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Contents

Class Distinctions

WE once heard a professional service engineer remark that if it wasn't for people like readers of PRACTICAL TELEVISION he would soon be looking around for a job. His implication was, of course, that much of the work that came his way was due to the result of amateur "failures" or caused directly by the bungling attempts of absolute novices.

This sweeping conception of the abilities of the amateur enthusiast is not uncommon, and the subject is occasionally aired in print. In the U.S.A. the controversy often becomes very heated, especially in the pages of technical magazines. The problem, of course, is more acute in that country because, firstly, the business of servicing is on a different basis to that in this country and, secondly, because the do-it-yourself cult has inspired proportionately more laymen to tackle their own TV servicing. In the U.S.A., servicing is a *business* first; here it is, usually, a *service* first. In the U.S.A. servicing is divorced from selling; here it is usually an adjunct of a retail business.

However, we feel that critics of amateur enthusiasts often do them an injustice. It is useless to deny that there *are* amateur dabblers, whose enthusiasm (and optimism!) is not matched by their technical ability. But on the other hand, there are certainly one or two professional service engineers at large who bring little credit to their calling!

To be fair, these critics should remember that a large number of PRACTICAL TELEVISION readers are themselves from the servicing fraternity and others are engaged in the electronics industry. Even those to whom TV is simply a hobby cannot be indiscriminately graded as sub-standard! There are several reasons for this.

For instance, the information published each month in PRACTICAL TELEVISION is often a good deal more explicit and *practical* than can be obtained from the trade press or maker's service manuals. Service engineers are dismally aware of the decreasing space devoted to their interests in the trade publications. And service manuals are often too severely specialised to be of use except to the laboratory-standard workshop.

The keen amateur also scores by having to use more careful diagnosis, to revert to basic principles. Not for him the simple expedient of popping in a new valve from a well-stocked shelf. He tests before buying a replacement—he has to!

One great advantage of the professional is his familiarity with "stock faults", gained through handling sheer numbers of virtually-identical sets. The amateur works from basic principles, takes longer, but presumably learns more on the way.

Readers of this magazine gain from the experience of contributors who are themselves professional technicians—such as the new series beginning in this issue on "Stock Faults".

In this way we hope that we are helping to bridge the gulf between the two camps and provide a magazine not for the professional, not for the amateur, but for anyone who takes an intelligent interest in the subject of television. Away with these class distinctions!

Our next issue dated June will be published on May 22nd.

TELETOPICS

Tuesday Nights for Education on BBC-2

THE form of presentation of the regular BBC-2 educational feature "Tuesday Term", which was seen for the first time on April 21st, was decided upon only six months ago, at the beginning of November last year. In one way it was a revolutionary decision as for the first time in Britain, television transmissions at peak viewing times were to be used for serious, educational programmes instead of using off-peak viewing times during the morning or afternoon, as had always been the case with schools' programmes, etc., previously.

Although this new series will appear every Tuesday evening on the new u.h.f. service and will continue throughout the year without a break, the production teams who will be involved expect to find scope for improving the presentation as the series progesses and experience is gained in this, the first large-scale attempt in the U.K. at broadcasting educational programmes over a national television network.

A BBC film camera unit at work in a junior school preparing material for the new "Tuesday Term" series, Mathematics '64.

"Tuesday Term" will be televised between 7.30 p.m. and 9.45 p.m. with normally four separate programme subjects each week. Each subject will continue for a number of programme instalments and some of the titles which have already been announced are Mathematics '64, Men and Money and Power in British Politics.

The primary aim of the series is to provide people already in professions with the opportunity to refresh themselves on established information and to learn systematically of the most up-to-date developments and techniques in a variety of subjects. However the interests of the home viewer have been borne in mind in the preparation of the programmes, so that each may help to provide a new knowledge or understanding of the topics involved.

The programmes have largely been prepared in collaboration with recognised authorities and institutions in the educational world and a working party exists under the Chairmanship of Mr. John Fulton, Vice-chancellor of the University of Sussex, in an advisory capacity for the series. A special study-guide to accompany "Tuesday Term" is to be published every four weeks, to be issued on a subscription basis.

BRITISH STUDIO EQUIPMENT FOR IRAN

TV studio equipment for the government of Iran has been supplied by EMI Electronics Limited, under a contract negotiated in conjunction with Ampex International of Switzerland.

The Teheran studio has been equipped with EMI image orthicon television cameras and associated equipment. Included in the supply of the studio installations were transistor modular sound equipment, vision mixing consoles and several studio monitors. Equipment for an outside broadcast vehicle was also supplied by EMI as part of the agreement.

Ampex International supplied videotape recording equipment.

NEW CLOSED-CIRCUIT TV EQUIPMENT

TRANSISTOR and printed circuit techniques have combined in a new closed circuit television system, recently introduced by AEI's Electronics Group, to help make the equipment one of the simplest and inexpensive installations available to the numerous industrial and public authorities with whom CCTV is finding increased acceptance for a variety of applications. In its basic form, this new system comprises a camera and a control monitor, though this can be extended for multi-channel networks where necessary.

The high definition pictures which this system provides are controlled from the monitor when the basic set-up is used, or from a distribution unit for multi-channel work. In the latter case viewing monitors can take the form of conventional domestic receivers or video receivers.

One important feature of the new system is its portability. Both the camera and the 14in. monitor have relatively small dimensions and together they have a combined weight of only 34lb.

The equipment has a power consumption of 45W which can be supplied by a variety of sources from 250V mains to a 24V supply of two car batteries.

EDUCATIONAL TV CONFERENCE

A ONE-DAY conference on the Role of Television in Education was held during March in Norwich, Norfolk. This conference, which was organised by the East Anglia Region of the Independent Television Authority, was attended and addressed by educationalists and technicians actively interested in television aids to teaching.

The morning session of the conference was devoted to Television in Higher Education with Mr. Peter Laslett, Chairman of the Cambridge University Television Commitee, as the principal speaker. (The recent series of "Dawn University" programmes which were transmitted over the ITA network, was the product of Mr. Laslett's Committee). The second session, in the afternoon, covered Television in Schools and was addressed primarily by Dr. Lincoln Ralphs, Chief Education Officer of Norfolk County Council.

At both sessions, the principal speaker was supported by a panel of experts, including Professor Stanley T. Donner of Stamford University, U.S.A., and Mr. G. C. Allen of the Ministry of Education.

Under the Chairmanship of Mr. F. Thistlewaite (Vice-Chancellor of the University of East Anglia) the conference was well attended by representatives of educational bodies in East Anglia, of Anglia Television, the BBC, the G.P.O., the Marconi Company and the Pye Group, as well as a number of teachers from local schools.

CCTV at Harrow

AT a recent public address exhibition at Harrow, in Middlesex, EMI Electronics closed-circuit TV cameras linked two exhibition halls to a studio where various demonstrations of p.a. equipment were given. The demonstrations were televised by EMI type 8 cameras and relayed over the link to television receivers in the halls.

A dozen 15-minute programmes of demonstrations were transmitted during the two days of the exhibition.

British Relay Acquire Antiference

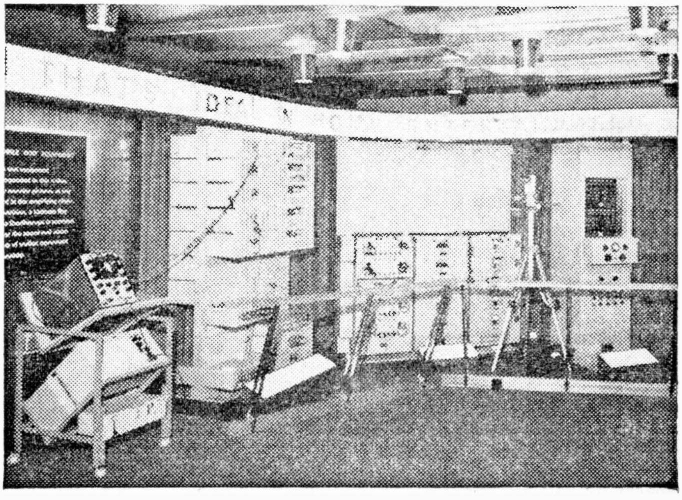
THE issued share capital of Antiference Installations Limited, has been acquired by British Relay Limited—a firm actively engaged in "piped" television systems—who have announced they will continue the business of Antiference as part of its Special Services Division, providing master aerial systems for TV and radio in multi-storey flats, hotels, etc.

It has also been announced that it is intended to change the name of Antiference Installations Limited to British Relay (Installations) Limited.

PIPED TELEVISION AT IDEAL HOME EXHIBITION

AT London's Ideal Home Exhibition, held recently at Olympia, the British Relay Organisation exhibited on their stand a fully equipped relay station of the type used in many towns and cities to "pipe" television and radio programmes direct to receivers in as many as 20,000 homes.

The stand (see illustration —right) was not just a static exhibit however, as during the period of the show the equipment was working to relay BBC-2 test transmissions and the regular TV programmes to receivers on the stand and in the lounges and offices throughout Olympia.



A ROTATABLE AERIAL

for improved DX reception

BY I. C. EWENS

WITH the interest recently aroused over the reception of Continental television programmes in this country many people will, no doubt, wish to be in a position to obtain the very best results when conditions exist for putting a usable signal down in their area.

As has been recently learned from articles published in PRACTICAL TELEVISION little modification is required to the dual standard sets to render them capable of receiving 625 line v.h.f. transmissions, and this leaves the aerial as perhaps the weakest link in the chain of reception.

Fig. 1—Showing how a swing through 180° enables the aerial to line up on transmitters all over the continent.

The aerial described in this article has been designed, built, erected and successfully operated by the author. There is, however, plenty of room for improvement, and no doubt readers will be able to add many refinements to what is really a very elementary rotatable array built in order to prove the advantages of rotation.

The aerial was designed to operate over the Band III spectrum in favour of Band I, as the reduced size and weight were an advantage in overcoming the initial problems of construction. However, long distance reception is more likely to be obtained on the lower frequencies of Band I and details are given to enable the enthusiast to build an antenna resonant in the middle of this band.

Height not a Vital Factor

It was decided to mount the array on a twenty foot pole, and it is interesting to note that in the case of DX signals height is not of great importance with directional arrays as the signals are reflected downwards. As will be seen from Fig. 1 whatever part of the country the receiver is situated in the aerial will only need to be rotated through 180 degrees to line up with any transmitter on the continent; this obviously simplifies construction considerably.

Reflection of v.h.f. radio waves takes place in the atmosphere at varying heights, and thus the aerial will need to be tilted up and down on its axis as shown in Fig. 2. Ideally the aerial should be so arranged that its polarisation could be changed, however this is not considered of paramount importance as in all probability the signals after having travelled many hundreds of miles will be neither one thing nor the other. Horizontal polarisation was chosen as the majority of continental stations use this mode of transmission.

The array must have good directional properties for there are many continental stations using the same channels, and co-channel interference has to be seen to be believed! This desired directivity is easily achieved by the addition of directors.

In efforts to keep costs to a minimum no expense must be spared in the interests of safety, not only to your own property and family but also to your next door neighbours.

Material Required

The method of construction of the support carrying the aerial is illustrated in Fig. 3, and the materials required are as follows:

Timber: 1 3ft. 6in. length of 2in. by 3in.
1 3ft. length of 2in. by 3in.
3 3in. hinges
1 2in. gate post hinge
3 $\frac{1}{2}$in. diameter bolts—length dependent on the diameter of the supporting pole.
Screws or nuts and bolts for fitting.

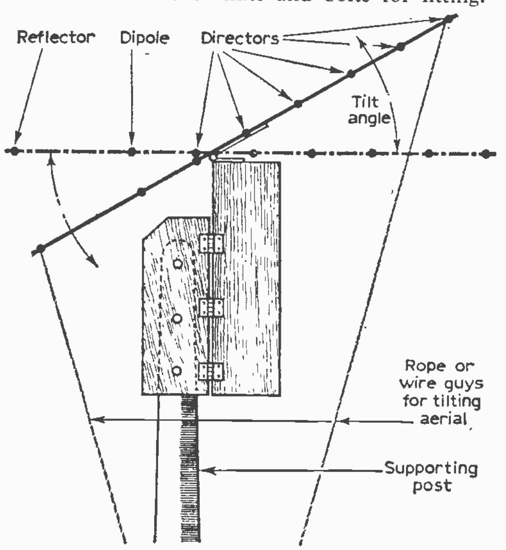


Fig. 2—Illustrating how the aerial tilts up and down on its axis.

Bolts should be used to support the hinges numbered 1, 2 and 3, but some difficulty may be experienced in obtaining them because of their narrow gauge. The wood screws employed by the writer for this purpose were 3in. long and 12 gauge, the same screws being used to support the gate-post hinge. Pilot holes should be drilled to avoid the wood splitting.

Construction of the aerial is made quite simple by the use of a 2in. x 1$\frac{1}{2}$in. batten as the boom carrying the elements, its length being dependent on the number of directors it is intended to use.

Other materials required are $\frac{3}{8}$in. or $\frac{1}{2}$in. diameter alloy or aluminium tubing, and if old aerial elements can be obtained so much the better. Screws, putty and lengths of plastic clothes line complete the requirements.

The Aerial Elements

A folded dipole is used to match the impedance of 75Ω coaxial feeder cable and it is suggested that eight elements be used, details of element spacing and size are given in Fig. 4 and tables 1 and 2. The data given is for a frequency approximately in the middle of each board. These measurements

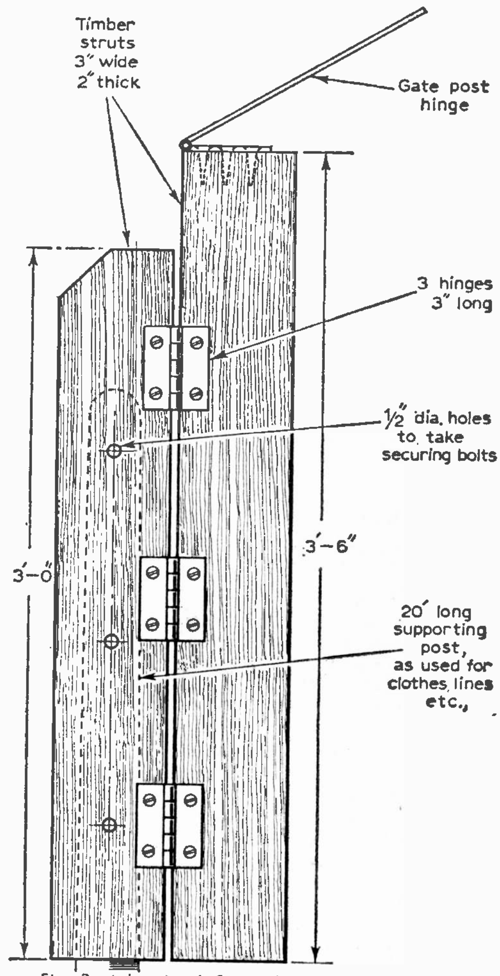
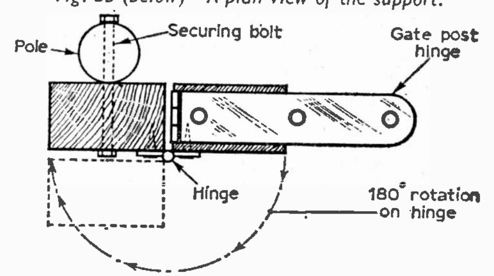


Fig. 3a (above)—A front elevation of the aerial support.
Fig. 3b (below)—A plan view of the support.



become quite critical at high frequencies so keep as near to them as possible.

In order to assemble the aerial, drill holes (as indicated in Fig. 4) to accept the elements, then secure them by drilling through the batten and element for the fixing screw.

In order to attach the aerial to the support, find

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RECONDITIONING TELEVISION RECEIVERS for resale

By F. Walker

THIS article is primarily intended for those who run small workshops in which general service work is carried out and in which second-hand TV receivers are brought up to a satisfactory working condition with a view to subsequent resale. The article will also be of interest to television enthusiasts who wish to recondition their own or friends' receivers. It is not intended for the beginner or the less informed.

Looked at from a businessman's viewpoint, the main idea is to show a profit after the receiver has been bought, serviced, and sold. And the amount of money that can reasonably be spent on the receiver is determined by the initial buying-in price and the estimated price it will fetch when sold.

As an example, if a set is bought for five pounds, another five pounds can be spent during reconditioning, if the estimated selling price is fifteen pounds. Note that the profit of five pounds in this case is for the work spent on the necessary repairs. Thus labour charges are not taken into account here since the labour payment can only be covered by the profit on the sale of the set; that is, if a fair and honest business is being conducted.

Here, the maximum amount that can be spent when buying the set is the sum of five pounds. If the buyer thinks the set might fetch twenty pounds on resale he can afford to spend rather more than five pounds.

One problem is how the buyer is to know that the set will only require five pounds spending on it to bring it up to good operational order? Quite simply it is the job of the buyer to examine the set in question and make sure it will not cost too much to repair, all the time being mindful of the price asked and the price it is expected to fetch when sold. Be wise and overestimate the cost of the repair rather than underestimate, because unforeseen things might go wrong with the set after it has had new components fitted; also damage could occur in transit, and such damage would have to be put right before resale, with additional costs.

When the set is being examined, note down the following points (these are in order of importance).

(a) Is the cabinet unmarked? If it is in poor condition it could put off an intending buyer (that is, the final purchaser) and consequently lose a sale. The external appearance of a TV receiver is the most important factor of all since it is the first thing the customer will see when you show it to him. No one can expect a second-hand TV to be perfect, but it is up to the buyer to separate the lemons from the cream-puffs.

Later on mention will be made about renovating cabinets that are not too badly marked. Don't forget, however, that a set offered at a ridiculously low price because it has a bad cabinet may still be a worthwhile proposition if the chassis and tube are in good order.

(b) Is the picture tube good? This can be easily checked by visual examination. The symptoms of a failing tube are classic, i.e. lack of high-lights, sometimes with loss of focus. If the set has had a booster transformer or some other part fitted to improve the emission of the c.r.t., then the set is certainly a candidate for a reconditioned tube. In such circumstances the buying-in price will have to be low to make the set a worthwhile proposition. It is definitely unwise to attempt to resell a set with a boosted tube since the heater will almost inevitably blow or fuse in a short while, and the customer will think rightly or wrongly that he has been " done ".

(c) Has the set been in the hands of a meddler? There are many fiddlers and dabblers who really do not know what they are doing, and it quite often involves considerable time and money to correct their misguided attempts to fix a faulty receiver, apart from any original fault that may be present.

