• A BAND III PRE-AMPLIFIER •

Practical Television

1/-

AND TELEVISION TIMES

EDITOR: F. J. CAMM

DECEMBER 1955

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Televiews

COLOUR TELEVISION

THE BBC, as is now well known, has been putting out experimental transmissions in colour. The results, however, are not such as to encourage the thought that colour TV is a possibility of the near future. Indeed, members of the trade most interested from a technical point of view are almost unanimous in their comment that it is merely a prospect of the distant future.

It must be remembered that colour TV has been tried in America, but with unsatisfactory results. It is our view that the mechanical system at present employed is not the answer to the problem, and is about as near to real colour TV as Baird's disc TV receiver was to TV receivers as we know them to-day. The problems involved are vast and answers to many of the problems have yet to be found. In any case, it is doubtful whether the country is yet ready for colour television programmes. Vast sums of money need to be spent in research work which at the present time the BBC can ill afford. No doubt, when it does come, it will be accompanied by an increase in the licence fee.

The Editor and Staff Join in Wishing Every Reader a Very Happy Xmas

INCREASED PURCHASE TAX

IT is one of the idiosyncrasies of Chancellors of the Exchequer that when our internal economy is in need of rearrangement they impose taxes on goods produced by growing industries. In the early days of the motor car, its development was hampered by restrictive taxes and restrictive legislation. The increased purchase tax on TV receivers is the latest financial brake to be placed on British scientific development in a field which has been pioneered by Great Britain and in which up till now we have led the world. As it now seems part of our political economy to prevent people spending the extra money which at the Government's request they have worked harder for, we must presume that to spend money on any device which helps to make life a little pleasanter is almost an offence against the State.

Fortunately, thousands of readers of this journal have placed themselves outside the reach of the Treasury maw by building their own receivers, and since Mr. Butler's announcement there has been an increased demand for our handbook entitled "Practical Television Circuits," which shows how to make television receivers from a simple one costing about £10 to those of a more ambitious type. The do-it-yourself movement now extends to the construction of all domestic equipment subject to penal purchase tax. That is why our companion journal, *The Practical Householder* has, in the course of four months, become a national magazine with probably the largest circulation of any monthly magazine in the country. You will find it a useful adjunct to the home. It costs 1s. every month.

PREMIUMS FOR TECHNICAL WRITING

NON-PROFESSIONAL writers of technical articles dealing with radio and electronics, including specialised applications to any industry, and the editors responsible, are reminded in a leaflet issued by the Radio Industry Council of its premium award scheme,.

Up to six premiums of 25 guineas each are offered yearly in respect of articles which, in the opinion of the Council's panel of judges, are likely to enhance the reputation of Great Britain in radio, television and electronics.—F. J. C.

ALIGNMENT OF TV RECEIVERS

MAXIMUM PERFORMANCE IS ONLY OBTAINED WHEN A SET IS PROPERLY LINED-UP.. THE PRINCIPLES ARE DEALT WITH HERE

(*Continued from page 246, November issue.*)

Single Sideband Receivers

LAST month we considered the double sideband mode of television picture transmission, and the receiver alignment required to provide a double sideband response. To start this month's article we will consider the same factors appertaining to the single sideband system. It is this system which is used on four of the five Band I channels, and the system which is to be used on all channels in Band III. The station at Alexandra Palace is the only one which uses the somewhat wasteful double sideband system.

The requirements of a national television service, embracing high- and low-power stations, made it necessary to employ the available frequency spectrum to maximum advantage. This has been done by transmitting the whole of one vision sideband and partly suppressing the other one; this is generally known as a single sideband transmission, but since a vestige of modulation remains on the partly suppressed sideband, the system is sometimes referred to as "vestigial sideband."

The transmission curve for this system is illustrated at Fig. 6, and by comparing this with the double sideband transmission curve it is clear to see that something like 2 Mc/s bandwidth has been salvaged. This is most important where it is necessary to get a certain number of sound and vision channels in a limited spectrum. It will also be seen that the suppressed sideband is at the high-frequency side of the transmission curve, the one farthest removed from the sound carrier.

Owing to the fact that picture signals up to 0.75 Mc/s are transmitted equally in both sidebands (this is because it is not possible to cut off the unwanted sideband sharply at the transmitter), the receiver's vision channel response must be arranged to compensate for this double power. This is readily achieved, as may be seen from the receiver's vision response curve at Fig. 7, by fixing the vision carrier at a point which is 6 db down the high-frequency side of the vision response curve. Since minus 6 db corresponds to a 2 to 1 reduction, it can be clearly realised that the extra modulation power up to 0.75 Mc/s is balanced out by the time it reaches the vision detector.

We should now understand that if this precaution is not taken, and the receiver response arranged so that the carrier falls within the full pass-band, as on the transmission curve, the receiver's detector will receive two times the power of the higher modulation frequencies from the D.C. level up to 0.75 Mc/s. This will, of course, give rise to the symptoms associated with an exaggerated low-frequency response (or a poor high-frequency response, relatively).

