands. Diathermy interference often provides an example of this kind, for in such equipment the activating R.F. is usually obtained by applying unsmoothed or " raw A.C." to a large power oscillator. The radiation is then heavily modulated at 50c/s and on a picture appears as a single horizontal band of herring-bone pattern occupying approximately one-tenth of the picture height. Moreover, the pattern formation may drift from time to time due to the dielectric effect of the patient altering the oscillator frequency.

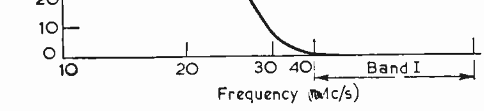


Fig. 16—The frequency/attenuation characteristics of the high-pass filter of Fig. 15.

Transmitters

Although it is beyond the scope of this article to deal with all the possible causes of pattern interference, one or two further examples may be of interest. R.F. interference from mobile and fixed commercial transmitters often causes trouble in metropolitan areas of fairly low television signal strength. Interference of this kind is rarely consistent, but in some cases, where the set is very close to the station, the actual message may be heard on the receiver's speaker.

Process and heating appliances employing powerful R.F. generators are other offenders. These appliances are finding increasing favour in factories and small works, and they may not be efficiently screened. Although the Post Office and others are endeavouring to ensure that such signals are not radiated in the television bands, harmonics of the R.F. signals often find their way into spurious acceptance channels of nearby television receivers.

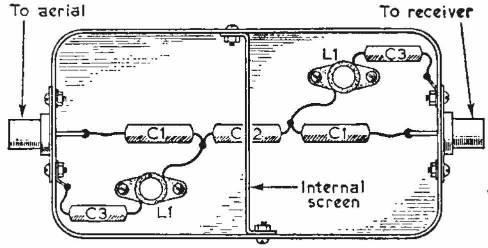


Fig. 17—A suggested construction for the filter of Fig. 15.

Furthermore, it sometimes happens that pattern interference is caused by a relatively " pure " R.F. signal which is far removed in frequency from the primary acceptance of the receiver. Interference in this case arises from the fact that nearby receivers are unable to reject the unwanted signal sufficiently. It thus breaks through the first tuned circuits and overloads the R.F. amplifier valve, which gives rise to the production of harmonic frequencies. Once these are produced they cannot be rejected by the following stages and so are amplified along with the required signals.

The Uses of Filters

In all cases where the interfering R.F. signal falls outside the normal receiver pass-band the resulting patterns can be cleared by the insertion of a suitable filter in the aerial downlead.

If the frequency of the unwanted signal is below the signal frequency, then a high-pass filter would solve the problem, for, as we have already discovered, such a device offers a high attenuation to signals below a specific cut-off frequency and low attenuation to signals above the cut-off frequency. Conversely, if the frequency of the unwanted signal is above the signal frequency the call would be for a low-pass filter, as this offers a high attenuation to all signals above and a low attenuation to all signals below a specific cut-off frequency.

The terms low-pass and high-pass mean just what they imply. A low-pass filter passes only the lower frequencies while a high-pass filter passes only the higher frequencies in relation to a designed cut-off frequency.

(Continued on page 299)

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 proprietary makes of commercial receivers. We regret that we are also unable to publish letters from readers seeking a source of supply of such apparatus.

COMPATIBILITY

SIR,—Being confined to my house recently owing to illness, I had an opportunity of day-time viewing. During the course of this, I saw the afternoon experimental colour transmissions carried out by the BBC. I always understood that any colour system must be compatible, and must confess that the picture received on my black-and-white receiver was perfect. In fact, I would go so far as to say that it was infinitely better than the normal black and white transmissions which I receive. Apart from the various " stills " which were transmitted on various days, the documentaries, and travel films seemed to have a remarkable range of tones. The details seemed to stand out more, probably due to the very much better gradation of tones which were reproduced, and at times it even seemed that the picture possessed stereoscopic effects. It would be interesting to know whether other viewers feel the same way about this, or whether knowing it was a colour transmission, I was affected psychologically by the transmission. — G. ROGERS (Kingsbury).