For instance, all the vision i.f. transformers may have been peaked to counteract poor sensitivity, when the trouble was really a low emission valve in the tuner. You can easily recognise the dabbler's set: smeary pictures, sound on vision, vision buzz on sound, missing back and chassis screws, missing e.h.t. and valve cans, pieces of badly soldered wire all over the chassis, broken ion-trap magnets from over-tightening, etc., etc., these are some of his hallmarks.

(d) How old is the set? There is no sense buying 10, 12 and 14in. receivers. They are obsolete. Equally, the old BBC-only sets are out as far as we are concerned. It is a matter of opinion, of course, but generally speaking, sets over five years old are best avoided as most valves and components will be in a poor state anyhow.

Also console receivers seem to be less " saleable " than table models, and probably this is why no manufacturer sells console models nowadays. After all, just screw in four contemporary legs to a table model and it becomes a consolette which is adequate for most people wanting a floor-standing model.

(e) What make is it? And this is a vexed question! All experienced servicemen will know just what is meant by that. There are some makes to be avoided like the plague, but unfortunately they cannot be mentioned. One make was known to have an almost consistently troublesome frame circuit, suffering from persistent and very annoying frame jitter no matter how the hold control was adjusted. Another always seemed to be full of bad or totally unsoldered joints. Yet another had to have a replacement line output transformer fitted just to replace the e.h.t. rectifier, because the transformer was oil-filled (and this is a comparatively recent set). Obviously the experience of the buyer counts heavily in this field.

There are different ways of obtaining suitable sets for reconditioning, (e.g. " for sale " adverts in the local paper) but probably the best way is to become friendly with one or two retail television shops. They take a large number of second-hand TV's in part-exchange for new models, and most will be quite happy to get back the price they have allowed in the part exchange deal, especially if you offer cash.

The shops aren't usually interested in selling these older sets in the showrooms because all the space is taken up with new models, and they regard second-hand sales as bad for their own particular business anyhow.

As a rough guide, the average allowance for the old set in part-exchange is in the region of five pounds, but this is only a general figure. 21in. sets will be worth rather more. 23in. and 19in. receivers are a comparatively recent development and it is unlikely these types will become available to recondition for a year or two.

The subject of buying-in has been aired; we come now to the actual reconditioning process itself. It must be borne in mind that the set will be offered for resale with a guarantee (one month is a fair period) so we must be careful to ensure all faulty parts in the set are properly replaced and a professional repair is carried out.

Obviously the set should work properly immediately on installation at the customer's home. If it does not, or faults keep appearing, the customer will be annoyed, and he will almost certainly pass the word among his friends that you are unreliable. A few such remarks could rapidly dirty your reputation for quite a long time and it is prudent to remember always to give the customer a good impression of your unfailing reliability and efficiency.

Concerning cathode ray tubes, it goes without saying that the replacement tube in a reconditioned receiver, if such receiver is to have another tube, should itself be reconditioned. There seems little point in using new tubes as replacements, especially from the profit angle, unless new tubes can be obtained at the same price as the regunned types. The regunned tubes are just as good as the new (all working parts are renewed, including the phosphors) and some are even better, being guaranteed longer—some in fact for eighteen months.

The serviceman may have on hand one or two fairly good used tubes salvaged from burnt-out sets etc., and if these are definitely known to be in a reasonable working condition there is no reason why they should not be used as replacements.

The chassis should be made free of all faults; no explanation is required for the service man since this is his job, and it is not proposed to go into the method of chassis repair as this subject is way outside the scope of this article. In any case, if you can't repair TV's you shouldn't be reading this!

When the set has been bought, the buyer will quite naturally have assured himself that the cabinet is in a fair state or is at least capable of being renovated. A useful product for removing the light scratches all sets have somewhere or other is "Scratchoff", a well-known scratch-removing polish. It is manufactured by Messrs. A. C. Farnell Ltd., Hereford House, Vicar Lane, Leeds, 2, and it costs 3/- per tube retail. No applicators are needed as it has a wick at the top of the polythene case. The majority of minor scratches will be effectively eradicated by this product, but it must be realised that it won't fill dents and chips, neither will it remove deep score marks or cigarette burns.

Cabinets with this more serious damage will have to be stripped and recellulosed or relacquered. Most small service workshops will not have adequate facilities for this kind of work; the best plan under these circumstances is to send the cabinet to a professional spray shop (completely stripped of all parts, including loudspeakers) where proper equipment and controlled drying conditions will be available.

The cost of a cabinet repolish will be in the region of one or two pounds (for a table model); there is no call for spending more on this job, principally because we have to have profit margins in mind. There will be certain cases, however, where more expenditure would be justified, mainly late models with polyester finishes.

When the set has been renovated completely it ought to be soak tested for a day or so to be quite sure no unforeseen fault develops and to see that intermittent troubles do not rear their ugly heads. It is imperative to be as careful as possible that the set will not go wrong whilst in the customer's home, the idea being to sell the set and never go back to it for at least a year or so. Watch this point and keep an unsullied reputation. The guarantee can be worded something like this:

> **Joe Bloggs, Radio and Television Engineers**
> *Telephone: Anyplace 54321*
> **Guarantee**
>
> For Clearvue 17in. table model television receiver type ABC123, serial no. XYZ123-321.
>
> This receiver is guaranteed for a period of one calendar month from date of purchase against faulty workmanship in our reconditioning processes, provided that:
>
> (a) Notification is made to us of purchase within seven (7) days of the date of that purchase.
> (b) The mains voltage selector in the receiver is correctly set to suit the mains voltage supply to which the receiver is connected.
> (c) No unauthorised person or the purchaser himself tampers with the interior of the receiver, excepting the above mentioned mains voltage selector and the subsidiary controls.
>
> If clauses (a) (b) (c) are violated the guarantee at once becomes invalid.
>
> The guarantee does not cover fire, theft, damage in transit, flooding and lightning.

After considering financial aspects, buying only sets suitable for reconditioning, actual reconditioning itself, and writing or typing a proper guarantee, there remains the most important aspect of all, i.e. the question of selling it. This selling business deserves more thought and ingenuity than all the processes and operations described. After all, the work spent on the set comes to naught if you can't sell it.

Fortunately there are various well tried methods; drinking men can pass the word around in their

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CONTINUED FROM PAGE 315 OF THE APRIL ISSUE

CHANGING CATHODE RAY TUBES

PART 2: EKCO, DYNATRON AND FERRANTI MODELS

By H. Peters

As mentioned in the first article of this series, the number of different models produced by the Ekco Group has increased annually over the period under review. Fortunately the basic chassis has changed very little, and apart from small variations due to cabinet design, detailed instructions for a handful of basic types will enable the majority of readers to change their tubes without difficulty.

Some models, usually 23in. consoles of limited issue have been omitted, and readers wishing to check upon the drill for replacing tubes in these should take advantage of our queries service.

To find the instructions applicable to your own model simply look it up in the index and refer to its Basic Type in the text, together with the additional notes indicated in the next column.

Basic Type TP308

Unplug receiver and lay it face downwards on a cloth. Remove two rear feet and two screws between them and the front feet. Undo the two screws at the top of the case behind the control panel, lift the case up a little, unplug the loudspeaker and lift the case right off. Remove the screen mask (two screws at the bottom) and the top section (three screws and the Channel Selector and Fine Tuner knobs).

Disconnect the e.h.t. and base connections to the tube and remove the ion trap magnet. Remove the picture positioning assembly and loosen the scancoils. Unclamp the tube and mask and withdraw forward, taking care not to damage the scancoils, which should be eased off gradually.

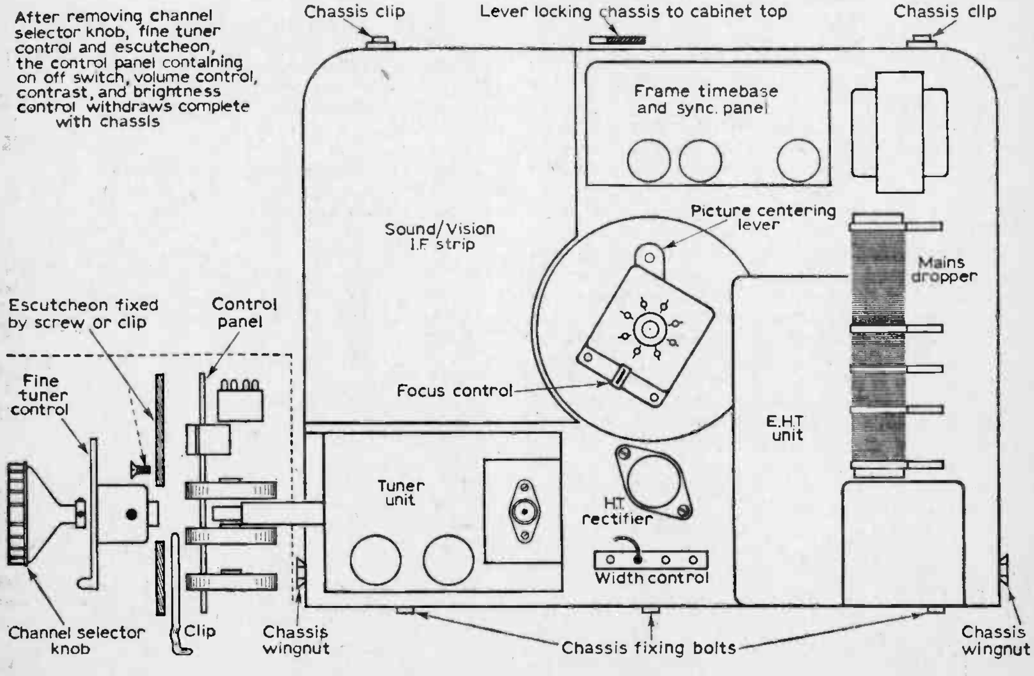

Fig. 1—The basic chassis arrangement of the models covered by this month's article

After reassembly ensure that the ion trap magnet is adjusted for maximum brightness regardless of picture positioning.

Basic Type T344

Unplug the set and take off back and bottom covers. Remove the Channel Selector and Fine Tuner knobs. The Channel Selector knob is held by two grubscrews accessible via a small hole in the Fine Tuner shank just inside the cabinet. The Fine Tuner knob pulls off. Remove the side control escutcheon (one screw) and clip the control panel to the chassis side. Unplug the speaker and remove the 2B.A. screws fastening the cabinet to the chassis bottom. The chassis will then slide out backwards.

Remove the base connector and e.h.t. connector from the tube, slacken the brass clamp behind the scancoils (if fitted) and slacken the nuts on the sides of the band clamping the c.r.t. bowl. Withdraw tube, checking that the scancoils remain undamaged. Clean and replace in reverse order.

NOTE 1.—Some sets have concentric extensions between the Channel Selector and Fine Tuner knobs and the tuner. These and their support bracket need to be removed after the Channel Selector and Fine Tuner knobs.

NOTE 2.—The window and frame on the 17in. Table models is held by five screws inside the cabinet. It can be removed with the chassis in situ, but the work is a lot easier if the chassis is withdrawn first.

NOTE 3.—The window on 17in. Consoles slides down through a slot in the bottom after two wingnuts have been slackened and the metal plate slid clear of the window slots. Do this with the set face down on a cloth.

NOTE 4.—The window on 21in. sets is removed by pulling out the p.v.c. strip at either side and removing the six screws holding the window to the cabinet.

NOTE 4a.—On 21in. Table sets with side mounted speakers, the speaker needs unplugging and removing before the chassis can be withdrawn.

Basic Type T368

Unplug the set and remove back and base covers by giving a quarter turn to each of the four polythene plugs. Remove Channel Selector and Fine Tuner knobs as per T344.

The tuner escutcheon is released by pulling out the phosphor bronze clip through the set bottom. Loosen the two wingnuts at the back of the chassis and move the locking lever at the top of the chassis to the right. The cabinet then lifts off forwards and upwards. The tube is then removed as per T344, paragraph 2.

NOTE 5.—The window removes after its side clamps have been released. These are held by screws hidden by the plastic trim, which is secured by a woodscrew and spring clip beneath the cabinet base. Do this with the set face down on a cloth.

NOTE 5a.—Window removal is by taking out the three bronze screws on the gilt strip each side of the cabinet front. This exposes the two window clamps which are removed, thus releasing the window.

INDEX FOR PART 2

Model	Basic Type	Extra Notes	Identification*	Nearest Ferranti
TP308	TP308	6	14" P.	TP1009
T342	T344	4 & 4a	21" T.	T1034
T344	T344	2	17" T.	T1023
T344F	T344	2	17" T. F.	T1023F
T345	T344	2	17" T. v.h.f.	T1024
T346	T344	1 & 3	17" C. v.h.f.	TC1025
TP347	TP347	6	17" P.	TP1026
T348	T344	4 & 4a	21" T.	T1027
T348F	T344	4 & 4a	21" T. F.	T1027F
T356	T344	4 & 4a	21" T. v.h.f.	T1034
T368	T368	5	17" T.	T1046
T368F	T368	5	17" T. F.	T1046F
TC369	TC369	—	21" C.	TC1047
T370	T368	5	17" T. v.h.f.	T1048
T371	T368	5	21" T.	T1049
T371F	T368	5	21" T. F.	T1049F
T372	T368	5	21" T. v.h.f.	T1050
TP373	TP347	6	17" P. v.h.f.	
TC374	TC369	—	21" C. v.h.f.	TC1052
T377	T368	5a	19" T.	T1055
T377F	T368	5a	19" T. F.	T1055F
T380	T380	8	19" T.	T1057 T1061
T380F	T380	8	19" T. F.	T1057F T1061F
T381	T380	8	19" T. v.h.f.	T1058
TC382	T380	7 & 8	19" C.	
TC382F	T380	7 & 8	19" C. F.	
TC383	T380	7 & 8	19" C. v.h.f.	
TC386	T380	7, 8, & 10	19" C. M/T.	TC1063
TC386F	T380	7, 8, & 10	19" C. M/T. F.	TC1063F
TC388 } TC388F }	T380	7 & 9	23" C.	
TC390	T380	7, 9, & 10	23" C. M/T.	T1068
TC390F	T380	7, 9, & 10	23" C. M/T. F.	T1068F
T402	T402	11 & 12	19" T. 405/625	T1075
TC403	T402	11 & 12	19" C. 405/625. M/T.	
TC404	T402	11 & 12	23" C. 405/625.	
TC406	T402	11 & 12	23" C. 405/625. M/T.	
T407	T407	11 & 12	19" T. 405/625.	T1084
T407F	T407	11 & 12	19" T. F. 405/625.	T1084F
TC408 } TC408F }	T407	11 & 12	19" C. 405/625. F.	TC1085 TC1085F
T409 } T409F }	T407	11 & 12	23" T. 405/625. F.	T1086 T1086F
TC410 } TC410F }	T407	11 & 12	23" C. 405/625. F.	T1087 T1087F
T415 } T415F }	T407	11 & 12	19" T. 405/625. F.	
T418 } T418F }	T418	11 & 12	19" T. F.	T1093 T1093F
T418T } T418TF }	T418	11 & 12	19" T. F. u.h.f. tuner	T1093T T1093TF

N.B.—Where the receiver model number is suffixed /P this indicates that a printed panel has been fitted in place of conventional wiring in the i.f. section.

* Key to model identification: P=Portable, T=Table, C=Console, F=Fringe area, M/T=Motor tuned.

Basic Type TC369

Unplug set and remove back and base. Remove Channel Selector and Fine Tuner knobs with extension spindles, as per T344, paragraph 1 and Note 1. Remove the side escutcheon (one wing-nut). Slacken the two wingnuts securing the chassis bottom. Move the locking lever at the top to the right and withdraw the chassis backwards and downwards through the cabinet. Proceed with c.r.t. removal as per T368.

Window removal: Remove the two tambour door stops inside the cabinet and push the doors further back than usual. Remove the 4B.A. screws thus revealed. This will release the curved window and its clamps.

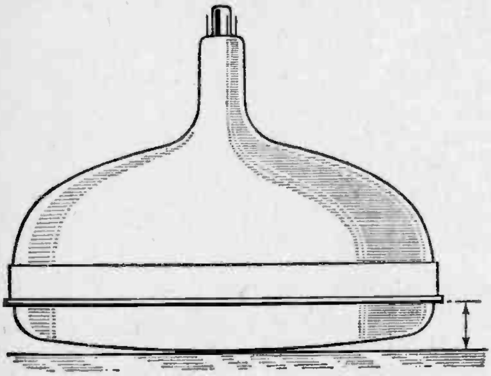

Fig. 2—The arrowed line indicates the critical measurement for tubes held to the cabinet front.

Basic Type TP347

Unplug and lay face down on a cloth and remove the four plastic feet. Hinge up the back cover, remove the wrap-round side, erect the set and hinge up the front cover. Remove c.r.t. base and e.h.t. connectors, slacken scancoil assembly and unclamp front of the tube, which will withdraw forward complete with window and plastic mask.

NOTE 6.—To remove the window, unbox as above, slacken cord around plastic mask and prise window out of mask.

Basic Type T380

Unplug the set and remove the Channel Selector knob. This is held by a spring loaded key which may be released by setting the u.h.f. position to 11 o'clock, and pressing down on the spring with a knife blade inserted behind the Channel Selector knob at the top.

Invert the set on to a soft cloth and remove its feet, which are screwed into the feet mounting brackets. Then remove the feet mounting brackets (four self-tapping screws) which allow the base cover rail and base to be removed. Remove the back, unplug the loudspeaker and remove the control panel, which is held to the cabinet by wingnuts. The chassis is held into the cabinet by four screws at the bottom and one at the top. These should all be removed and the chassis slid out of the cabinet.

Lay the chassis face down, remove c.r.t. base and anode connections, remove the magnet assembly from the tube neck, noting order in which parts are fitted. Remove the plastic disc from the end of the scancoils, slacken the bolts from the side of the tube bowl and lift chassis and scancoils clear of the tube. When reassembling, make sure that the spring clip is in good contact with the c.r.t. aquadag, and that the magnet assembly is pushed well forward with the scancoils.

NOTE 7.—On consoles, proceed as above, but remove legs and leg mounting brackets instead of feet and feet mounting brackets.

NOTE 8.—Window Removal: Prise out the styling strips above and below the screen and remove the four screws thus revealed.

NOTE 9.—Window Removal: Remove three 4B.A. screws below bottom window clamp. Lift window forward at bottom and slide it out of the top clamp.

NOTE 10.—Push-button Unit: This is held by two 4B.A. screws which should be removed at the same time as the Control Panel wingnuts.