Again it is necessary to ensure that the receiver response falls sharply at the frequency of the sound carrier. The sound rejector circuits (or sound traps as they are frequently called) take care of this, and it is quite usual for two or more of them to provide an attenuation of the order of minus 40 db; indeed, such attenuation is demanded if sound interference on vision is to be eliminated.

The sound channel response, shown in broken line

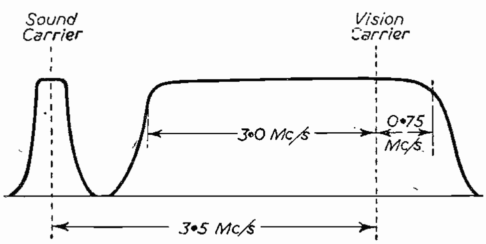


Fig. 6.—The transmission curve for a single sideband system.

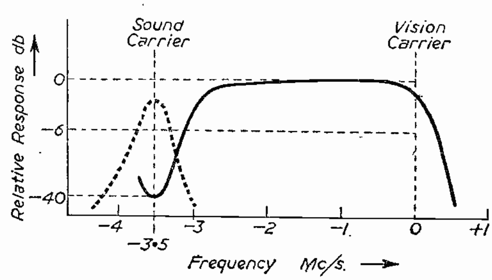


Fig. 7.—The ideal response curve for a single sideband receiver

in Fig. 7, commonly has a bandwidth between 0.1 Mc/s and 0.5 Mc/s.

Before continuing it will be desirable to make clear a point which appears to bewilder the beginner, and that is, it is quite permissible to align London area receivers for single sideband operation, even though the transmission is double sideband. Indeed, such practice is common on current 5 channel and two-band receivers. Moreover, modification to the alignment may, if desired, be made to the older style double sideband receiver and the higher sideband may be chosen so that a wide valley can be left between the vision and sound signals, thereby facilitating sound rejection.

In order to obtain a response as shown in Fig. 7, it is essential to employ an accurately calibrated signal generator and video output indicator, and also to apply the instruments precisely as stipulated by the manufacturers. It is not feasible to generalise in this respect, because alignment procedures depend on the design of the I.F. stages, and this differs considerably between manufacturers. It must be stressed, therefore, that the alignment process must not be undertaken lightly, and it is essential if the alignment is to be successful to follow very carefully the procedure laid down by the designer.

To illustrate this point, and also to give the experimenter an idea as to how alignment is tackled, we will now run through the alignment procedure stipulated for a commercial receiver of current single sideband design.

The Alignment of a Commercial Receiver

This cannot be a typical example, as there is no such thing as a typical television receiver, though nevertheless, it should serve to illustrate the application of instruments for alignment purposes.

A skeleton circuit of the R.F., I.F. and oscillator stages employed in a modern commercial television receiver is shown in Fig. 8, and it is this which we shall use in a hypothetical sense as an aid to instruction.

It is nearly always required to align the sound I.F. amplifiers first of all. This is easily done by applying a *modulated* signal equal to the sound I.F. to the grid of the frequency changer valve, monitoring the modulation signal, which appears across the loudspeaker, either by the loudspeaker itself, or preferably, by means of an audio output meter or A.C. voltmeter, and then adjusting the appropriate coils for maximum sound or maximum deflection on the meter.

It is also generally required to adjust the sound traps (sound rejectors) for *minimum* signal in the vision I.F.s as the result of the sound I.F. signal applied to the frequency changer valve.

It has already been explained how the multimeter may be used as a sound output indicator ; this is quite a simple matter and requires no further comment. We have also shown a method of using the multimeter as an R.F. indicator. This latter method is, as was intimated, useful for indicating video output, and might well be adopted successfully. For this function, however, it is also quite permissible to connect a multimeter, set to, say, the 100 volt D.C. range, across the anode load resistor of the video amplifier valve, with the negative connection to anode. So connected, an *increase* in reading corresponds to an *increase* in output.

Let us suppose that the sound I.F. of the circuit at Fig. 8 is 19.5 Mc/s, then we inject a modulated signal