AIRCRAFT FLUTTER

SIR,—In your December issue you included a letter from a reader seeking for a cure for aircraft flutter. Since the aerial picks up this nuisance, everything should be done to stop it receiving it in the first place, otherwise the AGC will not be able to remove the fluctuation in brightness. The aerial should be as directional as possible, and as the unwanted signal arrives from above, aerials with sloping elements should be avoided. If these precautions are taken on installation, coupled with fairly efficient AGC circuits, flutter will be completely eliminated in the majority of cases.—G. POWELL (Marden).

TV FILTERS

SIR,—I know how difficult it is to prevent slight printer's errors slipping in, and in the majority of cases, the fault is usually very slight and obvious. In case readers may not have noticed it, there is a small one in the December issue in the article under the above title where on page 122, Fig. 4. The correct formula should be

$$f = \frac{1}{2\pi\sqrt{(L.C)}}$$

—J. SINCLAIR (South Nutfield).

VALVEHOLDER TROUBLE

SIR, I recently had to service a set which made use of a printed circuit board, and the fault was a weak picture which the usual tests seemed not to cure. When going over the set I found that one of the valves was making poor contact on one pin only. This was in a ceramic type of valveholder into which the valve only sank a fraction of an inch, with the result that there was insufficient room for the springs to grip the valve pins properly. Unfortunately the only solution failing the removal of the valveholder and its replacement, was to bend all the legs slightly in different directions, until the side pressure made good contact on all pins. It appears to me that this is a failing with this type of construction, and I feel that there should be a different type of valveholder, preferably one with the normal type of straight-through socket.—D. PEARCE (Osford).

Television Filters

(Continued from page 296)

Improved Signal-to-Noise Ratio

It is also interesting to note that by the use of filters of this kind the signal-to-noise ratio of the receiver is enhanced. This is because the filters effectively improve the receiver selectivity without detracting from the required pass-band which, of course, is necessary for maintaining a high definition picture.

Design statistics for low-pass, high-pass and band-pass sections have already been given in this series, but at this stage it would be desirable to give a practical example. In Fig. 15 is given the circuit of a high-pass two-stage filter which offers progressively increasing attenuation to all signals falling on the low-frequency side of Band I, as shown in Fig. 16. The cut-off frequency is around 35Mc/s which prevents attenuation of the required television signals and gives almost zero insertion loss over Band I. The attenuation is greatest at 20Mc/s, but useful suppression is given at all frequencies below Band I.

A small tobacco tin is useful for housing a small filter of this nature, and in Fig. 17 is shown a suggested method of constructing the filter of Fig. 15. To avoid interaction between the two sections and to achieve high rejection ratios, the two sections should be separated by a screen as shown.

(To be continued)

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. 304 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

G.E.C. BT302

Could you please assist me in clearing this annoying fault on my receiver? There is a very fine black line permanently across the middle of the picture.—J. W. Davison (Newcastle-on-Tyne).

We suggest that the trouble may be due to V16—B729 or V15—an N379. C113 ($0{\cdot}1\mu$F) should also be checked.

FERGUSON T105

A vertical white line about ⅛in. wide has appeared, slightly to the left of the centre of the screen. Adjusting the line hold away from the lock position, widens the line into what appears to be a fold in the scan. I have changed the sync separator, sync amplifier valves, line drive and line oscillator valves. I have also replaced the line output transformer. It would appear that with this model the EF80s used in the line drive and oscillator positions are critical, as it was necessary to try about a dozen before a satisfactory lock was obtained, but it was observed that with some EF80s, although the picture would not lock the vertical white line had disappeared. I am not sure of the function of the transformer situated between the line oscillator and EB91, although slight adjustment removed some ghosting from the picture. I have a circuit diagram of the set.—L. Long (Birmingham).

The transformer mentioned is concerned with the line oscillator and discriminator. Adjustment of the cores affects line phasing and frequency. The trouble described, however, appears to be in the line output stage. Check the boost reservoir capacitor and the components connected to the control grid of the PL81 valve.