Basic Type T402

Unplug set and remove back. Remove Channel Selector knob (two grubscrews inside the cabinet). Lay cabinet face down and remove legs if fitted. Remove the two 2B.A. screws at the top edge of the chassis and hinge it down. Take out the two wingnuts holding the control panel to the cabinet and unplug the loudspeaker. Remove the tube base holder, unplug the scancoils and e.h.t. lead.

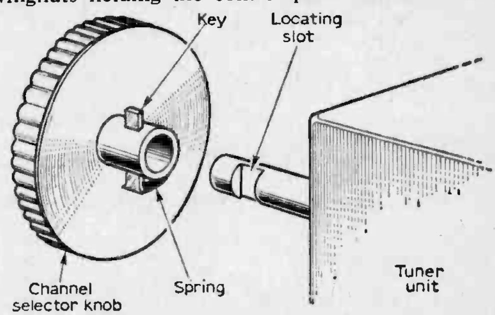

Fig. 3—The channel selector knob of the T380 group of receivers. The key should be pressed down with a knife blade to release the knob.

The chassis may now be lifted clear of its mounting brackets, leaving the tube assembly attached to the cabinet. This is then removed after undoing the four clamps around the tube strap. Remove the scanning assembly after slackening the clamping screws around the tube neck, remembering the order of the various parts for reassembly, unclamp the tube from the window. Clean all parts before reassembling in reverse order.

Basic Type T407

Unplug the set and remove back, remove Channel Selector knob, as per T380, undo control panel from chassis and take out u.h.f. tuner if fitted. Unclip and take out the loudspeaker. Hinge the chassis outwards from the right after removing top and bottom right-hand corner screws. (The polythene strap and switch linkage from tuner to chassis should have first been disconnected if it is fitted up—usually it is not.)

Remove the circlip at the top left corner of the chassis and the 4B.A. nut and washer from the lower l.h. chassis mounting block. Remove c.r.t. base, e.h.t. and scancoil leads and the black lead from the tuner to the i.f. panel. The chassis may now be lifted out. Remove and replace c.r.t. as per paragraph 2 of Model T402.

Basic Type T418

Unplug and remove back. Remove 405 Channel Selector knob as per T380 but with u.h.f. point at 7 o'clock. Pull off the fine tuner extension spindle. Remove control panel and v.h.f. tuner (four 2B.A. nuts). Unclip and remove loudspeaker.

Remove c.r.t. base, e.h.t. lead and scancoil plugs and unscrew the chassis fixing screws at the top (two) and bottom (four) of the chassis and lift out the chassis. Lay set face down and remove c.r.t. cradle and tube as per paragraph 2 of Model T402.

NOTE 11.—From T402 onwards the tube assembly is mounted to the cabinet as opposed to the chassis as hitherto. It is perfectly possible for the manufacturer to fit a twin panel tube in later production of these models. If this happens, proceed as for the basic model up to and including the removal of the scancoils. The c.r.t. is then changed over, making sure that the chassis clamps seat comfortably and firmly over the corner lugs of the tube's bonded panel.

NOTE 12.—Where c.r.t.'s are mounted to the cabinet, the measurement from the front of the tube face to the clamping band (see Fig. 2) is important. Measure the old tube in its clamp before unclamping, and make sure the new tube is mounted similarly.

Dynatron Receivers

These receivers employ a similar chassis to the current Ekco range of the same year, and the basic principles in c.r.t. tube changing, window removal, etc., are similar. More ornate cabinets are usually provided, and this involves the provision of modified control panel assemblies, etc., but it is generally possible to replace the tube by using the instructions for the relevant Ekco set. Near equivalents are as follows:

TV36 and TV37 (Belvedere)	=	T344
TV36F and TV37F	=	T344F
TV38 and TV40	=	T345
TV45 and TV46	=	T368
TV45F and TV46F	=	T368F
TV46V	=	T370
TV48	=	TC379
TV49F	=	T371
TV52 and TV53	=	TC368
TV56 (Richmond)	=	TC390

Ferranti Models

As with the Dynatron range, the main difference between the Ferranti and Ekco models of the same year is cabinet styling. With minor exceptions, the equivalent Ferranti model given in the right-hand column of the index should lead the reader directly to the correct instructions to enable the tube to be replaced. It does not follow that the chassis is electronically identical, although in many cases it is.

Next month Part 3; Pye models

RECONDITIONING TELEVISION RECEIVERS

—continued from page 345

" local ". Working men can do the same around their works. Adverts can be placed in the local newspaper. Some reject-stock dealers will be happy to place your sets in their windows for a small commission. Auction and sale rooms are always available (the fee in this case will be some 15%). All these methods and many more can be employed by the man who does not have a shop of his own.

Miscellaneous hints and tips

1 If the c.r.t. mask in the receiver is so dirty it can't be cleaned properly, it can be re-sprayed very effectively indeed by using a " Holts " aerosol can of grey matt primer, available from Messrs. Halfords' motor accessory stores.

2 " Windowlene " is an excellent preparation for cleaning armour-plate face glasses and c.r.t. screens.

3 The best way to clean the receiver chassis and cabinet is to use a vacuum cleaner arranged to suck as normal, and a new 1in. paint brush to disturb the dirt so that it goes up the nozzle.

4 " Min " cream furniture polish gives a good cabinet shine.

5 Dirt in fluted control knobs can be removed quickly and easily by using a fine-wire scratch brush in an electric drill.

6 A record of the model and serial numbers should be retained in case the set should be stolen.

7 Reconditioned tubes whose neck diameter seems somehow a little oversize can be eased into the scan coils with " Vaseline " petroleum jelly.

8 It is almost essential to have a van or car with a large boot to transport the TV receivers.

9 " Electro-lube " fluid is just about the best available for cleaning noisy volume control sliders.

10 Don't throw away those old tubes—some re-gunning firms allow 15s. if you send them back for reconditioning.

11 And don't leave those old tubes lying about; put them in cardboard boxes—they can cause serious injury if they implode.

12 Replace any missing back or bottom cover screws. It sounds an unimportant point, but you could be involved in a legal claim if someone is killed by electrocution from one of your sets.

13 Make sure the set has adequate sensitivity. It may be going into a weak signal area.

14 Don't use second-hand valves as replacements, they always seem to go wrong in another set.

15 Never attempt to re-polish a cabinet if you haven't the experience and equipment. The results are nearly always disastrous.

16 Don't expect to make fantastic profits! ■

ON THE AIR
Amateur Band Topics

STATION SET-UP FOR A DEMONSTRATION TRANSMISSION

AN ambitious station layout which was used recently by G3LGJ/T in an amateur TV demonstration programme transmission from his home QTH to the Slade Radio Society, four miles away, is shown in the block diagram Fig. 1 below. The equipment used was described in general terms in the introductory article on amateur television transmitting which appeared in last November's issue.

Two rooms were used, one as a studio and the other housing the transmitters, operators and equipment. Quite a large amount of space was occupied.

A sound mixer in the studio supplied a low impedance sound feed to the transmitter of studio sound and taped effects. The high-level sound input feed on the sound transmitter was used for this feed and enabled the transmitter operator to fade his own microphone and bring up studio sound and vice versa.

Three cameras were used, one together with an 8mm cine projector provided a telecine source, the other two as subject cameras, one of which dualed as a caption camera. Each camera fed its own monitor for previewing, etc., and the outputs of the vision distribution amplifiers (v.d.a.) were connected to a three push-button camera cutting switch to provide a single vision feed to the transmitter. Note that the vision distribution amplifier outputs are always terminated by 75Ω at the end of their respective cable runs, independent of switching.

At the transmitter the operator had a single monitor which could be switched to view either the incoming vision feed or the r.f. output of the transmitter.

Many amateur TV programme schemes have been successfully planned and operated by BATC members over the last few years. The larger studio-type layouts can only be assembled using equipment loaned by several TV amateurs. Of course equipment is not all that is required for these events—all the associated operators must pull their weight—and there is no doubt that operation of the equipment is half the enjoyment of amateur television.

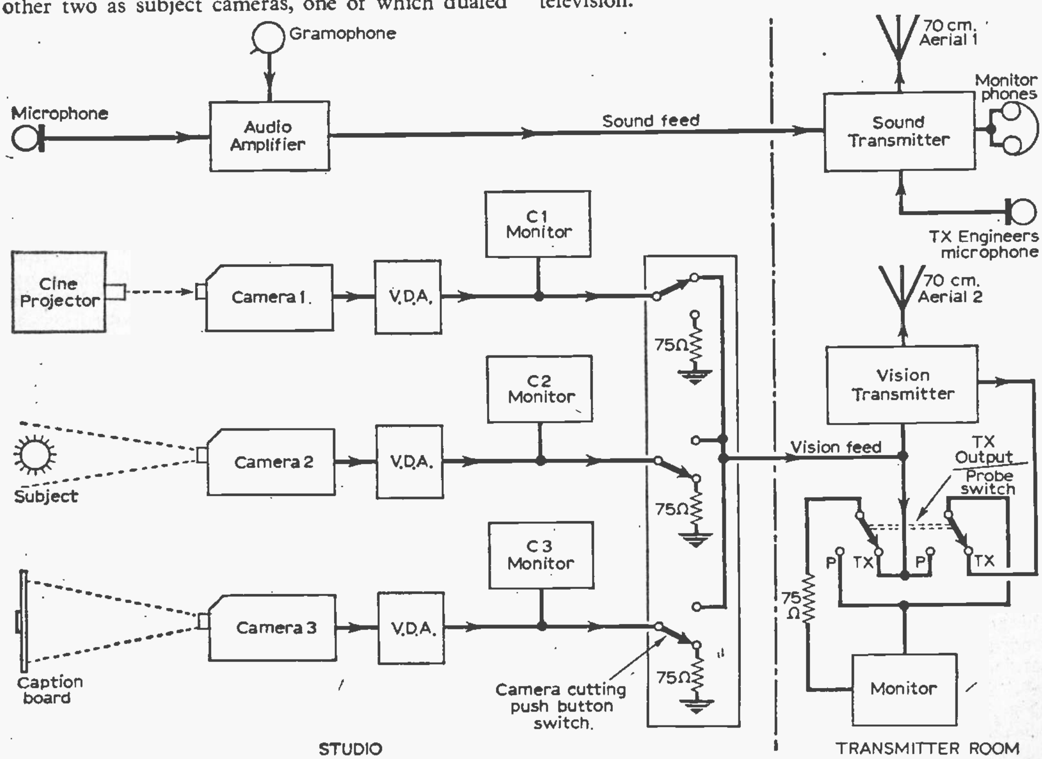

Fig. 1—Block diagram of the station equipment.

DX-TV

A MONTHLY FEATURE FOR DX ENTHUSIASTS

by Charles Rafarel

THIS month we will first of all continue with the problem of station identification. Many beginners will have heard of the "old hands" whose logs of stations in Bands I and III alone are in excess of 100 different stations and they may well be wondering how this is achieved when the total of available channels is only slightly in excess of 50.

These high scores are possible for three main reasons. One that we have already mentioned is the possibility of reception of a DX station on a certain channel when a nearer co-channel transmitter is not operating.

Another reason is "Floating Images", a term which needs a few words of explanation for the newcomer. Suppose, for example, under good ionospheric Sporadic E conditions we are receiving a good signal from Ostrava, Czechoslovakia, on channel OIRTI when suddenly, without any reduction in strength of the Ostrava testcard, a second somewhat weaker testcard appears, travelling forwards across the screen from left to right and then from right to left.

This second image under good conditions will be quite complete and perfectly "locked" but it will move as a whole across the screen and it may well be sufficiently clearly defined for us to identify it as, say, the testcard of Budapest, Hungary. So we have in fact received two countries at the same time!

It can also happen, due to changes in propagation, that the second testcard received becomes stationary on the screen and the original one becomes the "floater". This principle of two stations on the same channel need not only apply to two different countries—it can also apply to two different co-channel stations in the same country; for example, RAI, Monte Nerone, Italy, and RAI, Monte Caccia, Italy, both on channel IA, are often received in this way.

This method is also applicable to tropospheric reception in Bands I and III as well as Sporadic E/Ionospheric. It is also possible to receive more than two stations on any one channel, for example, the main image and two floaters have been received here from RAI Italy on channel IA in the form of Monte Nerone, Monte Caccia and Monte Cammarata. In this case all three were transmitting the same testcard.

So watch your screen carefully—there may be even more than two pictures on at the same time!

The third factor of help is to make use of the directional properties of the aerial array. If the receiver is tuned to a certain channel it may be possible to receive different pictures from different directions by rotating the aerial. As these signals emanate from different transmitters, reference to the aerial direction can give us a lead as to the transmitter's direction. Readers are referred to the article by I. C. Ewens elsewhere in this issue.

Coastal Trouble

A phenomenon recently brought to my notice by a Belgian DX/TV colleague may be of particular interest to British DX/TV experimenters who live near the coast.

A number of Belgian viewers in coastal areas rely on the Belgian/French TV service from Brussels Wavre channel E8, Band III, some 100 miles distant, and, while reasonable reception is normally possible, at times the signal strength fell well below acceptable level for days at a time, even during apparently good propagation conditions (i.e. high barometric pressure and dry weather).

At last one DX/TV amateur found the explanation. It was due to the prevailing wind bringing in salt deposit from the sea which lodged on the aerial arrays—the use of a hosepipe on the aerial cleared the trouble! Less enlightened domestic viewers found their pictures improved after a shower of rain.

I myself live in a seaside area and in future I shall pay attention to this point before assuming that the receiver has suddenly gone "low" or that propagation is not, at least in parts, predictable, and I shall be "watering" my aerial arrays! Other readers in seaside areas might note this possibility.

Setting Up Line Holds

I have spoken previously about setting up a receiver on a certain channel and leaving the receiver running so that if and when short duration Sporadic E signals arrive we are ready to see them without having to wait for the receiver to "warm up". Here are a few tips on how to adjust the line

—continued on next page

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hold for both 625 and 819-line reception, in the absence of Continental reception, by reference to the BBC and ITA testcard.

With a locked testcard image on 405 lines and the receiver switched for positive modulation, advance the line hold control to increase line frequency. At 625 lines you will see two centre circles of the testcard with the perimeters just touching each other, and at this point there will be a fairly wide grey vertical bend down the picture. Continue advancing the line hold very slightly until the locked image just breaks to the right; you will then be adjusted to 625 lines and you can switch to negative image by means of your changeover switch.

For 819 lines proceed as before but increase for line speed until you see two locked semicircles (parts of the original centre circle of the testcard). The two semicircles, one at each side of the screen with the curved portions pointing horizontally inwards, are about half of the width of the screen apart. When set up in this condition the receiver is adjusted for 819 lines positive image.

D X News

Yugoslavia is at last listed as having a Band I TV transmitter. The station is at Kapoanik, near Belgrade, and operates on channel E3CCIR, 100kW e.r.p., and it has already been received here.

We have had a most interesting letter from Mr. M. McNamara, of Dublin, who reports an interfering signal on his "local," Telefis Eireann, Dublin, channel B7. This consists of a testcard bearing a Union Jack motif. In my opinion this could be a "pirate" and I am in touch with Telefis Eireann about it, but no reply to date! Has anyone else picked up this one? We should be pleased to hear about it. ■

Rotatable Aerial

—continued from page 343

its approximate point of balance and attach the gate-post hinge with bolts so that when it is free it closes to lie flat and *not* open and point skywards. Plug the ends of the elements with putty to stop water entering and to prevent the tubing vibrating in the wind. In the interest of safety attach a length of plastic clothes line to the boom of the aerial and also to the supporting pole, so should the unforeseen happen and the aerial break at the joint it will be prevented from reaching the ground.

Only two control lines are necessary to control the two-way movement of the aerial. Though very simple and extremely effective, it is, of course, open to improvement. There is no reason why a system of pulleys and wheels could not be adopted for remote control of this aerial. Two electric motors could be employed, in fact endless possibilities exist and there is much scope for the amateur designer.

TABLE 2

BAND III ELEMENT SIZES AND SPACING

Element Lengths	Element Spacing
Reflector 31in.	Reflector—Dipole 15½in.
Dipole 28in.	Dipole—Director 9½in.
Director 1 27½in.	Director—Director 9½in.
Director 2 26½in.	
Director 3 25½in.	
Director 4 24½in.	
Director 5 23½in.	
Director 6 22in.	

Material: ⅜in. dia. alloy or aluminium tubing.

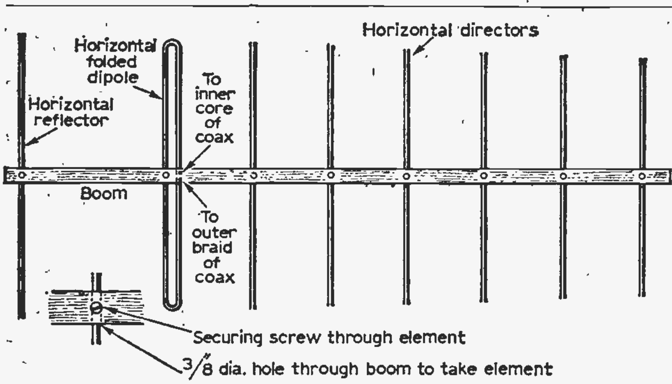


Fig. 4—Assembly details of the array.

TABLE 1

BAND I ELEMENT SIZES AND SPACING

Element Lengths	Element Spacing
Reflector 108in.	Reflector—Dipole 54in.
Dipole 101in.	Dipole—Director 32in.
Director 1 96in.	Director—Director 32in.
Director 2 94½in.	
Director 3 92in.	

Material: ½in. dia. alloy or aluminium tubing.

CAUTION

Before r.f. transmission of pictures can be contemplated, the operator will require an Amateur Television Licence. This licence can be obtained by a British subject who has passed the Radio Amateur's Examination. No morse test is required. For further particulars on this subject write to the Radio Services Dept., General Post Office, Headquarters Building, St. Martins-le-Grand, London, E.C.1.

for 70cm ham band A Switchable SOUND/VISION TRANSMITTER

By B. W. Smith, G3LGJ/T

This is a low power transmitter suitable for the newly licensed TV ham. The input to the final stage is 25W.

The G.P.O. licensing conditions require amateur TV stations to transmit their callsigns by c.w. or phone as well as by the video signal, although not necessarily simultaneously. Therefore the equipment to be described in this present series has been designed for sound or vision operation. The mode of operation is selected by a sound/vision switch.

CONTINUED FROM PAGE 311 OF THE APRIL ISSUE

LAST month's article dealt with the construction of the two chassis. In this connection it only remains now to provide diagrams showing the component layout and wiring.