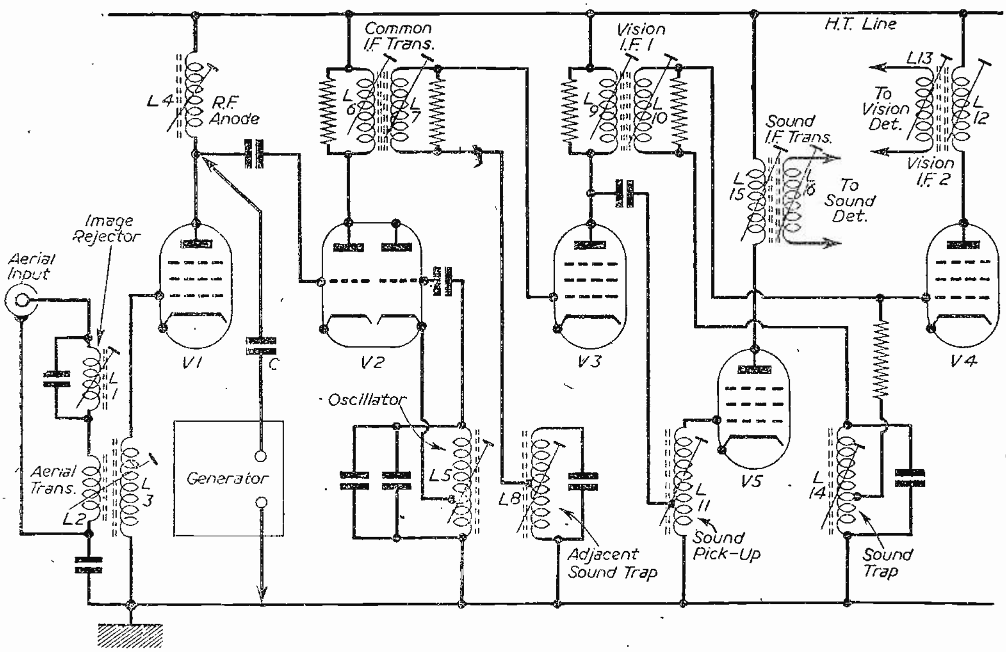


Fig. 8.—Showing the R.F., oscillator and I.F. stages of a modern commercial receiver.

at this frequency into the signal grid of V2. It is always best to apply the signal through an 0.1 ΩF isolating capacitor, and to connect the "earthy" side of the generator output direct to chassis. Precautions must also be taken in order to avoid damage to the signal generator and operator when dealing with a receiver which has its chassis in contact with one side of the mains supply.

Where the circuit is of Fig. 8 style, it would be best to inject the signal to the anode of the R.F. valve V1, via an isolating capacitor C, as shown. Now our first adjustment in our aim to achieve the desired overall response as illustrated at Fig. 7, is to adjust the tuning of the sound trap L14 for *minimum* reading in the video meter.

In order to obtain a readable indication, it is generally necessary to put in quite a strong signal and to ensure that the sensitivity and contrast controls are set at maximum. A modulated signal is not essential for this operation.

With the volume, contrast and sensitivity controls at maximum, the tuning of the sound pick-up coil L11 and the sound I.F. transformer L15 and L16 should next be adjusted for maximum indication in the sound output meter.

The signal must, of course, be modulated for these adjustments, and its amplitude must be kept at the lowest possible level, consistent with readable indication in the meter.

While adjustments to the I.F. tuning are being carried out, it is often a good idea to mute the local oscillator as a means of preventing spurious responses which are liable to provoke alignment error. This can be done quite easily, either by shorting the oscillator coil or by disconnecting the H.T. supply to the oscillator section. Whichever method is adopted care should be taken to prevent undue disturbance to the associated wiring.

Before going on to the next section, further trouble can often be saved by re-adjusting coils L14, L11, L15 and L16.

In the circuit at Fig. 8, L8 functions as an adjacent channel rejector and attenuates the vision I.F. response at a frequency which corresponds to the adjacent sound channel. If the receiver uses an oscillator which is the I.F. higher in frequency than the incoming signals, this rejector might well be tuned in the region of 14.5 Mc/s, for it must be remembered that the relative positions of the sound and vision signals in the I.F. channels are reversed when the oscillator frequency is higher than the signal frequency —the vision I.F. response becomes something like a mirror image of the original.

Most modern five-channel and two-band receivers embody an adjacent channel rejector, this being necessary to prevent breakthrough of the sound signal originating from a station which is one channel *higher* than that to which the receiver is tuned. For instance, an incorrectly adjusted adjacent channel rejector on a receiver which is, say, tuned to Channel 4 might suffer from interference from Channel 5's sound signal. This interference takes the form of vertical lines possessing the characteristics of a 1.5 Mc/s pattern, this does, in fact, correspond to the difference in frequency between the two signals concerned. In severe cases of adjacent channel interference, the picture is often disturbed by the sound modulation, and this produces the symptom of sound interference of vision, accompanied by the 1.5 Mc/s pattern.

The adjacent channel rejector should be adjusted for *minimun* output in the video meter, it often being necessary to apply a large unmodulated signal in order to get a workable indication.

The Vision I.F.'s.

This is the most important part of the whole process, for which it is essential to make reference to the receiver's alignment data. Regarding the circuit at Fig. 8, it might well be that the vision I.F's. are peaked at one particular frequency, and the bandwidth obtained by the damping resistors and the shape of the response curve by the rejector circuits. This is not always the case, however.

Since we have supposed that the receiver uses a higher than signal frequency oscillator, and a sound I.F. of 19.5 Mc/s, it is quite feasible that 17.6 Mc/s will be used for the vision I.F.'s; this will provide the correct relationship between the vision response curve and the vision carrier for single sideband operation when the oscillator is adjusted for maximum sound.