BUSH TV53

This receiver has a Mullard type A.W.36-21 picture tube, and as it is beginning to show signs of low emission, I would like to fit a new one. I should be pleased if you could instruct me how to do this. I haven't a service sheet for this set. I would particularly like information on how to remove the neck of CRT from focus assembly, etc. I have never had the chassis out of the cabinet of the receiver and would therefore like to know if this presents any difficulties.—J. Williams (Yorkshire).

Tube removal is not difficult if carried out in the proper manner, taking note of the positions of all removed plugs and sockets. Slacken the front control knob grub screws and pull off knobs. Take off the rear cover and speaker leads from right side of the cabinet, and remove the screws from the rear edge of each chassis. Disconnect the tube base socket and inter-chassis leads and plugs. Disconnect leads from scanning coils to the frame output transformer (a pair), and the two line coils leads, one above the preset form control, one to the top of the line output transformer. Remove the EHT cap to the side of the tube. Slide out both chassis. Lay cabinet face down, remove ion trap magnet (note position) and centring clamp magnet and scanning coils. Remove the tube mask screws and lift out the tube.

K.B. L.V.T.50

Could you please help me with the following fault which has developed on my set? The bottom of the picture is compressed and is now showing a black band to a height of three inches. I have had all valves tested and they seem to be working correctly.—G. Thames (Swansea).

You should check the front left side 6BW6 frame output valve, its 820Ω bias resistor, 8μF bias decoupler and other associated components.

PHILIPS 2168U

Could you please supply me with any information you can, regarding this fault which has developed in my receiver? The screen has divided into two, horizontally, and gives two complete pictures one above the other. What is the cause of the trouble and could you give me the value of the condensers, etc., in the affected section.—G. Charles (Port Talbot).

You will have to check the two valves in the centre of the chassis (PCL82 and ECL80) and also the 3·3M resistor (orange, orange, green) in series with the hold control, if this latter component is at the end of its travel. Check other components associated with pin 6 and pin 2 of the ECL80 valve, if necessary.

AMBASSADOR TV4

I wonder if you can supply me with the following information regarding my receiver? I have the chassis of this set but it has no tube, and as I do not possess a service sheet I would like to know the make and type of tube generally used.—F. C. Hayes (Welling, Kent).

The Ambassador TV4 uses a Mazda CRM123 tube and is a 12in. table model.

MARCONIPHONE V.T.68DA

When this set is first switched on the sound is all right and there is a raster but no picture. After about ten minutes the picture appears and the set

(Continued on page 303)

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(Continued from page 300)

continues to work normally. I have changed the tuner valves.—R. T. Martin (Leicester).

Your letter does not state whether the brilliance of the raster is controllable or not. If the raster is bright even with the brilliance turned down, suspect the tube of having a heater/cathode short and install a heater isolating transformer (check tube heater voltage which may be 8·5V, 10·5V or 13V). If the raster is quite normal, however, check the vision detector crystal diode XL1 (0A70 or equivalent), the Z152 vision I.F. amplifiers and the video amplifier N153 and associated components.

COSSOR 947

According to service chart this set is fitted with coils for channels 1 to 5 and 9 and 10. It is a 12 channel turret tuner. I understand that the new "Grampian" transmitter has opened at Aberdeen on channel 9. Could you advise me what steps I must take to be able to receive this station. At present I get only faint sound and raster but no picture.—D. Allan (Fife, Scotland).

We would advise you to ensure that an efficient channel 9 aerial is in use and that the tuner unit valves 7AN7 (PCC84) and 8A8 (PCF80) are in good order, particularly the former.

SOBELL 171 TV

Recently I took out the coil biscuits and cleaned the contacts of the tuner but after replacing them I found that the volume on BBC (channel 4) had decreased considerably. Could you please tell me which trimmer on the tuner I might adjust to get the volume back to normal? The lines on the picture are spread out towards the top of the screen. I believe this is the fault of a valve. Could you tell me which ones to check?—B. L. Brown (Northampton).