Fig. 9 is an underside view of the main chassis. This diagram should be studied in conjunction with the top view given in Fig. 3 last month. As will be noted from the remarks in the caption Fig. 9 is not entirely complete wiring-wise but it is only necessary to refer to the circuit diagrams (Fig. 1 and Fig. 8) in order to complete all the connections.

The vision modulator chassis layout is given in Fig. 10. This diagram, together with the circuit diagram Fig. 2 and the details in the text in last month's article, adequately covers the construction of this second chassis.

TESTING AND TUNING UP THE TRANSMITTER

The r.f. section of the transmitter must be checked and put into operation first. All valves can be inserted in both the modulators and in the r.f. section, but h.t. should not be connected to the modulators.

Temporarily disconnect the screen supply voltage of V2 and V3, this is necessary to avoid over dissipating these valves during initial lining-up. A suitable quartz crystal must also be plugged into circuit, say, for example, 8Mc/s. Switch S1 to phone operation, since it is impossible to tune up the r.f. stages using vision modulation. Connect the h.t. to the r.f. section and switch M1 to first position, i.e. to read V1B grid current, Adjust VC1 until a reading is obtained from M1, this current should be brought to its maximum value by tuning L1 and VC1 to their optimum settings. The grid current obtained into V1B should be about 2·5mA.

If a communications receiver covering 24Mc/s is available it is worthwhile checking the transmitter signal on 24Mc/s with the b.f.o. The b.f.o. heterodyne note must be quite clean and stable even when VC1 is adjusted. Switch M1 to the second position to check V2 grid current. Adjust VC2 with an insulated screwdriver for maximum, the capacity effect of the screwdriver can cause this current to change when the screwdriver is removed, but it is essential that maximum drive should be obtained, so that a little trial and error may be necessary. V2 grid current should be about 2mA.

The screen resistor of V2 can now be reconnected, and M1 switched to the third position to read V3 grid drive current. Adjust VC3 for maximum reading of M1. The grid coil of V3 is resonated by V3 grid capacity and will need to be tuned. This can be done by stretching or compressing L5 using an insulated prod. Compressing L5 increases its inductance. L5 and VC3 should be adjusted until further improvement in M1 reading is impossible. Grid current of V2 should now be about 2·5mA.

The aerial can now be connected to the transmitter output. The aerial r.f. output loop L7 is coupled to the shorted end of the L6 lines, with about 1in. overlap and as close to L6 as possible.

Monitoring the r.f. output ir rather difficult at these frequencies, however, a 6·3V, 0·04A lamp bulb provides an extremely useful indication. Connect the centre contact of the bulb to the central connector of the aerial socket using about ½in. of stiff wire. The capacitance between the lamp screw connection and earth is sufficient to complete the circuit.

Re-connect the screen resistor of the QQV03/20A. M2 should now read about 70mA of anode current. Slowly adjust VC4 until the lamp glows, VC4 and L7 can now be adjusted until the maximum bulb brightness is obtained, indicating maximum r.f. power to the aerial.

If no indication of r.f. power is obtained, disconnect the aerial and use a 6·3V 0·04A bulb in the manner already described, on one of the anode lines of V3 at their mid-point. *Warning*: Do not forget that there are 300V on the lines. After rotating VC4 there is still no indication of r.f., the capacitor will probably not be tuning over the correct frequency range. Try adjusting the capacitor clips on L6 to a new position about ½in. away.

When the transmitter is finally tuned up, check that VC4 is not at minimum or maximum capacity when tuned for maximum r.f. output, if so adjust L6 taps up or down the line.

The 6·3V low current lamp can be left in position on the aerial socket as a visible r.f. output

while talking in a normal conversation voice into the microphone held about 6in. to 12in. away. As the gain is turned up, the lamp monitoring the r.f. will begin to flicker brighter, at this point both M1 (reading V3 grid drive current) and M2 should not kick when the transmitter is modulated. If the gain is advanced further, M1 and possibly M2 will kick downwards, this downward kick indicates that the transmitter is being overmodulated and the gain must be reduced sufficiently to prevent this. The headphone monitor should be clean, free from hum, noise and distortion when the microphone gain control is set to this band.

The final check on your signal quality and depth of modulation is best obtained from another

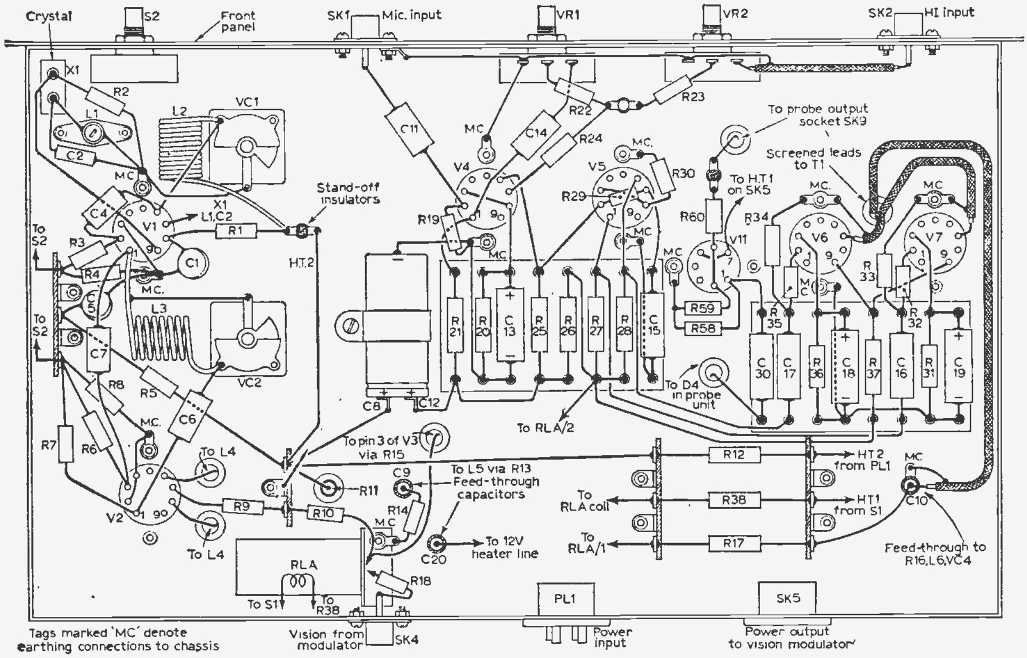


Fig. 9—Underside view of the r.f. and sound modulator unit showing components and major wiring. Note that wiring relating to the following circuits is not shown, or only in part: valve heaters; relay; switches S1 and S2; power supplies; PL1; SK5.

monitor. The power consumed by the lamp is very small and the operator has a reassuring glow from the bulb indicating all is well. Note that although indicating optimum r.f. tuning and output coupling, the lamp will not indicate whether the aerial is working, and in fact glows brighter without the aerial.

Only now, after having obtained some r.f. output on the 70cm band, should the modulator be checked. All the valves are required in the sound modulator and the crystal microphone should be connected to the input socket SK1. A monitoring headphone set can be plugged into the jack socket to monitor the audio modulator, this will only be possible if the transformer T1 has a third monitor winding.

Adjust the microphone modulation gain control

amateur station, since, after all, this is the purpose of the transmitter.

VISION ALIGNMENT

Alignment of the vision modulator is best attempted using an oscilloscope and a linearity test waveform, which can either be a composite line sawtooth or a composite greyscale. The sawtooth and greyscale are usually generated electronically, but a greyscale can be generated using a camera. The greyscale is seen on the screen as vertical bands of graded bands of black, dark grey, through to white in several graduation steps. Fig. 11 shows a monitor display and the line frequency waveform —each step rises equally.

To generate a greyscale waveform using the

camera, draw or paint a card 12in. x 8in. with vertical bars as in Fig. 11. When the camera is focused onto this card which is positioned to completely fill the raster, a camera video output waveform, shown in Fig. 11, should be obtained. Repaint parts of the card as necessary to produce a video waveform of approximately equal step amplitude. Once this waveform has been obtained it can be used to check the linearity of video circuits, and in particular the vision modulator.

Connect the vision modulator into circuit fully valved, however before switching on check that your vision transmission will not be interfering with any other amateurs. Do not connect the video to the modulator, switch the transmitter on, and set S1 to transmit vision. The r.f. output will fall to zero, M1 reading zero, and M2 only a few milliamps, which is all perfectly in order. The sawtooth or greyscale test signal can now be connected to the modulator and terminated at the second vision socket by a 75Ω termination, if the vision is not to be bridged. A termination can easily be made by soldering a 75Ω resistor into a coaxial plug.

Use an oscilloscope to monitor the grid input of V8, this should be 1V peak to peak (if necessary adjust the vision distribution amplifier), and with a picture/sync ratio of about 70/30. The most important point is that the sawtooth or greyscale must be linear, because this signal is to be the test standard.

Turn VR3 to minimum gain and monitor the anode waveform of V9 with the scope. The picture-to-sync ratio must be the same as at the input but, of course, peak-to-peak voltage will now be much greater. If the sawtooth or steps are not linear or the syncs are crushed adjust VR4. Notice that with VR4 adjusted one way the syncs will crush and the other way the whites will crush. This control which sets the grid operating voltage of V9 should be set midway between these two positions. Increase the video gain VR3 and readjust if necessary VR4 until the maximum waveform voltage can be obtained from V9 anode without severe video distortion.

Monitor the video output of V10 cathode with the scope and if a d.c.-coupled scope is used note that the sync bottoms are now at earth potential, having been d.c. restored to earth. Some slight readjustment of VR3 and VR4 may be required to obtain a clean waveform at V10 cathode. The peak-to-peak output waveform voltage should be about 250V using an h.t. supply of 350V. Alternatively a d.c. voltmeter between V10 cathode and earth will give a reading of about 150V.

The transmitter should now be transmitting vision reasonably free from distortion, the r.f. lamp

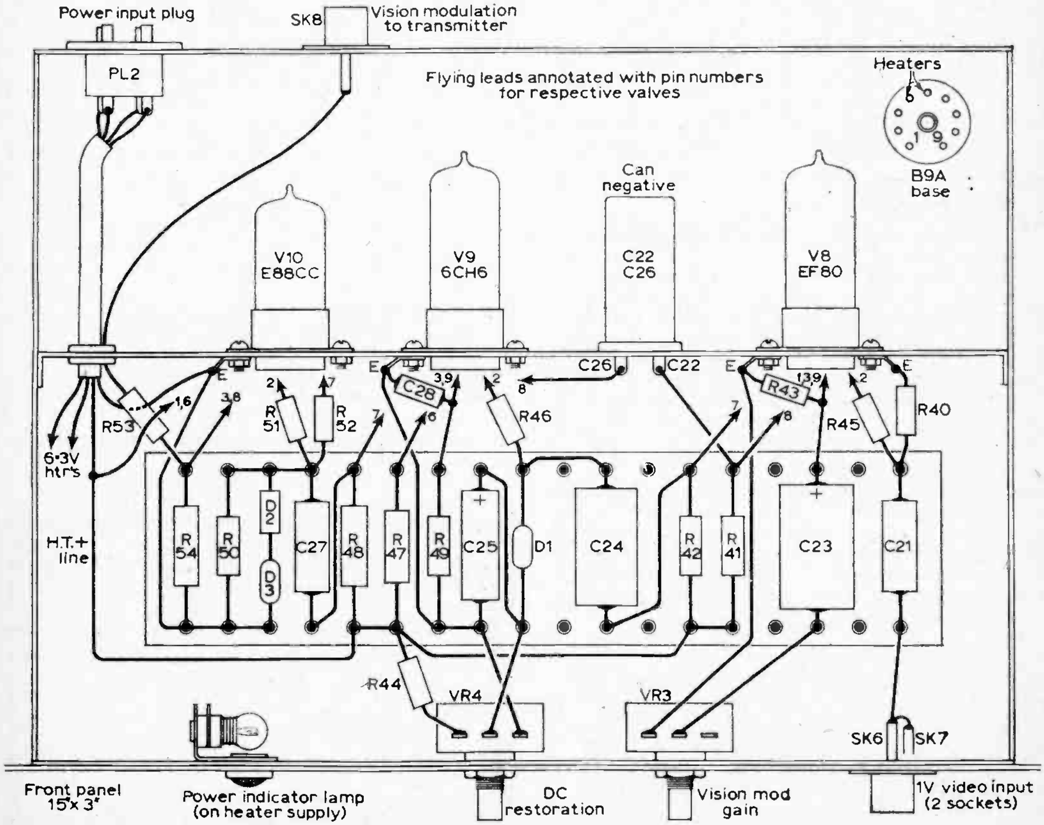


Fig. 10—Component layout diagram of the vision modulator chassis.

should glow and M2 should read about 40mA and M1 in position three about 2mA. Do not worry that the transmitter seems to run at a lower power compared with telephony transmissions; a vision transmitter normally will only run at about one-third of peak white power. Peak white d.c. power input to the QQV03/20A is about 25W. An occasional check should be made on the grid drive position throughout the transmitter—a fall in drive may cause a fall in r.f. power output.

Once VR4 is set it will not require further adjustment unless V9 is changed. VR3 is the vision modulator gain and should be run at the maximum before distortion occurs. If the video input to the modulator is always IV d.a.p., VR3 will not need to be adjusted. Do not attempt to overdrive the transmitter by increasing VR3 too far, otherwise white crushing and sync slipping will produce poor pictures at the received end. The modulator will clip syncs to a small extent in the d.c. restorer; this effect is easily corrected by slightly increasing the sync picture ratio of the input.

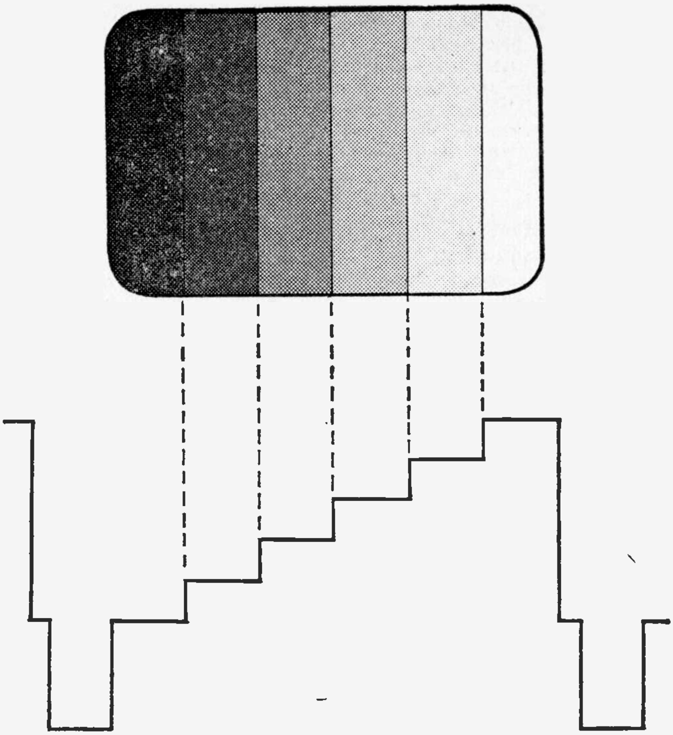


Fig. 11—The top diagram shows the monitor display: the bottom diagram shows the line frequency waveform.

R.F. PROBE MONITOR

Monitoring one's own transmission, especially at video, is always a tricky problem, since the probe circuit of Fig. 8 will only give an idea of what is happening and cannot be used for linearity or frequency response checks. The diode D4 rectifies a small percentage of the r.f. present at the aerial socket, and the video developed across R57 is coupled to V11 a Z77 strapped as a triode cathode follower. The diode part of the circuit is built next to the aerial socket and does absorb some of the r.f. power; however, the loss is not too important compared with other r.f. losses.

The cathode follower V11 is not a 75Ω drive impedance and should not be terminated at the monitor. The output from this valve is only about ½V d.a.p. but should be sufficient to provide a useful video monitor feed. The most useful guide as to the quality of the transmitted signals is from a remote 70cm TV receiver.

CHOICE OF OPERATING FREQUENCY

The transmitter as described will only transmit sound *or* vision and if a simultaneous sound and vision transmission is required a separate transmitter will be needed. The sound transmitter does not need to be the same power as the vision transmitter and can well be lower powered.

As mentioned already, the sound amateurs share the same band as the television amateurs but in fact only use the frequencies 432Mc/s to 434Mc/s. If a contact is required with a sound amateur it will be useless operating outside this 2Mc/s wide band, since he will not normally tune outside this range. Consequently it is useful to have a crystal that will operate in this band.

However, if the TV amateur starts transmitting *video* on this frequency he will quickly lose friends because the video bandwidth is 3Mc/s and the transmissions are double sideband; the channel occupied by the vision signal is 6Mc/s wide. The video transmission carrier frequency should not be within 3Mc/s of the sound band limits, i.e. the range 429Mc/s to 437Mc/s should not be selected for the vision carrier frequency, so a separate vision transmission crystal will be needed. The amateur band extends from 425Mc/s to 445Mc/s, so there is still plenty of room left. If simultaneous sound and vision are contemplated the sound carrier is 3·5Mc/s below the vision frequency.

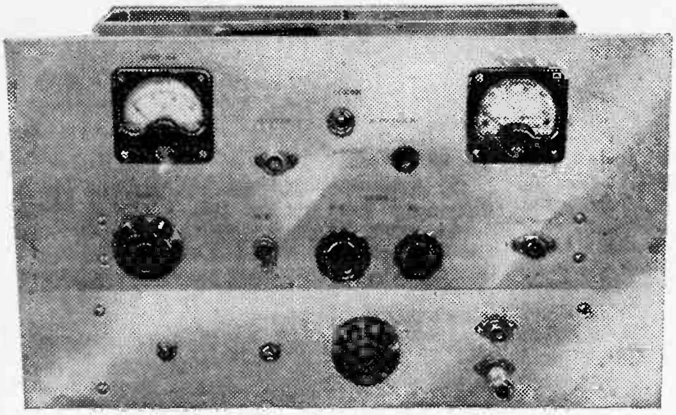
The advantages of simultaneous sound and vision are enormous and its use must be considered, since operation can be frustrating with pictures only. The writer has selected for his own transmissions a sound frequency of 433·75Mc/s and a vision frequency of 437·25Mc/s. This enables the sound transmission to fall in the 2Mc/s wide sound band yet keeps the vision spectrum (434·25Mc/s—440·25Mc/s) outside the phone band.

Allowing the sound channel to fall in the phone part of the band quite often stimulates the sound amateurs to build converters to receive your vision.