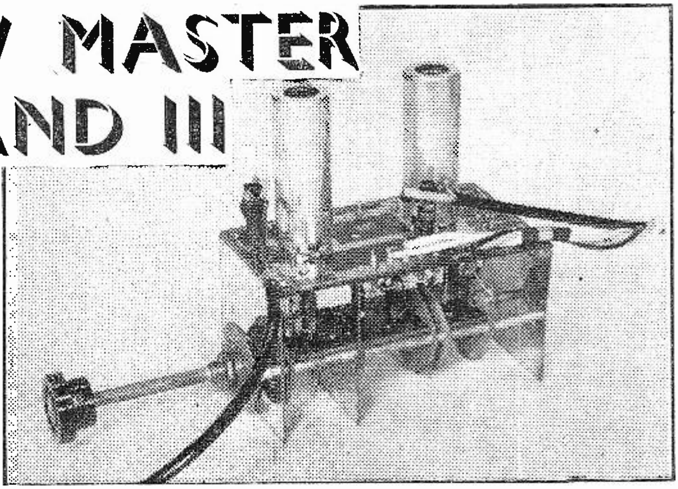
The signal is still applied to the anode of V1, as for alignment of the sound channel, but this time it is unmodulated. After having set the contrast and sensitivity controls at maximum, coils L13, L12, L10, L9, L7 and L6 should be adjusted, in this order, for maximum indication in the video meter. It is often necessary, in order to avoid interaction, when adjusting the primary of a vision I.F. transformer, to damp the secondary with a 1,000 ohm resistor and conversely, when adjusting the secondary, to connect the resistor across the primary.

The R.F. and Oscillator

If the foregoing adjustments have been carried out correctly, the precise characteristics of the sound and vision responses will have been moulded and, if all is well, the relationship of the vision carrier with respect to the vision I.F. response will be correct when the local oscillator is tuned for maximum sound.

(To be continued.)

THE VIEW MASTER ON BAND III



The converter for the View Master.

THE MODIFICATION OF T.R.F. RECEIVERS FOR THE RECEPTION OF THE I.T.A. TRANSMISSIONS

WITH over 30,000 View Masters in daily use, one third of these being in the London area, considerable interest has been shown and very many queries have been received requesting information on the conversion of the View Master for reception of the Band III transmissions.

The View Master being a T.R.F. receiver has problems peculiar to itself and a careful approach is necessary if a satisfactory performance is to be achieved. This position is complicated even further by the fact that the Model A View Master for reception of the Alexandra Palace transmissions is tuned to the upper sideband of the vision carrier so as to give adequate rejection of the accompanying sound without the necessity of employing rejector circuits and without affecting the video response. For this reason details of the recommended modifications have been delayed until sufficient experience has been obtained on the performance of various methods under actual operating conditions. That this has been proved to be the correct course is amply justified by the difficulties experienced by those users of T.R.F. receivers who have boldly fitted commercially available converters without consideration of the technical difficulties and have either hoped for the best or have ignored the problems which may arise, though frequently this may have been through ignorance.

As the first Band III transmitter is located in the London area, we must deal primarily with the conversion of the Model A View Master, though the recommended modifications will, of course, apply to all other View Masters. Because the London View Master is aligned to the upper sideband of the vision transmission the video response at around the carrier is approximately 6 dB down, falling to greater than 20 dB down at 1 Mc/s on the low-frequency side of the carrier. On the higher frequency side of the carrier the response is of course maintained up to 2½-3 Mc/s. The video response, together with the accompanying sound channel is shown in the diagram Fig. 1a, whilst immediately beneath it is the video and sound characteristic of the Band III transmitter (Fig. 1b), which, of course, is similar to Channels 2-5 on Band I. From this diagram it will be seen that the vision receiver characteristic and the Band III transmitter characteristic are quite different, and therefore a converter which operates by converting the Band III frequency to a Band I frequency, for example, 194 Mc/s to 45 Mc/s, and feeding into the vision and sound receivers (see Fig. 2) must suffer from a lack of the higher modulation frequencies, with the result that the definition of the picture will be seriously impaired. If the vision receiver has its alignment modified to improve the performance when receiving the Band III

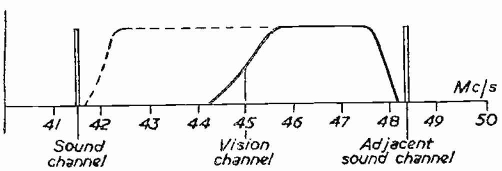


Fig. 1a.—Diagram indicating vision receiver response of model A View Master in relation to accompanying sound channel.

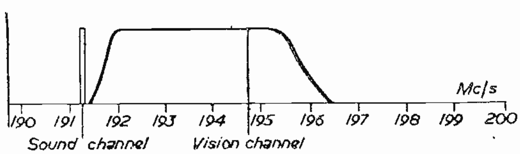


Fig. 1b.—Frequency characteristic of Band III transmission.