With regard to the turret tuner, first switch to channel 4 and set the fine tuner midway. Remove both knobs and insert a non-metallic trimming tool into the hole next to the spindles (use a knitting needle with a shaped end) and tune for maximum sound. To remedy the bottom compression, check the rear centre PCL83 valve and the 100μF (25VW) electrolytic capacitor to the left of the valve.

McMICHAEL M22T

I am experiencing trouble with the picture of my set. At first, the top few inches of the picture appeared to be stretched upwards, and the left-hand quarter of the picture stretched to the left. I managed to cure the top of the picture by adjusting the frame linearity control, but the left side remains the same. I wonder if you could tell me also where the width control is on this set. At the moment the picture is much too wide. When the new BBC relay station opens at Oxford early in 1962 (channel 2), will a channel 2 coil be all that is needed to convert the set?—A. Inness (Oxford).

The width adjustment is a plug and socket (three position) on the rear right side of the receiver. Near by is the line linearity slider which expands and contracts the left side of the picture in relation to the right. Channel 2 coils may be obtained and clipped into the required position on the turret when desired. Inspection of the existing coil biscuits will show the method of fitting. The bottom cover of the tuner springs off to expose the turret.

REGENTONE BIG 12/5 AND ULTRA V815

The picture does not completely fill the screen, but after the set has been working a while, it improves slightly. The focus too is slightly out of adjustment. A new EHT rectifier has been fitted which made the picture considerably better. This did not last long, however, and now there is no EHT at all. The heater of the EHT rectifier shows continuity, as does the heater winding on the line output transformer. At the moment I am using an Ultra V815, and though this has quite a reasonable picture, it lacks height at top and bottom. The bottom of the picture also has a thin line of increased brightness. Would it be possible to advise me on both these queries? —N. May (Leamington Spa).

Regarding the Regentone receiver, you should disconnect the EHT lead from the top of the EHT smoothing capacitor (trace lead from U25) which could well be leaky. Have the 20P1 tested. If the resulting picture still lacks width, change the 14A97 metal rectifier on the front right side. With regards to the Ultra, you should check the 20P3 valve (front right) and the 470k (yellow mauve yellow) resistor which is the anode load of the 6K25.

BUSH TV80

When switching on, the sound comes up quite quickly, but there is no picture or raster for about four to five minutes. When the picture first appears it is very dark and just a little lighter at the top. It is also a little small in size but after about 20 seconds it is perfect, but then comes about 10 seconds of a howling noise. From then on the set seems to be working perfectly with all the controls reacting quite normally. I have checked all the heaters and noted that the CRT lights up almost as the set is switched on. I have replaced V9, the PY81 booster diode and also V7, a PL81. I am about to replace the EY51 EHT rectifier (V8). Could the fault lie here or could there be something else which may need replacing? —R. Perriton (Plymouth).

We should advise you to check the PCF80 video amplifier, ensure the ion trap magnet on the rear of the tube neck is correctly adjusted for maximum brilliance and check the video amplifier components if necessary.

PHILIPS 1758U

I should be most grateful for your advice as to the most likely cause of a fault in the above set. There is intermittent bending of the verticals, the setting of the line hold is very critical and a picture can only be held with both the contrast and brightness retarded. Any attempt to advance either of these controls results in either a broad black line down the centre of the screen or a complete breaking up of the picture into black and

white diagonal tears.—D. Mowatt (London, S.W.19).

You should replace the PL81 line oscillator valve and the 47pF capacitor to pin 2 of this valve base.

BUSH TV66

The trouble is a persistent form of flashing on the screen, which appears to be connected with the line timebase circuit. The flashing is generally most noticeable just below the centre half of the screen. I have put in new valves in the positions associated with the line timebase, namely, the ECC82, PL81, PY81, and the EY86. Also, on the advice of a friend, I have replaced the two small metal rectifiers used in the discriminator — line sync circuit — but with no improvement.—H. Richardson (Norwich).