Occasionally it can be useful to transmit at either of the band limits—for example, if transmissions are received and transmitted simultaneously on 70cm or if a received signal is to be retransmitted. This is possible on 70cm providing the received and transmitted frequencies are well separated by 15Mc/s and more but it does require a rather complex aerial system.

EX-GOVERNMENT CRYSTALS

The transmitter has been designed for an ex-Government range of crystals which are currently available at about 5s. each and have the advantage of being easily dismantled for regrinding to a new frequency. The crystals can be obtained in frequency jumps of 25kc/s, e.g. 8,000, 8,025, 8,075, etc., and also in $33\frac{1}{3}$kc/s steps, e.g. $8{,}006\frac{2}{3}$, 8,040, $8{,}073\frac{1}{3}$, etc. The choice of transmission frequency should be made first and this should then be divided by 54, the frequency multiplication of the transmitter.



The completed transmitter.

For example: If 437Mc/s was the selected 70cm frequency the crystal frequency will be

$$\frac{437{,}000}{54} \text{ kc/s} = 8{,}093\text{kc/s}.$$

Incidentally it may as well be pointed out that the output 70cm frequency will not be exactly 54 times the frequency mounted on the crystal due to the overtone mode of crystal oscillation. The nearest crystal frequency in the standard 25kc/s range lower in frequency than 8,093 is one of 8,075kc/s. However, if this crystal is used the transmission will be about 436Mc/s, which is 1Mc/s lower than the desired frequency. This crystal can easily be ground to make its frequency higher by 20kc/s.

CRYSTAL GRINDING

Much has been written about crystal grinding, etching, etc., and it is very simple to move an 8Mc/s crystal by 30 or 40kc/s. Some means of either measuring the 70cm frequency or one of the lower transmitter harmonics will be needed. The writer used a communication receiver, listening to the 24Mc/s harmonic. Returning to our example, an 8,075kc/s fundamental will produce a harmonic on about 24·225Mc/s and this must be moved to 24·278Mc/s, which is a very small change, consequently the receiver used must be accurate.

The crystal should be carefully dismantled, removing the three fixing screws and the spring cover. The quartz is usually held between two metal support plates and will be very thin. The grinding medium can be a sink cleaning compound such as "Vim" with water added. Put the crystal face down on a flat surface in the grinding medium and use figure-of-eight strokes, pressing lightly on to the crystal with one finger. The quartz wafer should be dried, cleaned and reassembled after about ten strokes to check the frequency. This is perhaps the most tedious part, but constant checking is necessary to prevent overgrinding the crystal past the required frequency.

OPERATION

No mention has been made so far as to what aerial to use for transmitting.

The 16-element array described in the 70cm receiving equipment article in last December's issue of PRACTICAL TELEVISION will work equally well on transmit as well as receive. This aerial is quite modest as far as 70cm arrays go but it does have a useful gain of about 12dB over a dipole.

Before long it is highly likely that a more powerful transmission would seem highly desirable. This can be obtained by two different methods.

Increasing the transmitter power will certainly improve reception at the receiving end and this can be accomplished by adding a linear power amplifier after the final stage (V3) of the present transmitter. A linear power amplifier is an amplifier which amplifies the modulated r.f., operating under class AB or B biasing conditions.

The great advantage with this method is that no further modulation of the r.f. power is required. A linear amplifier is equally effective with sound or video modulated r.f. The maximum power limit for a 70cm amateur TV transmitter is 150W peak white power input to the valve delivering r.f. to the aerial. Using linear r.f. amplifiers driven by the transmitter described in this article could bring the power up to this maximum legal limit.

The second method is to improve the aerial system. Aerials with power gains up to 20dB are in use on this amateur band. An aerial with 20dB gain will give an e.r.p. 100 times that of the r.f. feed to the aerial. This is not, however, something for nothing—all the r.f. energy is concentrated into one direction, making the aerials very directive; some have beam widths of only 15 deg. If simultaneous sound and vision transmissions are envisaged either an aerial diplexer or an entirely separate aerial is required. ■

BY H. W. HELLYER

STOCK FAULTS

PREVALENT TROUBLES IN COMMERCIAL

A SINGLE article bearing the above title appeared in the August 1963 issue of PRACTICAL TELEVISION. It opened with the statement that there are more circuit variations than one man's memory can cope with, but that a large proportion of the faults met by a practising service engineer fall within the general category of " Stock Faults ". After burning one's fingers once or twice with a tricky fault, one learns to fly straight to the offending spot when similar symptoms occur.

What is a "Stock Fault?"

But what is a " stock fault " to the serviceman, is a " once-only " job to the set owner. Correspondence that followed the previous article showed that many readers would welcome an exchange of views, or a discussion of prevalent faults. This series of articles is an attempt to dig in greater detail the ground that was lightly tilled last August. Taking the television receiver stage by stage, illustrations from commercial models will be given to indicate the faults that—in the author's experience—have been most prevalent, or have given the greatest worry.

Many readers will recognise the common faults, and be familiar with their solution. Indeed, there is a healthy proportion of practising engineers within PRACTICAL TELEVISION'S family of readers; they may wish to add to the list from their experience. The writer will be glad to collate such information with a view to passing it on.

Tuner Unit and Aerial Circuits

To begin at the beginning—the tuner unit and aerial input circuits. For the past ten years, most sets have had some sort of tuner unit, capable of receiving at least one station in Band I and Band III. Many of the older receivers have fallen into disfavour, and the advent of u.h.f. has brought a new crop of tuners on the market.

We are concerned here with the "old stalwarts" that have survived, with very few changes, since the old "ITV Conversion" days, and one or two of the popular types that seem destined to be with us still for a few years to come.

Popular Makes

Of these "popular" models, perhaps the most frequently met are the two or three forms of turret tuner. There are small variations between the Clix (Edison Swan), Cyldon, Brayhead and Plessey turrets but they have many points in common. The construction of a typical turret is shown in Fig. 1.

Coils are wound on formers mounted on " biscuits " clipped longitudinally on a skeleton drum. The method of clipping gives rise to one fault cause: lugs on the ends of the biscuits insert in slots in the discs of the drum, and the biscuits are held firmly by the end springs and, in the case of Cyldon and Brayhead, strong spring clips at the centre piece. If coil biscuits have been removed carelessly the lugs can become chipped and very slight movement is enough to cause intermittent contact of the plated studs with the springs of the side panel assembly.

Occasionally biscuits will have been changed, perhaps alternative or modified types fitted (this happened frequently during the Band III Conversion period) and the central spring clips incorrectly fitted, or even omitted altogether. The tightness and correct positioning of biscuits should always be checked.

Defects in Coil Formers

Less obvious, but equally troublesome, is the coil former that works loose on the biscuit mounting. The result may be an intermittent connection where windings are of fine wire (Band I) but is more insidious at higher frequencies. The coils remain intact but the position of the tuning slug in the former changes with vibration, and the effect may be to induce " creep." Many a PCF80 has been changed when the original fault was as simple as this, and the cure consisted of a touch of contact adhesive at the inner end of the coil former.

Cracked Formers

A similar fault is the cracked former, especially the type mounted laterally, as the oscillator coil

RECEIVERS

in Cossor models, Clix and Brayhead biscuits. The plastic of early Philips coils (whose turrets are in many ways similar to the above) was brittle and tended to split when ill-used. Often it is possible to remove the whole former, leaving the coils intact, replacing it with another from an unused switch position.

The Plessey turret, which was the first serious attempt at scaling down what had become one of the "standard" items of TV design, had a single coil biscuit which was held in place by the spring action of the rear drum disc. Principal faults here were the wearing of the slot in the biscuit, distorted disc, and wear at the rear of the turret casing, where the main spindle was "keyed" into its aperture.

Contact Spring Distortion

The contact spring problem has been with us since turrets began. There will always be the clot ready with thrusting screwdriver to distort springs in an effort to improve contact—regardless of the fact that the fault may well originate elsewhere.

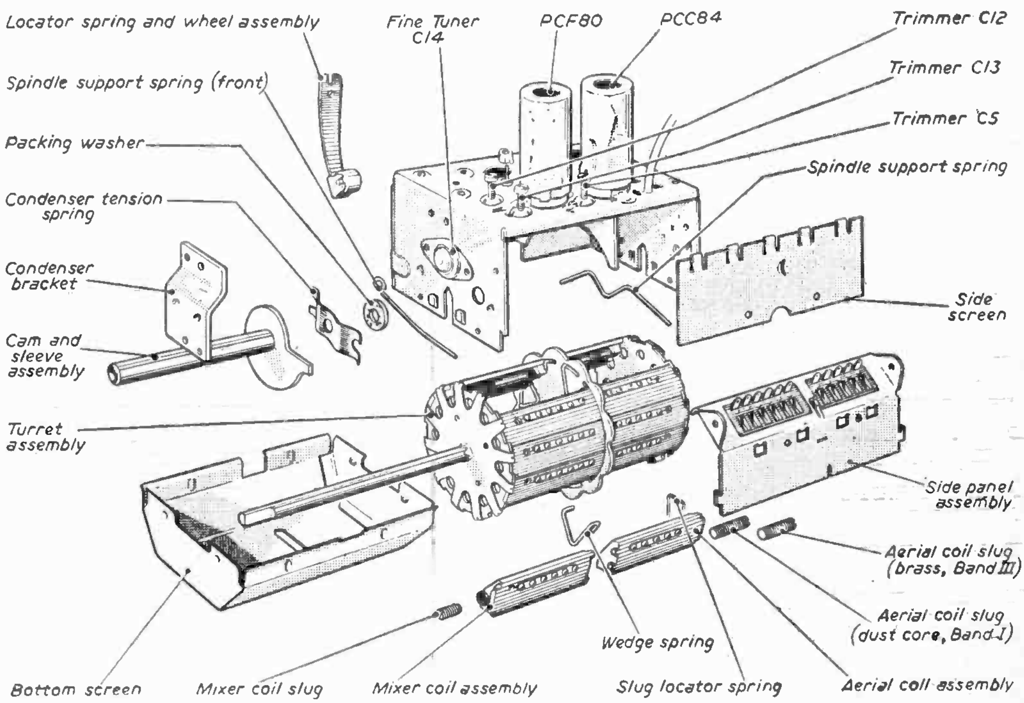


Fig. 1—The construction of a typical turret tuner.

If the springs have been distorted, and can be gently eased back to something near their original shape with a pair of fine pliers, they may be reset by gently pushing inward from the access slots at the outside of the side panel assembly while the turret is switched to a blank position. The turret is then rotated so that the studs "wipe" the springs in a direction from the rivet towards the end. Repeat this gentle setting two or three times, clean the springs with a clean brush and Electrolube (not carbon tetrachloride, which can attack certain types of plastic that may be used), then wipe the biscuit studs with a clean, dry cloth and finally treat them with silicone grease to prevent further oxidisation.

Another fault, apparently electrical, that has a mechanical origin, is the frequency change caused by a slipping fine tuner blade. The assembly is shown, in an exploded view in Fig. 2. The cam is a press-fit to the alloy spindle at "a". Unfortunately, there is very little overlap of the hollow spindle at the inner surface, and normal re-rivetting procedure is seldom effective for long. One method of solving this is to score the polished surface a little around the junction of spindle and cam, and apply a good quality adhesive, allowing it plenty of time to set before moving the tuner. It is worth remembering that the prime cause of this annoying fault is ham-handedness—an attempt to turn the fine tuner beyond its stop.

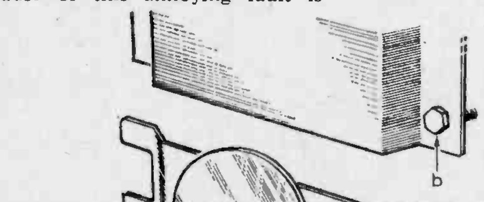


Fig. 2—Slipping fine tuner blade.

A similar kind of fault is caused by looseness of the screws "b" which secure the front plate. This, in turn, allows the spring "c" to slacken, and the fine tuner tends to creep. Beneath spring "c" is a packing washer and the fork arms sit over a wire spring, used to hold the spindle firmly.

Slackness at this point is also a fault with the type of incremental tuner that has its contacts along the edge of the drum. Also, on this type of tuner unit, any loose panels or mounting screws can cause baffling faults by transmitting vibration to the coils, via the switch wafer. The coils are self-supporting, and are mounted on the wafers. Their position should not be disturbed, and the greatest care must be taken when servicing these units not to distort or displace coils. Very often it is simpler to remove the rotor and lay it safely on a soft material than to probe about between the coils to reach a suspect component.

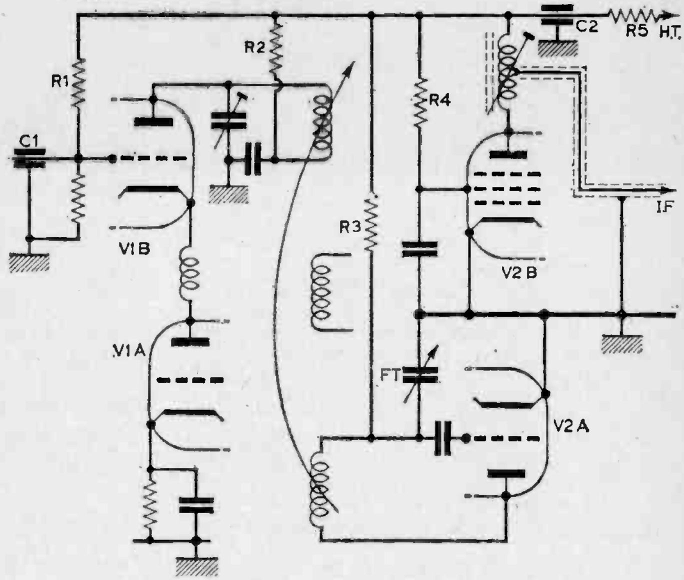


Fig. 3—Faults in the oscillator circuit.

Faulty Resistors and Capacitors

Which brings us to suspect components. There are two very prevalent offenders. One is the oscillator anode feed resistor (R3 in Fig. 3) and the other the feed-through capacitor, of which there may be several (C1 and C2 in Fig 3).

The h.t. carrying resistors in the turret, apart from R3, are seldom a cause of trouble. But other faults can rapidly cause damage to them, and the tell-tale wisp of smoke causes many a groan of dismay, as they are difficult to reach.

In most cases it is quicker to remove the rotor drum completely than to poke around with soldering iron and pliers in a restricted space and risk causing more damage. Generally, R3 is a 1 watt or 2 watt component, typical values being 6·8kΩ, 10kΩ or 12kΩ. As the prime cause of its failure is an electrode short-circuit in the frequency-changer, take care that the current does not exceed its rating when the set is switched on again— a meter will not show this fault, which only crops up when h.t. is applied.

Normal meter tests are also ineffective in tracing the intermittent short-circuit due to a cracked feed-through capacitor. These consist merely of a porcelain tube inserted in a hole in a screen, with the inner and outer surfaces of the tube silvered, the outer silvering being soldered to the screen. The only cure is to disconnect altogether and either replace the capacitor (not an easy task) or substitute it.

Except under the most stringent conditions, it is possible to get away with a direct connection made by pushing a piece of insulated wire through the hole, and a decoupling capacitor of about 1,000pF connected between the joint at one side of the screen and the original screen soldering. Failure of C1 in Fig. 3 is the kind of elusive fault that leads to loss of gain and is difficult to prove. As R1 is usually of a high value, 220kΩ or 470kΩ being typical values, a direct short-circuit at this point is unlikely to cause a complete burnout.

More vulnerable is the main h.t. carrying resistor, R5, sometimes mounted on the main chassis, or the tag strip bearing the tuner unit

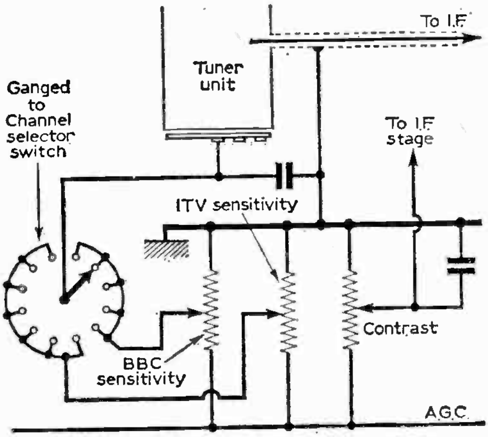


Fig. 4—Contrast and sensitivity arrangement.

connections. This may be a fairly low ohmic value, between 180Ω and 1,000Ω, but should always be replaced with at least a 1W component.

A further point where h.t. can be lost is at the connection to the i.f. coil or transformer. In this respect, Fig. 3 is not entirely typical. Very often the transformer is shunt-fed, or the secondary winding completely isolated and bearing no h.t. But there are many circuits still in use where the coaxial cable between the tuner unit and main chassis has a 200V or so potential between inner and outer.

Most likely point of damage is at the entry to the turret, particularly those units which have the entry doubling back on itself. Quite often it is possible to replace this lead from the outside by removing a side panel and connecting to an equivalent circuit point.

A.G.C. Line Troubles

So much for the higher voltages. What about the lower voltages, often overlooked, but quite important? For example, the a.g.c.

Despite the many variations in circuitry which we shall note at a later stage, the negative voltage applied to the tuner unit is generally a straightforward filtered feed, easily tested with a voltmeter. Principal fault is usually external, either open-circuiting or short-circuiting of a clamping diode being common. However, there are some circuits which can give rise to misleading symptoms. For example, Fig. 4, which is the a.g.c. contrast and sensitivity layout of the Alba T655.

Here the controlled i.f. stage receives a bias varied by the contrast setting, while the bias to the turret is tapped off via separate sensitivity controls. The setting of the selector switch determines which sensitivity control applies. There are thus five points at which a poor connection, a dry joint, or even a loose mounting screw at the bracket on which the sensitivity controls are mounted, can cause varying picture and sound.

To complicate matters, the a.g.c. bias is derived from the grid of the line output valve and a varying picture level can be the result of a faulty PL81, even though width and brightness appear normal! Circuits of this type should be treated with circumspection, and it is wise, if in doubt, to disconnect the a.g.c. line from the tuner unit and note the effect.

The Fireball Turret

A turret that has come into wide use, and whose shape seems to tempt some manufacturers to mount it in an inaccessible position, is the Fireball, made by A. B. Metals Ltd. This turret has a very compact construction. The coils are mounted radially on a ceramic former, as shown in Fig. 5. This former is retained by a 2B.A. screw and shakeproof washer to the threaded rear end of the switch spindle.