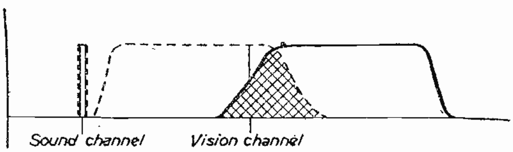


Fig. 2.—Plain line indicates video response of model A View Master. Dotted line indicates frequency characteristic of Band III transmission after conversion to Band I Channel I frequency. Shaded portion of diagram gives resultant response characteristic of Channel I receiver.

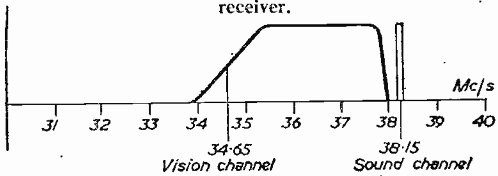


Fig. 3.—Frequency response characteristics of I.F. amplifier for use with Band I and III converter.

transmissions, then its performance on Band I will be affected, and it is obvious therefore that a compromise may have to be arrived at, but the receiver cannot in practice give a satisfactory performance on both Bands I and III. There is also the fact that when receiving Band III signals using a converter of the type discussed it is possible to have a direct pick-up into the receiver of the Band I signals. This may be particularly serious in an area of high signal strength. The result is that the converted Band III signal will beat with the unwanted Band I signal and cause patterning on the screen, the degree of patterning varying according to the pick-up of the Band I signals. Where this is only slight, then only a slight herring-bone patterning will be visible on the screen, which may or may not mar the enjoyment of the picture, but if this interference is excessive, then it can completely spoil the picture, giving the effect of a wire mesh in front of the screen and also affecting the synchronising, in which case reception would be impossible.

There is yet a further cause of interference, though in this case the interference is likely to occur on neighbouring receivers rather than on the receiver in use. This arises from the fact that when the Band III transmission is converted to the frequency of the local Band I transmission it is amplified in the vision receiver and attains an amplitude of between 2-3 volts at the detector. Unless the receiver is effectively screened a part of this voltage may be radiated either directly from the receiver or, what is more likely, the voltage may be introduced into the aerial feeder and be radiated from the aerial, with the result that receivers in the immediate vicinity tuned to the Band I transmission will receive a reradiated signal from the local interfering receiver, as well as the wanted Band I signal. When these signals beat together they can cause not only the severest forms of patterning, but can also affect synchronising, with the result that the picture is broken up. The seriousness of this is already apparent from the many complaints which have been received and requests for guidance to overcome the effect.

From the foregoing it is evident that the use of a simple converter to operate in conjunction with a T.R.F. receiver is not to be recommended, and it becomes necessary to make a radical modification to the View Master. Fortunately the modifications which are necessary can easily be carried out and in fact by adopting this course the View Master is brought right up to date and conforms largely to current practice. There is, of course, no reason why any T.R.F. receiver should not be adapted on similar lines and in fact this has already been done on the Electronic Engineering Televisor with entire success. This again shows one of the main advantages of building the View Master or indeed any well-designed television receiver since it is then possible for the constructor to put in modifications from time to time which permit the receiver to be kept constantly up to date by employing the latest techniques without at any time incurring an excessive expense. For example, when the View Master was first published it was designed to operate with a 9in. tube only. Shortly after, a 12in. tube was fitted, and subsequently 14in. and 17in. wide-angle tubes were also used. In every case modifications to the original circuitry were employed so that the subsequent changes were not on their own expensive. Bearing in mind the difficulties mentioned above and in the case of the London View Master the possible difficulties with reception arising some time next year when the new transmitter which is to be located at Crystal Palace and which will operate on a vestigial single sideband instead of double sideband as at present it was felt that the correct course to adopt was to modify the vision receiver so as to operate as a 35 Mc/s I.F. amplifier and to have a low noise converter suitable for Bands I and III to feed it. (Fig. 3.)

There are already large numbers of converters on the market and *any of these may be used* so long as the output is at the standard I.F. frequency of 34.65 Mc/s for vision and 38.15 Mc/s for sound. For the benefit of the constructor who prefers to build his own converter details will be given later for the construction of an up-to-date converter employing a printed circuit for the main wiring. It is therefore convenient to divide this article into two sections, the first dealing with the modifications necessary to the View Master to convert it into an I.F. amplifier for sound and vision on the lines already discussed and the second part dealing with the converter itself.

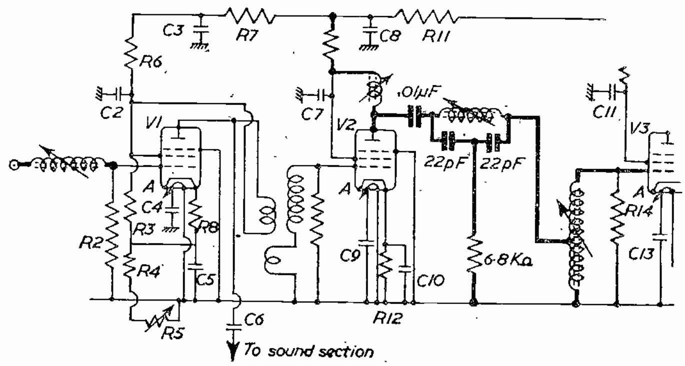


Fig. 4.—Circuit details of the modifications, shown in heavy lines.