We are not quite clear as to what is meant by "flashing on the lower centre of the screen." If the effect originates from one side and virtually streaks to the other, a discharge in the line output transformer or scanning coils is most likely. If however that effect is of black lines bunching together, the PCL83 frame timebase valve should be suspected. Another cause of flashing, but one which is usually accompanied by varying width, is a partial breakdown in the 140pF 6kVW capacitor (disc type) from the PY81 to the coarse width tapping on the rear of the line output transformer.

FERGUSON 105T

When the set is switched on it takes about two minutes for the picture to appear, although the sound comes on quickly. Sometimes the picture is distorted, when first switched on, with the images moving quickly across the tube to the left, and also slanting to the left from top to bottom. The line hold does not correct this. Also when the brightness is advanced, the picture blows up slightly and goes out of focus. If you could offer advice on these faults, I should be very grateful. —N. Brown (Frome, Somerset).

This fault is caused by some of the valves becoming slightly weak and requiring a greater time to stabilise. The valves concerned are those in the line oscillator and discriminator section. Also ensure that the line hold control is adjusted (after the set has been on for several minutes) so that the picture jumps into line lock when the aerial is removed and replaced.

MURPHY V240

Could you please help me to find the trouble with my 14in. Murphy V240 set? While watching a programme recently, the screen suddenly went blank. The sound was not affected.

Previous to this occurrence the brilliance and contrast controls were set mid-way for a good picture. Now, with the brilliance full on and the contrast half on, the screen is still blank but there is a faint white outline of the faces or subjects on the screen. With the contrast also full on, the screen lights up but the picture goes negative. The picture does not blow up and the focus seems correct.

The line whistle is still there and I have checked the ion trap magnet for maximum brilliance. —H. Marshall (London, N.W.2).

The symptoms indicate a faulty C.R. tube, but we suggest that you check that the ion trap magnet has not slipped from its setting of maximum brightness before discarding the tube.

PYE VT17

Immediately the picture fills the screen it collapses into a vertical white line. If the set is left on, it keeps repeating this procedure. The EY86 goes out as the picture collapses. I have replaced this valve with no result. The sound is not affected.—D. Davies (Ronkswood, Worcestershire).

This fault could be due to an inter-electrode short on either the PL81 line output valve or else the PCF80 line oscillator, just outside the screened compartment. You may be able to check these valves by tapping them when the set is operating, when flashes and disappearance of the line scan will indicate the fault.

PHILIPS

After the set has been working for a while the picture starts to "blink," with a definite "blip" on the sound, on ITV. Moving the fine tuner cures this for a few minutes, but then it returns. None of the other controls will stop this fault. On BBC the picture tears to the left in about ½in. wide strip, anywhere on the screen, depending on the scene and camera (sometimes on close-ups the picture is perfect). The sound is perfect all the time.—N. Mylis (Bristol).

The line pulling experienced on BBC is purely due to reflected signals on the aerial and some adjustment will have to be made to the aerial to clear this effect. There is no adjustment which can be made to the set which can clear it except to reduce contrast (to weaken the interfering signal).

The blinking effect on the ITV channel could be a little awkward to eliminate as it is probably due to inadequate decoupling or a poor chassis return path. Try extra decoupling with a 0·001μF capacitor on all tuner unit leads and check chassis connections, etc.

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PRACTICAL TELEVISION, MARCH, 1962.

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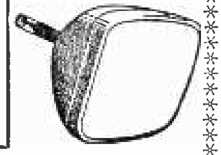

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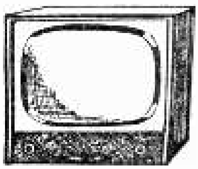

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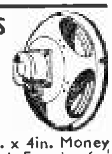

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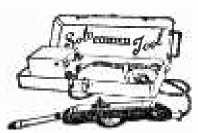

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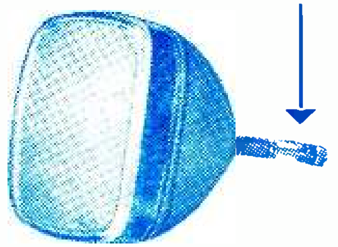

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