Principal cause of trouble is again oxidisation. The ceramic disc is easily removed, and the plated

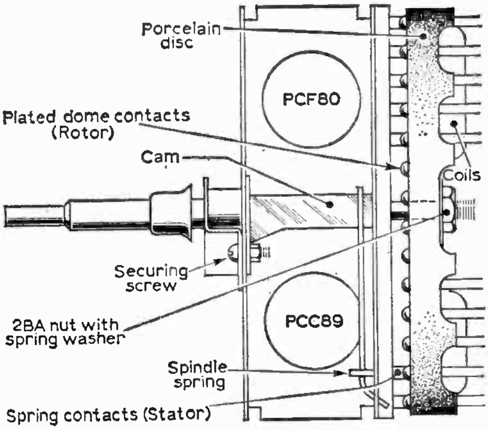


Fig. 5—Fireball turret.

studs can be cleaned with a soft cloth and coated thinly with silicone grease, but care should be taken with the contact springs. These are quite small and do not take kindly to being bent. Best way of polishing these is with a small paint brush and methylated spirit, finishing with Electrolube.

Make sure that the free ends of the springs are seating properly under the lips of their freeways, and that they compress correctly. Distortion at this point causes them to bind on the sides of the freeway and eventually flatten at the point of contact. When re-assembling, ensure that the ceramic disk is offered up with the slots in the boss in line with the ridges of the stator assembly —which are *not* diametric.

As can be seen from Fig. 5, the fine tuner has a different kind of action; rotation of the outer spindle compresses a capacitor vane by the travel of the cam. A cracked plastic cam can cause trouble, and the old bogey of loose screws is once more a prime suspect, especially where indicated in the diagram.

It is impossible to discuss the subject of tuner unit faults without a brief reference to aerial sockets. Although these must be familiar to all readers, it is worth noting that loose joints at the places indicated in Fig. 6 have many times led to wasted investigation of tuner units.

Varying signal level, odd flashes and crackling or a steady low gain can all result from poor soldered joints or strained connections at the rivet or pin end. Again, if at some time the set has been connected with incorrect polarity, and the aerial inadvertently short-circuited, both R1 and R2 could have been damaged. Usual value of these components is 1MΩ. The decoupling capacitors

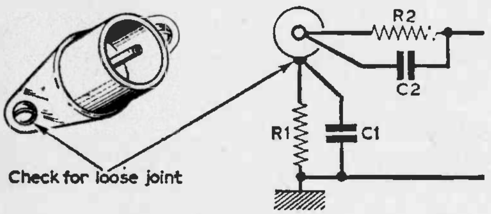


Fig. 6—Aerial socket faults.

are generally about 1,000pF, and an open circuit of C2 will give low gain. The other type of socket, with its screened outer held only by press-fit contact, can give rise to similar faults when worn. Heavy soldering is not really the answer: replacement with a more solid type is to be recommended, and needs patient filing and drilling of the rivets of the original before a direct change can be made.

Push-button Tuner Unit

A type of unit which has given a fair amount of trouble, although quite recent in design, is the S.T.C. model PC80. Part of its construction is shown in Fig. 7. Two BBC, two ITV positions and one u.h.f. setting are allowed by the push-buttons. Depression of each button pushes a setting plate to a different level. This moves a swivel rod bracket which actuates a plastic bar. In the bar there are a number of spring blade wipers of quite delicate construction. These slide up and down printed circuits making the necessary connections to the coils. Principal faults are partial or intermittent contact.

In all fairness to the manufacturers, it should be stated that this often occurs because the tuner has been clumsily handled. The wiper blades do not take kindly to adjustment, and the mounting of the plastic bar requires a tender touch. The insert to Fig. 7 shows the method of fixture. A plastic connecting piece holds the crossbar, and the cap slides onto a pin in the operating lever, at each end, then clips into place.

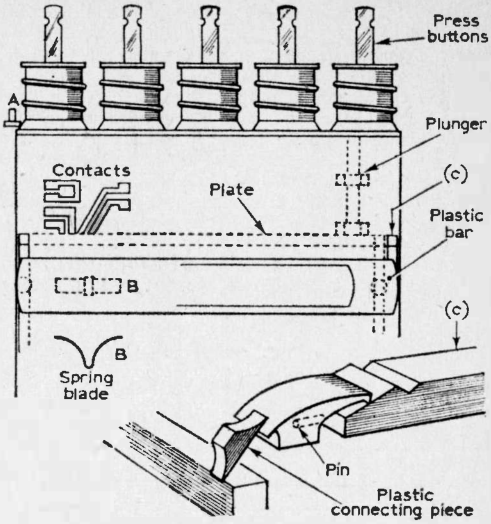


Fig. 7—S.T.C. PC80 push-button tuner.

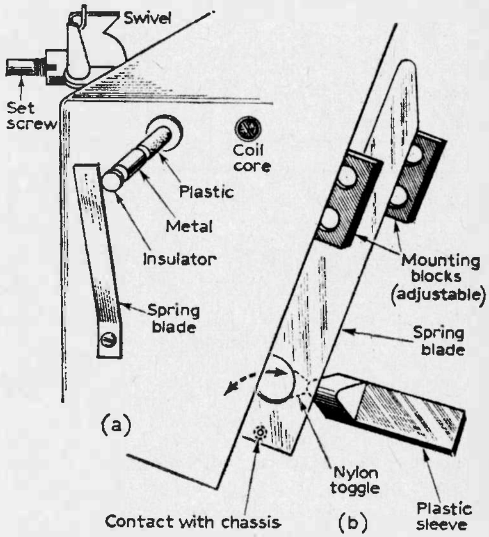


Fig. 8—Philips motor-operated turret: (a) contact assembly (b) motor limit switch.

To release the bar, the end moulding should be lifted at point C, the buttons released, and the bar skewed sideways until it can be withdrawn. When resetting, first depress the end BBC button, note the position of the blades (which can be seen quite easily by shining a light on the back of the translucent bar) on the contact pads, and set the screw A, beside the button for central contacting. Then press the outer ITV button and adjust the similar screw at the other end for central positioning.

Look all along the contacts and note that they should all sit centrally on the pads. Recheck at all button settings and ensure that the plunger locking is tight. Finally, reassemble tuner, noting

—continued on page 367

SERVICING TELEVISION RECEIVERS

No. 101: K.B. QV20/1, QV70 and QV30/1

By L. Lawry-Johns

CONTINUED FROM PAGE 303 OF THE APRIL ISSUE

THE 17in. models in this series use Mullard AW43-88 or Brimar C17AA tubes; the 21in. models use Mullard AW53-88 or Brimar C21AA. These are electrostatically focused tubes with the control applied to pin 4 from R130 slider wired to the tube base.

Chassis Removal

Remove rear cover, unscrew the recessed grub screws of the front centre control knobs and pull off the outer knobs. Remove loudspeaker plug from sound output transformer on the rear right side. Remove chassis fixing screws from the rear of the chassis and withdraw complete unit from cabinet.

COMMON FAULTS

No Sound or Vision. Valve Heaters Dead

Check mains input to mains dropper and R135, then PY83 as previously described.

Valve Heaters Alight

Check mains to fuse and metal rectifier again as previously described. Check d.c. output of FC31 to C103 and C104. If h.t. is present, check again the valve heaters and ensure all valves are properly heated and a heater glow is visible in the tube neck. The point is that some valves may not be receiving heater current whilst others may be passing too much. As the tube heater is the final one in the chain, if this is alight the others must be and this provides a quick check. If the tube heater is out, check V10 sound output PCL82. If this is unheated, check V11 (12AX7) and the tuner unit valves V1 and V2, remembering that if all these are out, the other valves will be overheated. In this case V5 (6AL5) is the most likely suspect and these valves seem more prone to heater-cathode failure than others.

Picture Faults

The effect of a failing U26 (V14 e.h.t. rectifier) has already been touched upon and the point already made, that the U26 need not alone be responsible for a picture that swells up and fades out with complete loss of focus, when the brilliance is advanced.

When there are no other symptoms such as lack of width and/or height, however, a replacement U26 will always improve if not completely cure the effect. Checking for low h.t. and the line timebase valves generally will usually clear up any further tendency for this effect.

Lack of Width

Following on from this U26 trouble, the already mentioned steps (without the necessity to check the U26) apply, of course, when the main symptom is lack of width, i.e. check V7, V6, V8 and the metal rectifier and including the R70 4·7kΩ screen dropping resistor, also R66 82kΩ if necessary.

Line Hold

If the hold control R61 is at the end of its travel, check V6 (PCF80) and then the 680kΩ resistor to pin 9 from the hold control.

A less common cause is when the control itself changes value from 500kΩ down to about 100kΩ. When the control is not at the end of its travel and the setting is extremely critical, or a full lock is not obtainable at all, attention is directed to C57 (25pF). This assumes the frame is locking normally. If the sync is poor generally, check V11 (12AX7) and associated components.

Lack of Height

If width is normal but height is lacking evenly top and bottom, check R108, R148 (both 1MΩ), R144 (180kΩ) and both VA1008 thermistors (R143 R145).

Bottom Compression

If the top appears extended and the bottom compressed, check V12 (PCL82) and C88 (50μF).

Whenever a PCL82 has to be replaced, it is always advisable to check the cathode bias resistor R110 (470Ω) which can change value when the PCL82 passes too much current. A low value bias resistor will cause a new valve to quickly fail, with bottom compression and fold-up as the inevitable symptoms.

No Picture

If the sound is in order but there is no raster resolved when the brilliance is advanced (or retarded) note whether the line whistle is audible.

in order, check the first anode pin 4 and focus anode pin 3 voltages of the c.r.t. base. The focus slider can change value, thus dropping these voltages considerably.

Also check the anode voltage of the video amplifier V6 pin 6 which, if high may denote a failing PCF80, although this would normally have drawn attention to itself before this occurs due to its use as the line oscillator.

No Picture Raster Appears When Brilliance Advanced

Again assuming the sound is normal, check V6 and associated components, V4 and its pin 7 and 8 voltages, and if necessary the CG12E diode detector and series chokes.

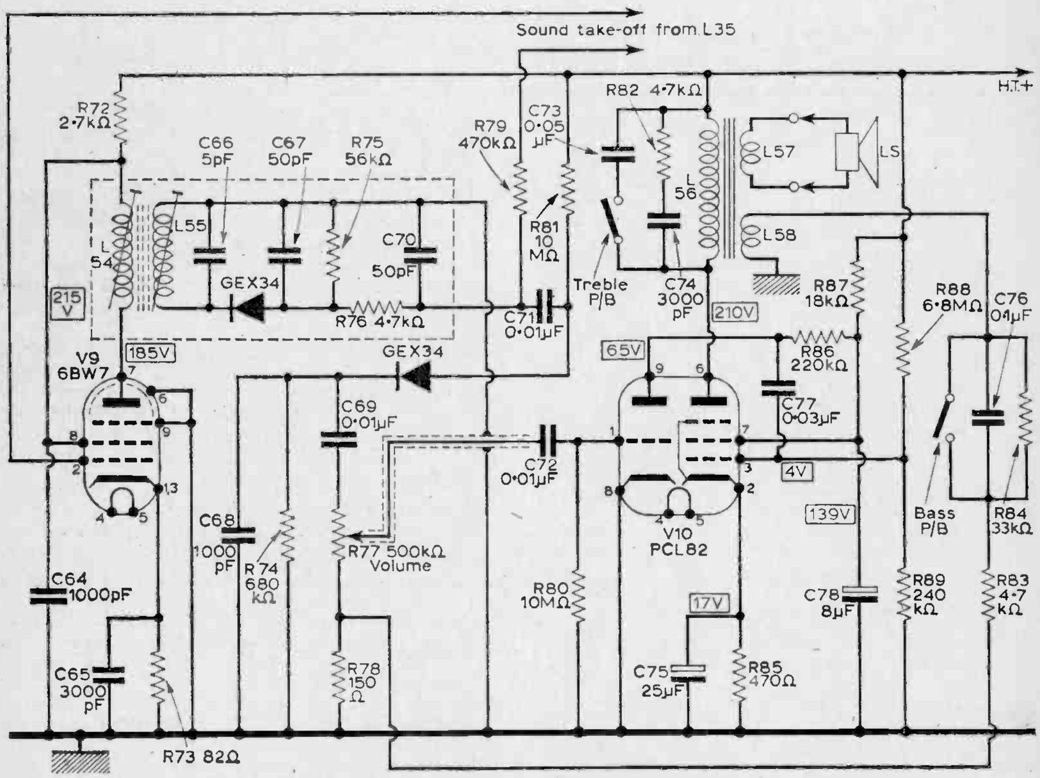


Fig. 4—The sound i.f. and audio stages of the models QV30/1 and QV70.

If it is audible, and is of normal pitch, check for e.h.t. at the tube anode and note if the U26 heater glows—although dust may obscure this. If there is little or no e.h.t. at the tube anode but there are healthy signs of voltage at the top cap of the U26, as evidenced by a blue glow to a screwdriver blade, or a bright glow in a neon when brought near, it can be reasonably assumed that the U26 is in need of replacement—which is also the case when the heater of the U26 is over-bright or varies in intensity. If the e.h.t. appears to be

No Sound, Picture Normal

Check V10 and voltages if there is no hum from loudspeaker; V9 and both GEX34's if there is a low hum. Check h.t. to V9 base pins 7 and 8.

Distorted Sound

Check V10 and its bias resistor R85 (470Ω), then R81 (10MΩ) if it is found that the distortion tends to clear on a weaker signal.

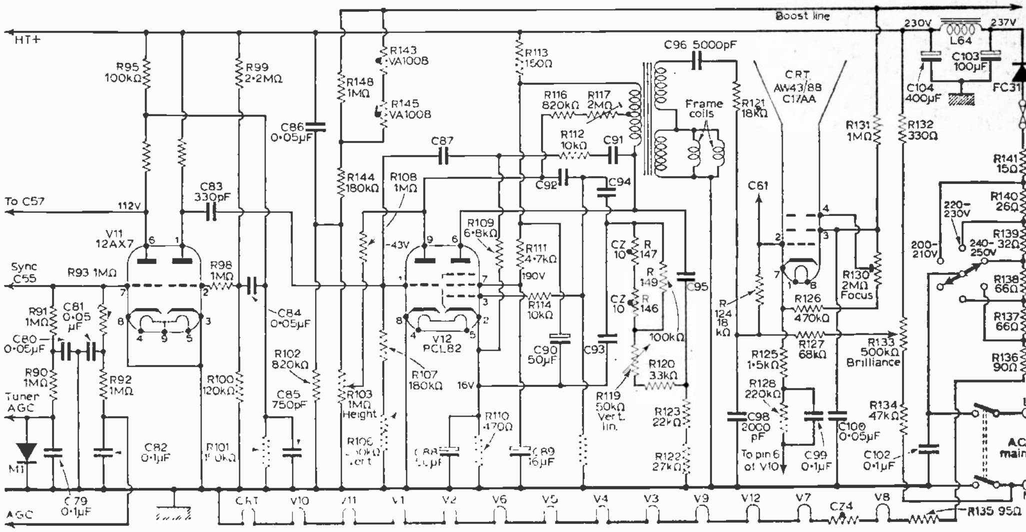


Fig. 5—The sync separator, frame timebase, c.r.t. and power stages.

Raster Normal, No Sound or Vision Signals

Check the tuner unit valves and supply voltages and then. if necessary, V3 (9D7) and its pins 7 and 8 voltages. Check R31 (1·8kΩ) and tuner decoupler capacitors if this is charred.

Weak and Grainy Picture

Check setting of R68 and then replace PCC84 (or PCC89) on tuner unit. If tuner unit values have been accidentally transposed, check V1 bias resistor R5 (100Ω).

Poor Contacts in Tuner

Clean the silver plated studs of the turret or disc but do not attempt to increase the bow of the contact springs of the switch bank or distort them in any way.

Picture Tilt

Scan coils may be rotated after the clamp screw has been slackened.

Picture Centring

The shift magnet for locating the picture correctly in the mask is immediately behind the scan coils housing.

Vertical Linearity

This control is labelled R119 in Fig. 3 (see page 303 last month), and is situated on the bridge next to the mains adjustment panel.

STOCK FAULTS *continued from page 364*

that the slide lugs must insert in their proper places, and *all* screws should be replaced.

Motor Driven Turrets

Motor-operated turrets of several types have been used for a number of years. The principle is simply that of make-and-break switching, with the actual turret of conventional design. Departures from the normal are to be found in the Philips range. Fig. 8 shows the contact assembly at the rear of the motor-operated turret fitted to a wide range of models.

The actual setting of the oscillator core is done mechanically. The coils are printed circuit panels, mounted radially on a drum. They are clipped into place and easily removed by prising at the stepped end with a screwdriver blade. Contacts of both rotor and stator can be cleaned easily. But the trouble comes when the plunger in Fig. 8a, a plastic rod, fouls its hole and does not reset at its variable position for different channels. Note that a spring blade is used to hold the insulating cap against the metal part, which in turn rests on the plastic. Note also that the prime setting is with the swivel bracket and its set screw at the front of the turret, whereas the coil adjustment is at the side, as indicated.

The fine tuning control is quite separate to the motor assembly, and consists of a drum with locked screws which depress the swivel bracket according to the setting. To tune, it is necessary to depress the fine tuner knob until its blade connects the appropriate screw which alters the plate setting. Usual trouble is that over-adjustment results in the plate riding hard one way, preventing fine adjustment.

The motor limit switch is illustrated at Fig. 8b. Note the elongated holes in the mounting blocks and spring blade, and check that the arm holding the nylon toggle is not bent. Check also that the rear drum is secured by its axial screw.

PART 2 WILL APPEAR NEXT MONTH

A MONTHLY COMMENTARY

Underneath the Dipole

BY ICONOS

YEAH! YEAH! YEAH! Three months or so ago I mentioned in these columns that I thought the popularity of the Beatles was on the ebb. Nay! Nay! Nay! I should have realised that the absence of the name of this quartette from the top of the pops in disc sales was no indication that in other fields their success would be unmaintained.

Their long term of popularity in public performances, television features, glossy magazines and newspaper comment, has broken all kinds of records, even the discs. Enthusiasm of the teenagers at "live" concerts almost drowns the amplified voices and guitars of the Beatles, whose clothes, shoes and, of course, hair-do's, are copied and worn in large quantities. Their very name has a value as great as "Brand X", whether applied by a variety of manufacturers (under licence, of course) for a variety of products.

Television has played its part in America as well as Europe in promoting the acceptance of the Liverpool beat. Television will also follow up with the presentation of other youthful musical groups in attempts to beat the new sound barrier. There is no doubt that all of them will be on discs, and as the Beatles are getting in the groove, who will come out on top?