Converting the Vision Chassis

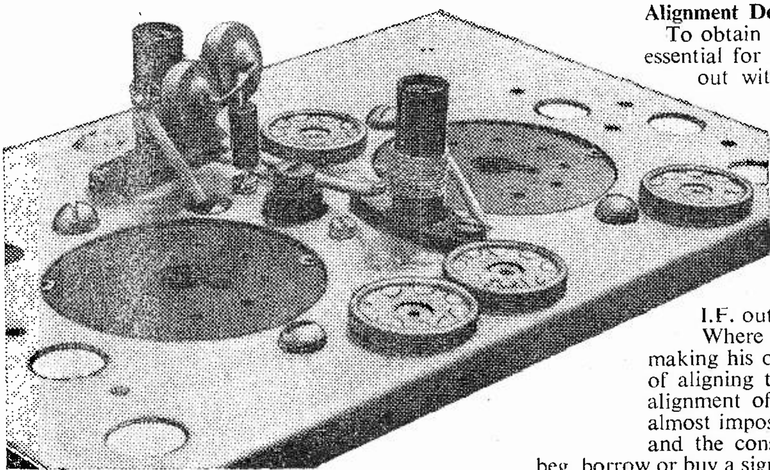
As the new I.F. is lower than the Band I transmitter frequency it will be necessary to rewind the tuning coils and at the same time to fit a sound rejector circuit tuned to the accompanying sound so as to prevent sound on vision interference. After many experiments a single sound-rejector circuit has been adopted; this is of the bridged "T" type, and if carefully adjusted is capable of giving an attenuation of 40 dB or more without appreciably affecting the higher modulation frequencies of the vision transmission so that the definition of the picture is not affected. The modified circuit arrangement is given in Fig. 4, whilst coil-winding details, together with the values of the damping resistors, are given in the table on page 298. Rewinding of the coils should not cause any difficulties and the method of coupling between stages is not changed except for the coupling between V2 and V3, since the bridged "T" rejector is connected between these stages, and it is therefore essential that V2 anode coil should on no account be inductively coupled to the V3 grid coil, otherwise the rejector circuit will be by-passed and insufficient sound rejection obtained. Fortunately, it is not difficult to make the necessary changes and the recommended arrangement is to fit the V3 grid coil above the chassis instead of as at present below the chassis. The sound-rejector circuit is fitted above the chassis also, but is placed approximately 2in. away, so that again there is little direct coupling between the two circuits; the connections between the anode of V2 and the sound rejector as well as the grid coil of V3 are taken through the chassis by drilling suitable holes and taking the wire leads through these points.

It has in some cases been found that when carrying out the alignment of the I.F. amplifier there has been some slight instability. This has been traced to insufficient decoupling due to operating at a lower frequency, which, of course, has the effect of increasing the impedance of the decoupling condensers. If this condition should arise it is only necessary to connect additional condensers of .001 μF in parallel with the decoupling condensers already in the circuit, usually one in each stage across the H.T. supply is sufficient, and the instability is thereby eliminated.

The sound receiver requires less modification than the vision receiver, and in many cases it has been found unnecessary even to rewind the coils, since when operating on Alexandra Palace they are normally tuned to 41.5 Mc/s, whilst at the new I.F. frequency they are tuned to 38.15 Mc/s, and this change in frequency can usually be covered by screwing the iron dust cores of the coils farther into the former. If in doubt, however, then two extra turns on each coil should be satisfactory.

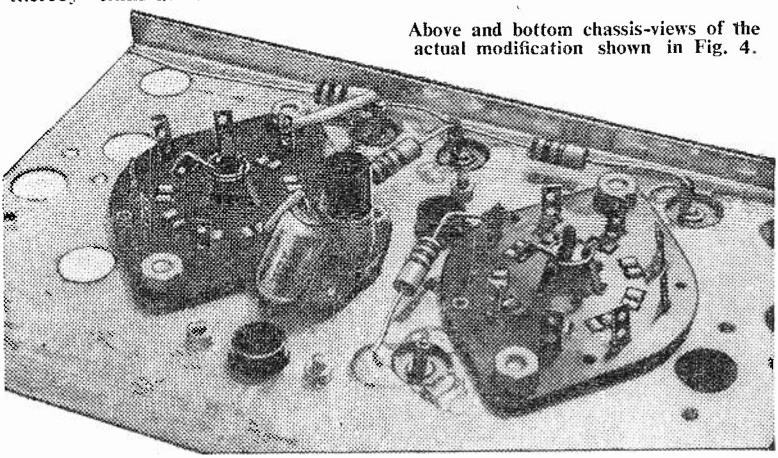
Because V1 can now have a narrower bandwidth than previously the sound signal fed to the sound receiver is usually somewhat greater, with the result that an increased sound output may be obtained. If necessary it is also possible to obtain the V6 input from the anode of V2 instead of V1, and thereby obtain an even higher output, though this latter course has seldom been found necessary.

There is a further interesting feature on the input side of V1 which may at first be puzzling; this is that the grid coil of V1 is not shown connected to chassis. This, however, is not very surprising and will be more clearly understood if the input circuit from the converter is also shown in its correct relative position, as it will then be found that the V1 grid coil is connected to a correctly matched coupling coil which is itself fed from a tuned circuit. By this means it is possible to have the converter spaced some distance from the input to the I.F. amplifier, since coupling between them is at low impedance and a length of coaxial feeder can conveniently be used for this coupling.



Alignment Details

To obtain the best possible results it is essential for the alignment to be carried out with the aid of an accurately calibrated signal generator. Though it may be possible to obtain a reasonable picture by alignment on a transmission it is only likely to be satisfactory if the converter feeding the I.F. amplifier has itself been accurately aligned and is, therefore, giving an I.F. output at the correct frequency. Where a constructor will be making his own converter the difficulties of aligning this in conjunction with the alignment of the I.F. amplifier make it almost impossible to be certain of results and the constructor is recommended to beg, borrow or buy a signal generator, since only then can he be assured of a really satisfactory performance. At this point it must be stated that technical details relating to the operation of the I.F. amplifier are in the main covered in the View Master booklets and are



Above and bottom chassis-views of the actual modification shown in Fig. 4.

not, therefore, dealt with in this article ; only details specifically concerned with the conversion of the vision chassis to an I.F. amplifier are dealt with here.

Having checked that there are no obvious faults in the I.F. amplifier the power supply may be switched on and a warming up period of around five minutes allowed. The following procedure should then be carried out :

COIL WINDING DATA		DAMPING RESISTORS
V1 Grid Coil	15½t.	15KΩ
V1 Anode Coil	15½t.	—
V2 Grid Coil	13½t.	22KΩ
V2 Anode Coil	15½t.	33KΩ
Sound Rejector Coil	14t.	
V3 Grid Coil	13½t. centre tapped	22KΩ
V3 Anode Coil	15½t.	33KΩ
V4 Diode Coil	21t.	—
V6 Grid Coil	9½t.	—
V6 Anode Coil	16½t.	—
V7 Diode Coil	18½t.	—

All coils wound with 28 s.w.g. wire.

As the tuning coils in all five models of the View Master have had different reference numbers, the prefix specifying the coils for a particular model, it has been decided not to give reference numbers to the modified coils for the I.F. amplifier, and, therefore, these are referred to according to their position in the amplifier.

The damping resistors given above are connected in parallel with the respective coils. They replace the resistors previously used.

Connect generator to grid of V3.

Tune V4 anode circuit to maximum output at 35 Mc/s.

Tune V3 anode circuit to maximum output at 37.5 Mc/s.

Connect generator to grid of V2.

Tune V3 grid circuit to maximum output at 35 Mc/s.

Tune V2 anode circuit to maximum output at 37.5 Mc/s.

Tune rejector circuit for minimum output at 38.15 Mc/s.

Connect generator to grid of V1.

Tune V2 grid circuit to maximum output at 35.5 Mc/s.

Tune V1 anode circuit to maximum output at 37.75 Mc/s.

Tune V6 grid circuit for maximum output at 38.15 Mc/s.

Tune V6 anode circuit for maximum output at 38.15 Mc/s.

Tune V7 diode circuit for maximum output at 38.5 Mc/s.

Connect generator to lower end of V1 grid coil.

Tune for maximum output at 35 Mc/s.

Repeat all above, but with signal generator connected to lower end of the V1 grid coil.

Note : For alignment purposes only a 220Ω resistor may be connected from the lower end of the V1 grid coil to chassis so as to permit a voltage to be developed when the signal generator is connected across it.

At the completion of alignment the response of the I.F. amplifier should conform closely to that given in Fig. 3.

(*To be continued*)

BBC Buys Colour

THE BBC has recently taken delivery, for experimental purposes, of a complete colour television camera chain from the manufacturers, Marconi's Wireless Telegraph Co., Ltd. This is a fulfilment of the first order the Corporation has given for colour television camera equipment, and will provide an all-electronic compatible system to Anglicised N.T.S.C. standards.

The apparatus comprises a three-tube colour camera, a camera channel amplifier (including aperture compensation and gamma correctors), complete signal coding equipment for providing N.T.S.C.-type signals on British 405-line standards, together with all the accessories which go to make a complete colour camera channel. In addition, black-and-white and tri-colour monitors and a colour-bar test generator have been supplied, together with a comprehensive amount of colour test equipment.

Of particular interest is the colour camera. This incorporates three 3in. Image Orthicons of special manufacture, each of which handles a primary colour component fed into it by a system of dichroic mirrors and lenses, which serves to split the light received from the televised scene into the three primary colours.