Candid Cameras

The Beatles have attained their second breath, so to speak, performing with a relaxation and friendliness magnified by microphones, TV and film cameras which are handled in a highly skilled manner, and with surprising mobility. Live television with small vidicon cameras and microwave links are sometimes used, in conjunction with video tape recordings.

In the course of time, the more sensitive Plumbicon camera will be developed for the same purpose. 16mm film cameras with their own striped magnetic sound on the same film as the picture, are often used, mainly limited to one camera, along the lines so successfully used in *Candid Camera*, both here and in the USA.

Another development has been the utilisation of several 16mm cameras with very accurately crystal-controlled speed of film travel, capable of synchronising with a separate magnetic sound recorder. Each camera can be started and stopped as required, to economise in film and avoid the use of large film magazines.

On the sound side, radio linked microphones, highly directional "gun" mikes, radio linked synchronising pulses and other technical gimmicks, may be useful in keeping down weight and bulk of equipment, as with the cameras, but the complications have to be overcome. It is not easy to operate a mobile multi-camera system which can achieve the editorial flexibility of the bulky and heavy Telecam film camera systems used in many European studio stages, on which multiple camera filming for television is carried out.

Zoom Lenses

Zoom lenses are popular and useful when attached to 8mm cameras for "happy holiday" photography. The use of the zoom for almost every shot is fascinating to the person operating the camera and dazzling to the home audience, unless it is adjusted and left in a long shot or close-up position, instead of being treated like the slide of a trombone—excepting, of course, when the moving zoom is operated occasionally and with great care.

The depth of focus is not so good as with straight normal lenses, and "split" focus on a zoom lens between a person in the foreground and one who is some distance away often results in lack of sharpness, especially when the light is poor and lens aperture large.

The same thing happens with 16 and 35mm filming, utilising zoom lenses, especially if the zoom has a 10:1 ratio, and colour film stock is used. In *Candid Camera* filming, the zoom operation is sometimes carried out from long shot to close-up with very great speed, the few frames of lens zooming being eliminated in cutting by the editor.

This cannot be done with a television camera, excepting for capturing from long shots extreme close-ups for sporting events at the right moment, when a goal is scored or a wicket falls. Nevertheless, the zoom lens is a most useful optical device, replacing in some cases the elaborate arrangements necessary for "tracking" a camera.

"Becket"

How long can a cinema film, a theatrical show, or a television play sustain the interest of the audience? Stage plays seem to be roughly standardised at 2½ hours, including two fifteen minute intervals, feature cinema films are getting longer and longer (from 1½ to 3 hours), and television plays are occasionally reaching the 90 minute time.

It is interesting to compare the timing of the TV version of T. S. Eliot's *Murder in the Cathedral*, which is to be 90 minutes, compared with the 2½ hours for the newest film on the same subject, entitled *Becket*, based on the play by Jean Anouilh. Starring Richard Burton as Becket and Peter O'Toole as Henry II, this film was made in a most spectacular manner, with magnificent settings and dramatic situations which hold the attention all through.

The BBC did not build Canterbury Cathedral on a studio exterior "lot", but a great deal of it has been acted and recorded on video tape in the Cathedral itself including the Crypt. This is a case where the film and TV treatments of the story of Becket will help one another; just as other classics do, including, for instance, the works of Dickens.

Stage and screen have periodically produced versions of the Becket story, which has been regarded for many years as a classic of the theatre.

BBC-2

What pleasant 625-line pictures are obtainable from BBC-2! It has often been said that the American standard of 525 lines with sixty fields, was far superior to Britain's 405 lines on fifty cycles. This is right, if the American domestic TV receivers are correctly adjusted. Another opinion is that the 60 field per second pictures gives far less flicker, particularly when the brilliancy is turned up. This is probably true, too, especially if the ambient light in a room is kept up, with relatively higher brightness on the c.r. tube

Nevertheless, the comparative information and detail on the two standards are relatively the same when BBC-2 is compared with the American 525 lines at 60c/s. When colour television arrives in Britain—which will still be a long time ahead—room lighting will have to be kept lower to obtain a good quality coloured picture.

In the meantime, I think that a better 625-line black-and-white picture, certainly with less flicker, will be noted by experimenting with the different positions of room lighting relative to the TV screen. I rather like the idea of inserting a dimmer in the lighting, which could be a tapped transformer, or similar device, instead of a variable resistance—or nothing.

ITV Reactions to BBC-2

There is no doubt that the BBC-2 625-line transmissions will have a "dimming" effect on some of the ITV contractors. Though the viewers with technical interests are likely to jump on the wide-band wagon, the neat little u.h.f. aerials will also become a status symbol on many a chimney stack, indicative of the superiority of the Joneses to the Browns (or vice versa).

Even the most non-technically minded people at the receiving end are likely to pay increased attention to the excellent pictures they can obtain on this channel, provided they are within range of the BBC-2 London area transmitters and have taken the trouble of having aerial systems properly orientated towards the transmitter (or to a reflection which is preferable).

It will be some time before BBC-2 penetrates into other areas but will in 1965 follow the order in which the original BBC TV network developed many years ago, to which will be added relay stations out of the range of the main transmitters.

This will affect in a similar manner the competition with the ITV contractors in the midlands, the north and Scotland. It is probable that Anglia, Westward, Border and Grampian regions will be without a third channel for BBC-2 for four or five years.

While BBC-2's effect on the new pattern of reception may reduce the T.A.M. ratings of the ITV stations when the third channel arrives, it will also be offset to some extent by the steady increase in TV receivers—and, we all hope, in TV licences.

BBC's Chairman

The BBC have carried on for some time without a Chairman since Sir Arthur fforde resigned for health reasons, and Sir James Duff has been acting as Chairman.

Great interest has been expressed in the newspapers on the question of who will be appointed to this formidable and responsible position. The appointment of one of the existing Governors will not necessarily apply as all Governors automatically retire when the present Charter expires in July. The choice, like that of the Chairman of the ITA, will probably be the Prime Minister's. In the past, for many years, the Chairman has been of an academic type and has carried out the colossal responsibilities very well indeed.

Since the BBC has had competition from the ITA and its contractors, the situation has become much more difficult, involving problems of good taste with which both of these organisations are faced. He will have to match up in some ways to Lord Hill, whose authorative Chairmanship has been highly successful. It will have to be somebody well known, able to appreciate the highly complicated organisation of the engineering and programme side, and a man to make quick decisions.

110° Scanning Circuits

BY G. K. FAIRFIELD

CONTINUED FROM PAGE 321 OF THE APRIL ISSUE

This second article shows how the frame scan current may be increased by a suitable value

DUE to the very low frequency of frame scanning, the deflector coils appear to the frame output transformer as an almost purely resistive load. It is not possible, therefore, to achieve any resonance action such as occurs with the line scan circuit, so that the increase in scanning current required for 110 deg. working involves, quite simply, an increase in scanning power required.

The major difficulty, therefore, lies in obtaining an increase in peak anode current from the low voltage h.t. supply found in modern a.c./d.c. television receivers.

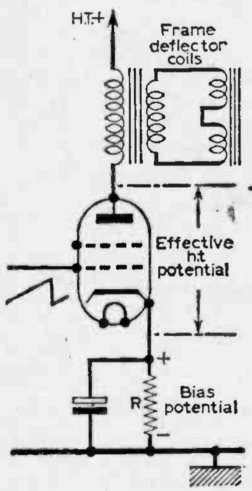


Fig. 7 (left)—The normal bias arrangements of the frame output circuit.

Bias Arrangements

This situation is aggravated by the fact that in order to correct for valve and transformer distortion fairly critical bias conditions may be necessary in the frame output stage (see the article "Scanning and Synchronisation, Part 3—Frame Scanning Circuits", by the present author appearing in PRACTICAL TELEVISION for November, 1957).

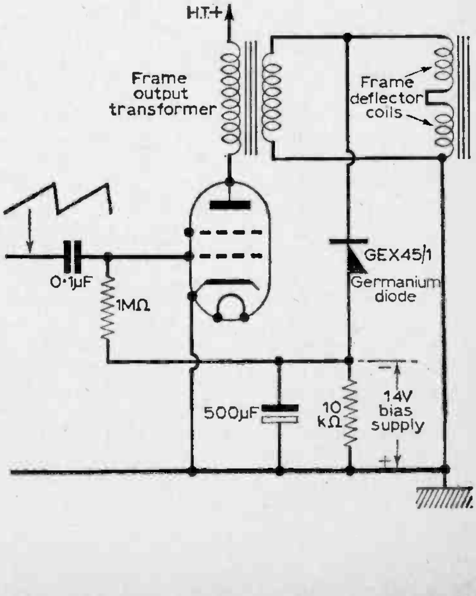
The usual way of obtaining this bias is by including a resistor in the cathode circuit as shown in the diagram of Fig. 7. Now if the h.t. supply reaches a minimum value of 180V when the receiver is operated off d.c. mains, and assuming 15V bias is required to achieve the correct biasing point with perhaps a further 10V dropped across the resistance of the frame output transformer, then only 180-15-10=155V is available across the output valve responsible for producing the large peak currents required for frame deflection.

In a given design for 70 deg. or 90 deg. scanning this will be sufficient, but to obtain a higher peak anode current then either a lower impedance (and therefore larger) valve must be used or the h.t. value correspondingly increased. We can effectively obtain a higher h.t. if the grid bias is obtained otherwise than by a voltage drop across the cathode resistance shown in Fig. 7.

A Practical Circuit

A simple solution to this problem is to make use

Fig. 8 (below)—A practical circuit for an alternative method of obtaining bias.

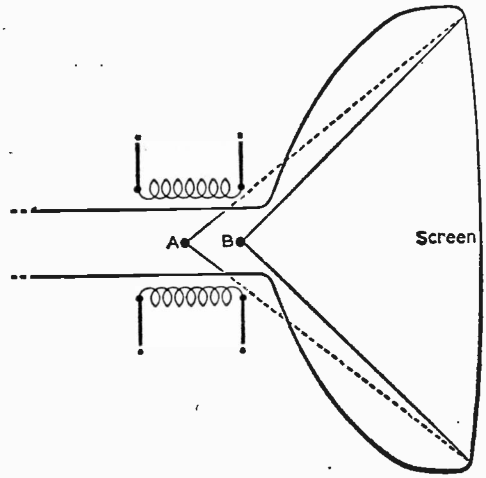


of the sawtooth waveform existing across the line or frame output transformer and by rectifying this provide the necessary bias potential required. Circuit details are shown in Fig. 8. Since very little current is drawn from this bias source no damping will occur across the frame circuit. For the same reason a small germanium diode can serve as the rectifier.

The smoothing capacitor shown will have to be fairly large if modulation of the bias supply at frame frequency is to be avoided. It is worth mentioning, however, that a controlled amount of ripple may be beneficial in improving the linearity of the timebase circuit and in practice a smaller value of smoothing capacitor may well be chosen.

If the bias is derived from the width coil tapping on the line output transformer then a much smaller capacitor will be needed and a value of 0·5 or 1μF may be used.

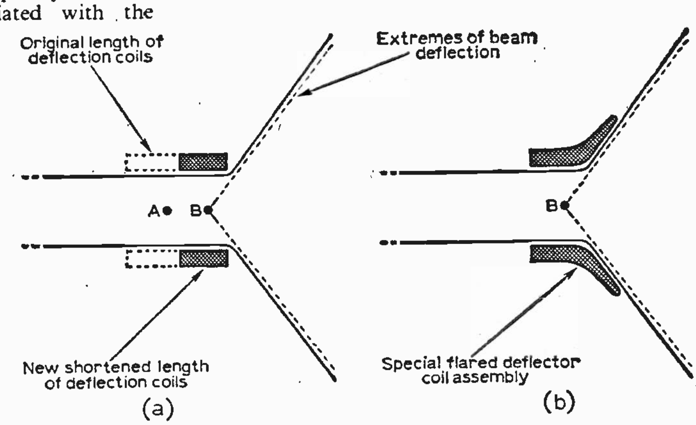
Fig. 9—Beam shadowing with a wide-angled tube.



Temperature Compensation

It was mentioned earlier that the load impedance for the frame scan circuit is almost purely resistive. This leads to a difficulty associated with the increased scanning power necessary and this is the change of coil resistance with variations in power requirements and linearity. These changes are accentuated by the use of voltage negative feedback circuits for linearisation. The feedback tries to keep the voltage across the load constant so that an increase in resistance produces a decrease in scanning current.

Fig. 10—Deflection coil arrangements to eliminate beam shadowing.



This may be counteracted by including in series with the coil a temperature dependent resistance or thermistor mounted close to the coil. The resistance of this component, which is initially a few ohms, falls with increasing temperature and by careful choice of valves the total load resistance of the combination can be maintained almost constant.

Deflector Coil Design

The increase of picture scanning angle can have several unfortunate effects with some deflection coils originally designed for 70 deg. and 90 deg. working. The most serious of these is cut-off or "shadowing" of the corners of the picture. How this can occur is shown in Fig. 9. The centre of beam deflection lies at point A and if the deflection angle increases beyond a certain maximum then the beam will hit the shoulders of the tube and is not able to reach the screen at all. The effect can be overcome if the deflection centre A is moved nearer to the screen at B as shown by the full lines of Fig. 9.

We can bring this about in two ways. Either the width of the deflection coil assembly can be shortened (Fig. 10a) or the deflection coils can be flared to take them further up the neck of the cathode ray tube (Fig. 10b).

The first of these alternative leads to reduced deflection sensitivity, requiring much more scanning power in the coils for a given deflection.

To wind a flared coil fitting further up the tube neck is not easy since it is necessary to prepare fairly elaborate trumpet-shaped winding jigs and position the coils very exactly round the tube neck.

A second difficulty lies in the raster distortion that occurs with designs of this type. Specially tapered windings are used to assist in overcoming this, but the final correction is carried out with several small magnets disposed about the tube neck and rotated to correct the "pin-cushion" distortion present.

In general it is advisable to purchase a complete

—continued on page 375

A TV Baby Alarm

FEEDING A MICROPHONE SIGNAL INTO THE AUDIO STAGE OF A TV RECEIVER VIA A TRANSISTOR AMPLIFIER.

By Gordon J. King

SOME experimenters may have already tried connecting a microphone to the audio stages of a television receiver in an endeavour to superimpose the sound of distress in the infant's bedroom upon the programme sound. Direct connection of a microphone is rarely successful owing to the relatively small gain of the audio section on the one hand and the low level microphone signal on the other. This article describes how the microphone signal can be boosted before it is fed to the audio section.

Triode-Pentode Audio Section

The majority of television sets employ a triode-pentode audio circuit as shown in Fig. 1. Here the signal from across the load of the sound detector is applied to the grid of the triode and the triode steps up the audio to a level suitable for driving the pentode output stage and loudspeaker. The triode employs "grid-current" biasing by the 10MΩ resistor between grid and chassis and the pentode has normal cathode biasing by the 330Ω cathode resistor.

Slightly different arrangements will be found between sets of different make and model, but all models using a triode-pentode valve will have a circuit almost exactly as shown in Fig. 1, plus, possibly, some form of negative feedback, depending upon the type of valve used. The PCL82 has separate cathodes, but some triode-pentodes have just a single cathode common to both sections and a slightly different circuit, of course.

For average sound volume the triode receives at its grid about 50 to 100mV of audio signal. The sound detector produces a signal across its load several times stronger than this, but this high level is used only when the volume control is turned full up, and this not very often provided the set is working correctly and the viewers have average hearing.

Now for a baby alarm to be fully effective even the slightest murmur from the infant should be audible over the programme sound, irrespective of the setting of the volume control. This means, then, that the alarm channel must always be at full gain.

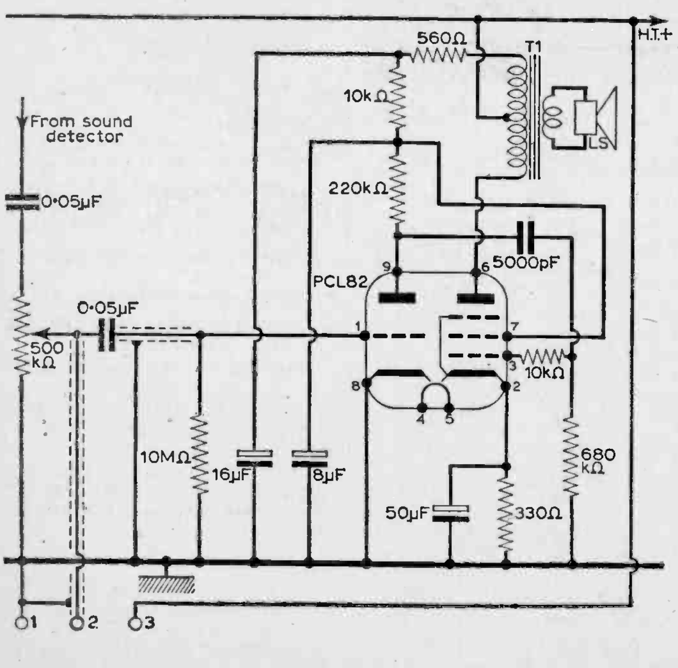


Fig. 1—Circuit of typical television sound output stage using triode-pentode PCL82 valve. The connections terminated at 1, 2 and 3 are extra to the circuit for connecting the baby alarm amplifier.

This presents several problems such as signal/noise ratio and hum level, bearing in mind that it is neither desirable nor possible to position the microphone close to the face of the baby. Of course it would be a bad thing for the alarm channel to superimpose hum and noise (other than that of the infant) upon the sound of the programme.

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Transistor Microphone Amplifier

The solution to signal/noise ratio and gain was discovered in a small transistor microphone amplifier, as shown in Fig. 2. This is a simple "earthed emitter" circuit with the microphone signal applied to the base via a microphone transformer. The amplifier is powered from the h.t. line of the receiver via a potential-divider network comprising R1 and R2. With an h.t. line of about 230 volts, approximately 10 volts d.c. occurs across R2. Although this voltage has already been smoothed by the receiver smoothing circuits, extra smoothing is given by a 1,000μF electrolytic capacitor C1. This ensures that the amplifier does not introduce extra hum into the grid circuit of the audio section.

As the amplifier will often be coupled to an alternating current/direct current type of set where the chassis is connected to one side of the mains supply, extra special care must be taken to isolate the microphone feed circuit, for even the slightest a.c. voltage transferred to the microphone could prove distinctly unhealthy to the restless infant.

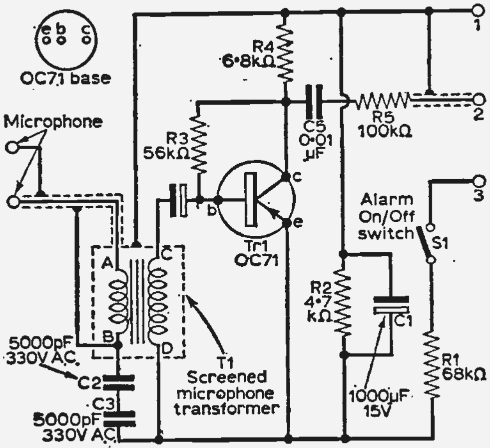


Fig. 2—Circuit of the baby alarm amplifier. The OC71 transistor is powered from the h.t. line of the receiver via potential-divider R1 and R2. Extra smoothing is given by C1. For double safety, two isolating capacitors C2 and C3 are used in the microphone circuit. These must be no larger than 5,000pF and rated at 330V a.c.

COMPONENTS LIST

Resistors:

R1 68kΩ
R2 4·7kΩ
R3 56kΩ
R4 6·8kΩ
R5 100kΩ

Capacitors:

C1 1,000μF electrolytic 15V
C2 5,000pF 330V a.c.
C3 5,000pF 330V a.c.
T1 Microphone transformer (Radiospares).
Tr1 OC71 transistor
S1 s.p.s.t. toggle switch

This design incorporates features that render it absolutely safe in use.

Safety First

Firstly, isolation is given by the A-B and C-D windings (primary and secondary) of the microphone transformer T1. Secondly, isolation is provided by capacitors C2 and C3. Two series-connected capacitors are used so that in the remote event of one capacitor breaking down there will still be another in the circuit maintaining adequate safety. As an added precaution, the outer screen of the microphone cable can be connected to a true earth, such as a rising water main; but make sure that a *true* earth is used.

The amplifier is designed for a moving coil microphone of about 20 to 100Ω impedance (the actual value is not important), and it should be connected to the primary of the microphone transformer through a thin, coaxial cable. The type of cable used as television downlead from the aerial in areas of high signal is ideal and not very costly. This cable can be obtained with a cream, plastic covering, and if it is necessary to run it to the bedroom on the surface of woodwork, such cable is far better than that with the more conventional brown, plastic covering.

The amplified signal is developed across the collector load resistor R4, and is fed to the audio stages of the set through the coupling capacitor C5 and the "buffer" resistor R5. This latter component prevents the signal being distorted by the rectifier effect of the collector/base junction of the transistor, and it also avoids the programme signal from being loaded excessively.

Connections to the Set

There are three points of connection from the set to the amplifier, marked 1, 2 and 3 in Figs. 1 and 2. Reverting to Fig. 1, it will be seen that a connection is made from set chassis on 1, from the slider of the volume control on 2 and from the h.t. line on 3.

The h.t. connection in particular must be well insulated. The connection to the volume control should be through screened cable, and a length of the coaxial microphone lead can be used here quite successfully. It will be understood, of course, that the amplified microphone signal is applied direct to the grid of the audio triode, meaning that full microphone channel gain will always exist provided the volume control is not turned right to zero, for then the grid is shunted by the 0·05μF coupling capacitor. While this will not "kill" gain completely it will considerably mute the alarm signal. If required, this can be overcome simply by connecting a 47kΩ resistor between the slider of the volume control and the 0·05μF capacitor. Such a resistor would not normally affect the operation of the volume control on the programme sound, and in some sets it may already be fitted.

Amplifier Construction

The transistor microphone amplifier is best made up on a piece of $\frac{1}{16}$in. laminated plastic board measuring about 2in. by 5in., as shown in Fig. 3.

The components may then be secured to the board by threading their lead-out wires through small holes drilled with a No. 55 drill.

The wiring may then be completed on the reverse side of the board, and the broken-lines in Fig. 3 show this. Note that where wires cross a length of insulated sleeving must be threaded on to the conductors to avoid short circuiting, which could easily damage the transistor.

The screened cables on the microphone circuit and on those connecting 2 to the set should be secured to the board by small soldering tags, the latter retained by 6B.A. nuts and bolts.

After the wiring is completed and the circuit has been checked several times, the amplifier can be mounted on the inside of the cabinet (if of wood) by drilling a hole in each corner of the board and using wood screws and stand off pillars to prevent the circuit from touching the cabinet side—a practice which could incite a pick-up.

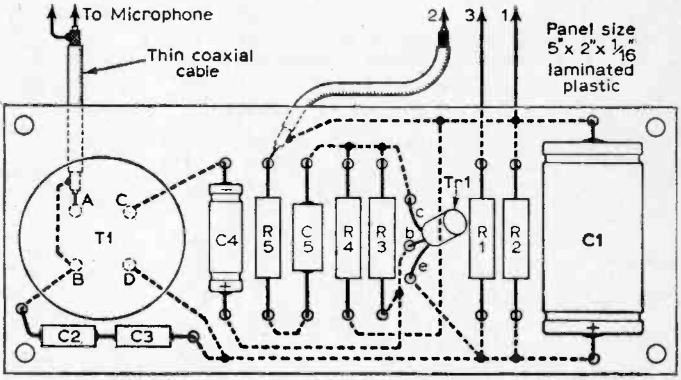


Fig. 3—The transistor amplifier can be built on a laminated plastic panel measuring about 2in. by 5in. The components are all mounted on one side, and the connections are on the reverse side with the lead-out wires threaded through small holes (drill No. 55).

If it is not possible to fix the board to the cabinet, then it must be secured by stand-offs to the chassis or to a chassis member, ensuring that the circuit is kept well clear of the metal chassis and set circuit. The amplifier should also be kept as far as possible away from the a.c. and power circuits of the set, including the frame and line output stages, where the heavy signals here could get into the amplifier and superimpose a hum or whistle on the sound.

As it will not be desirable to keep the amplifier on at all times, a simple on/off toggle switch should be interposed between the lead from R1 to the h.t. positive line. This switch can be fitted to the rear cover of the set.

Components

All the components for the microphone amplifier are readily available from most radio stores. Radiospares Limited markets a suitable microphone transformer and 1,000μF capacitor for C1.

One of the ex-Government or surplus moving/coil microphone inserts can be boxed in such a way as to fit in with the nursery furnishings. Such a microphone is usually reasonably sensitive for this application; but other microphones and inserts all ready and made up can be used if required. There is usually no problem here.

A high impedance ceramic or crystal microphone could be used (less microphone transformer) but this is not particularly recommended owing to the noise and hum picked up on a high impedance line from the amplifier to the microphone. An ordinary coaxial cable tends to become microphonic under high gain conditions, and although on the face of it it may seem less costly to use a crystal microphone and no transformer, in practice this is not always the case after one has found it necessary to spend out on extra special cable to clear hum and noise. If a high impedance microphone is used, however. *mains isolation is still essential.*

Operation

The device is best checked by removing the aerial from the set (or turning to a vacant channel), turning the volume control halfway on and checking how well noises from the baby's room are reproduced in the set. At this stage the microphone should be adjusted for the best position by using a ticking alarm clock as a substitute for the infant—the infant almost certainly at this time being in its "noises off" condition.

Signal may then be applied to the set and the alarm breakthrough ratio assessed. In most cases the alarm signal will always be well above the programme signal. ■

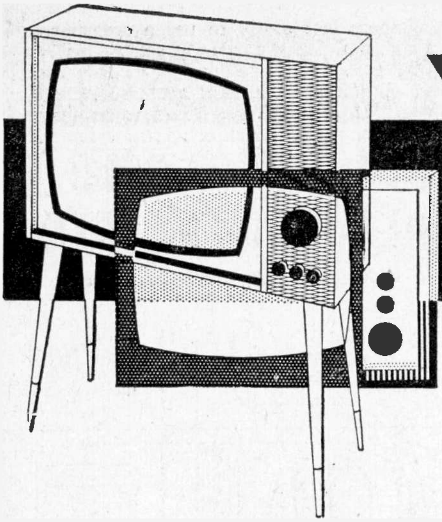
110° Scanning Circuits

—continued from page 371

deflection assembly from a reliable manufacturer rather than attempt the rather lengthy trial-and-error routine which would be necessary for the constructor in arriving at the compromise solution required.

The above remarks must not lead the reader to understand that a special design of coil is needed in all cases. This depends on the mechanical design of the coils, thickness of the cathode ray tube wall in the shoulder region and width of the electron beam which depends, in turn, on the e.h.t. available.

The designs discussed in this and the previous article can be carried out with the equipment at the reader's disposal and may or may not result in a special coil design of the type described above being required. ■



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. 380 must be attached to all Queries, and a stamped and addressed envelope must be enclosed.

BUSH TV22

This set is in excellent condition and I would like to replace its present tube with one of a larger size. I wonder if you could advise on this matter and describe any circuit alterations that would be necessary.

Also is it possible to convert this receiver to ITV operation.—M. J. Milson (Loughborough, Leicestershire).

We would advise you to obtain a TV24 cabinet (which should only cost a few shillings) and fit a Mullard MW31-74 which is a 12in. tube. This would entail only mechanical alterations.

To carry out the conversion to ITV you will have to purchase the Bush TC184 tuner unit, which is still available from some advertisers at a price of about 10s.

DECCA 444

After losing the picture on this receiver, I changed the line output transformer for a new one, on advice I received at the time. When the new component arrived there was no position for an EY51. A valveholder was incorporated, however, and so I fitted an EY86 which produced a picture with a $1\frac{1}{2}$in. gap at the bottom of the screen and a $\frac{3}{4}$in, gap at the right-hand edge.—G. Hartley (Hull).

The new transformer is designed to take the EY86. The lack of width and height should lead to a check of the h.t. voltage. If the d.c. output voltage from the rectifier is less than the a.c. input voltage, the rectifier is probably worn and should be replaced.

ALBA 717

When first switched on, the picture will fill the screen but only with the width control advanced almost fully, and with the frame hold also hard against one stop. When the set has warmed up, picture height gradually reduces until after about forty minutes there is a gap of 2in. at the top and $1\frac{1}{2}$in. at the bottom of the screen. This situation remains for the rest of the time the set is switched on.

Another fault which is present all the time is a vertical white line down the left-hand side of the screen.

I have tested and found to be in good order, the PCL82 and ECL80's in the frame panel and the PY32 rectifier. Also I have replaced the EY86, PL81 and PY81 valves, all without clearing the faults.—T. W. G. Marshall (Cardiff).

These symptoms indicate either that the line timebase falls in efficiency as the result of a fault in an associated component which develops with time or heat, or that the h.t. voltage falls after a while. This latter could be caused either by a fault in the rectifier which, again, does not develop immediately, or by extra heavy loading due to the development of a line timebase fault.

A few voltage tests should prove these possibilities. Alteration in value of a component between the oscillator and the amplifier could be responsible and would probably account for the vertical line mentioned. But also have in mind the possibility of a booster diode circuit fault. Check the booster diode and the associated reservoir capacitor.

MURPHY V410

This set reproduces a perfect picture but the sound on both channels is drowned by buzzing which increases with increased volume. Adjustment to the contrast control will eliminate the buzzing but also leaves a negative picture on the screen.—J. Greenwell (Glasgow, S.W.2).

Check the screen grid decoupling capacitor of the 30F5 sound i.f. valve, which is between the

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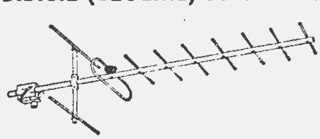

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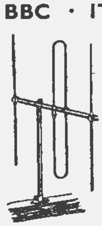

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valveholder and the upper coil. It is a 0·001μF capacitor and should be changed for a Hunts W99 component, fitted in exactly the same position.

PYE SP17

Sometimes a normal picture is received when this set is first switched on; sometimes a picture which is stretched vertically appears. In the latter case, the picture reduces to a normal size after about two minutes.

After a further hour of operation the picture begins to cramp at the bottom of the screen, leaving a 1½in, gap. This fault gradually worsens and is accompanied by decreasing width. At this stage adjustments to the line hold control become necessary to keep the picture stable.—C. W. Hallett (Croydon, Surrey).

We advise you to check the PCL82 and PCF80 valves at the back of the receiver, both of which appear to be slow heating.

G.E.C. BT2253

The horizontal hold on this receiver is very critical. Constant adjustment to the hold control is necessary to keep the picture steady.—A. Mullan (Mallusk, Co. Antrim).

Replace the Z329 (EF80) next to the N308 half-way up the right-hand side. If this is not effective, check the 330kΩ resistor to pin 2 and the 3·9pF capacitor to pin 8.

BUSH TV83

Could you indicate the cause of persistent line hold slipping on this receiver? Sometimes this occurs only a few minutes after the set has been switched on; more often it begins after two or three hours' operation.

The hold can be restored by adjustment of the control, but of late this has become extremely critical.—P. T. Griffith (Pontllanfraith, Blackwood, Monmouthshire).

You should replace the upper right side ECC82 valve. If necessary, check the discriminator diodes associated with the centre sync transformer.

DECCA 333

I wish to replace the metal rectifier in this set with a silicon diode. Could you inform me of a suitable type and any circuit alterations that will be necessary?—R. C. Neale (Garlings, Margate, Kent).

A suitable component for this application is a Radiospares type REC51A, which should be obtained from a dealer. This supplies 500mA at 250V but must be fed from the a.c. supply through a 20Ω surge limiting resistor of 5 or 10W rating.

ULTRA 9/15

Permanently on the picture of this set is a horizontal white line, approximately ½in. in depth. This line oscillates up and down by about 1/8in. This fault is slightly different from one which occurred some time ago, and which I cured by replacing the 20P3 frame output valve.

In attempts to cure this present fault, I have replaced two 20L1's (V8 and V19) and a 20P3 (V20). I have checked the voltages, which appear to be normal. Capacitors C91, C90, C85, C92 and C98 have been checked o.k.—J. Print (Watford, Hertfordshire).

This symptom is definitely one of frame timebase trouble. If the line occurs at the bottom of the picture, it indicates that the frame amplifier is unable to produce the full power necessary for maximum scan amplitude. This is often caused by a low emission frame output valve, bias trouble on the valve, low heater volts, low h.t. volts, shorting turns in the frame output transformer or trouble in the bias capacitor of the valve. All these points should be investigated.

PHILIPS 1756

To obtain the correct lock, very critical adjustment of the frame hold is necessary, with the control set at a point approximately mid-way in its travel.

There is also a sound-on-vision fault which causes the picture to jump frequently.

Valves in the frame timebase are all in good order.—M. Leach (Headington, Oxford).

We would advise you to check the 220kΩ anode resistor of the sync separator and the high value resistors associated with the frame sync clipper. Check the video amplifier electrolytics if necessary.

With regard to the sound-on-vision fault, if this is not due to misalignment, check the h.t. line electrolytic capacitors and that decoupling the sound output stage.

ULTRA V712

This set has recently developed the fault of frame slipping, particularly just after switching on from cold. After a period of operation the fault occurs intermittently. Also the frame height has reduced, with the top and bottom of the picture distorted. The frame height control P4 will not correct the latter fault.

I have fitted a new 6K25 frame generator valve (V8) and a new UL46 frame amplifier valve (V9). I have also renewed the 0·5μ capacitor, C29. None of these changes have effected any improvement.—J. M. Goodall (High Barnet, Hertfordshire).

With reference to the frame slip fault, check V4 (6L19) and its associated components. Regarding the latter fault, you should check C30 for leakage and C31 for capacity. Also check R35 if necessary.

H.M.V. 1869

From time to time, a black, horizontal line appears at the bottom of the screen. This is never permanent, the line jumping up by about an inch for periods of a few seconds to a few minutes.

I have a duplicate set of valves for this set, so I

can eliminate the possibility of a valve fault.—H. Alder (London, N.W.2).

If the top centre PCL83 is not responsible for the erratic jumping, check the 50μF bias electrolytic capacitor associated with pin 7 and the wiring of the valve base.

PHILIPS 1768U

Normally this set is reasonably free from hum. However when tuned to the BBC channel and a *white* caption is superimposed on the picture, a very loud hum develops which completely obliterates all other sound.—D. E. Williams (London, S.W.6).

We advise you to replace the 10μF electrolytic capacitor which decouples pin 8 of the PCL83 sound output valve, if the trouble has only just started. Also ensure that the aerial input is properly attentuated to avoid overloading, that the BBC coil core is properly aligned and that the PCC84 and centre ECL80 valves are in order.

SOBELL T347

I have recently replaced the tube in this set and would like to know if the focus magnet has to be connected anywhere. Since the replacement, the picture is shifted upwards leaving a black band at the bottom of the screen and cutting off the top of the picture even with the height control fully clockwise.—S. H. Brown (Braintree, Essex).

The T347 uses an AW36-20 or an AW36-21 which are both electrostatically focused tubes. The method of shifting the picture is to adjust the clamp magnet immediately behind the scanning coils, rotating the clamp and the insert magnet by means of the knob which determines the degree of shift.

TEST CASE -18

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

? *The receiver would give a normally good picture at most times but during certain periods, mainly on the BBC channel, two short, horizontal, bright lines would appear towards the top left-hand side of the picture. These were not present at all times and rarely seen on the ITV channel.*

It was also discovered that the lines could sometimes be eliminated by very careful adjustment to the frame hold control, and that they appeared as shown in Fig. 1 when the height was reduced. It was then seen that, in addition to the two lines at the left of the picture, there were also a pair of lines at the right of the picture and also two dots between the two sets of lines.

What was the cause of this symptom and what steps could be taken to eliminate it?

See next month's PRACTICAL TELEVISION for the solution to this Test Case and for another problem.

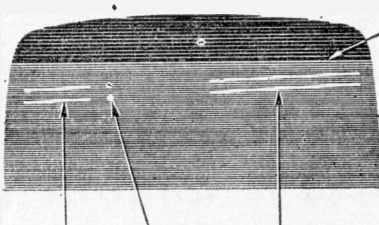

Fig. 1—The fault symptom of this month's Test Case.

SOLUTION TO TEST CASE 17
(Page 328, last month)

Since the sound and vision breakthrough occurred only when the volume control was advanced, the trouble was caused by the audio signal getting into the vision circuits and the vision signal getting back into the audio circuits.

Misalignment can also cause similar effects, but here they would remain even when the volume control is turned right off. Thus, the alignment can be absolved from blame when operation of the volume control distinctly affects the symptoms.

In the case in question, the trouble was eventually pin-pointed to internal coupling within the case of a dual electrolytic assembly, one section being used to decouple the vision circuits and the other section the sound circuits. Replacement of just one capacitor section solved the problem, but to be on the safe side the complete dual capacitor was replaced.

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This coupon is available until May 22nd, 1964, and must accompany all Queries sent in accordance with the notice on page 376.

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Page 264, March issue, 1964

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