Special features of the camera include a single remotely-operated four-lens turret, using standard lenses, a remotely controlled iris, a high-quality view-finder to assist registration, and twist-grip focus control. Individual Image Orthicons can be changed in two or three minutes.

Built-in TV for Cars

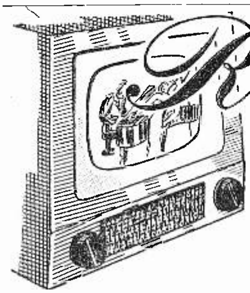
THE first British television set to be specially built into a car has been developed by E. K. Cole, Ltd., and it made its debut at the 1955 Motor Show.

It was shown by the well-known coach-builders Freestone and Webb, Ltd., in their special Rolls-Royce "Silver Wraith" touring limousine. This 9in. tube Ekcovision receiver has been specially styled into the rear compartment division and is so positioned as to provide comfort viewing for the passengers in the back of the limousine. It measures 10½in. wide by 13in. high by 15in. deep.

Developed from the Ekcovision mains/battery portable TV, first introduced at the Radio Show, this set works off the car's 12-volt battery and uses the ordinary wing-mounted telescopic car radio aerial to pick up TV transmissions—both BBC and Commercial, as well as the VHF radio programmes. The receiver can be used up to within 25-30 miles radius of the transmitter, unless the car is in an unfavourable location.

Secret tests by Ekco engineers have proved that the receiver will operate successfully while the car is moving or stationary. It has been styled into the car in such a way that it can easily be removed for use on a picnic, or, if required, it can be operated indoors by plugging it into the mains and using the normal TV aerial.

Working from the 12-volt car battery, the Ekcovision car receiver consumes, on TV reception, the same amount of current as that used by one headlamp.



Receiving the I.T.A.

THE CONCLUDING ARTICLE OF A SERIES ON THE PROBLEMS INVOLVED IN THE RECEPTION OF COMMERCIAL PROGRAMMES ON BAND III

By Gordon J. King, A.M.I.P.R.E.

(*Continued from page 263, November issue*)

Aerials for Band III

ESSENTIALLY, an aerial in addition to that used for Band I is necessary for the reception of TV programmes on Band III. There are exceptions to this, however, particularly so far as viewers living near the Band III transmitter are concerned. Recent field strength tests revealed that under certain conditions and within an area of about 10 miles from the Band III transmitter, an existing Band I aerial provided excellent reception of Band III transmissions—this was readily demonstrated by using a two-band receiver having a common signal input socket.

It is most interesting to note, however, that while a good Band III signal could be obtained by using a simple Band I dipole in a certain location, two blocks round the corner, using an " H " type Band I aerial, not a trace of signal could be seen or heard. Tests of this kind were made in the region of 15 miles from a low-power Band III transmission.

It is safe to say, therefore, that an aerial additional to the Band I aerial is almost certainly required for the reception of Band III signals. Nevertheless, it has been estimated by the radio industry that 75 per cent. of Band I viewers who will be within the range of the Band III transmitters (not the fringe area viewers) need spend no more than £5 on a new or adapted aerial. Fringe area viewers will, of course, have to spend more than that to get consistent reception.

Combined Band I/Band III aerials

In locations where it is possible to get some sort of Band III reception on an existing Band I aerial, it may be necessary only to adapt the Band I aerial so that it becomes responsive also to Band III signals. This may be achieved by connecting a dipole tuned to Band III in shunt with the existing Band I dipole—see Fig. 23. Add-on units of this kind are readily available commercially at very low cost. Additional Band III elements are also available to act as a reflector, where the existing Band I aerial is an " H " or " X " type—see Fig. 24.

When an " H " or " X " type Band I aerial is so adapted its performance on Band I remains substantially unchanged, and it endows a performance on Band III practically equal to a separate three-element Band III array. Under favourable conditions aerials of this adapted kind are suitable for reception of Band III signals in the region of 15-20 miles from the transmitter.

Under normal conditions, no dismantling of the existing cable connections is required, and the existing feeder may be used to carry both Band I and Band III signals to the receiver. In certain less

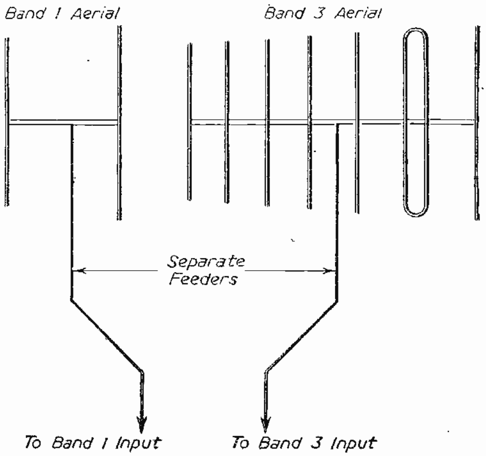


Fig. 21.—Separate Band 1 and Band 3 installations are desirable in the fringe area, and where a receiver having separate input sockets is used a crossover unit is necessary.

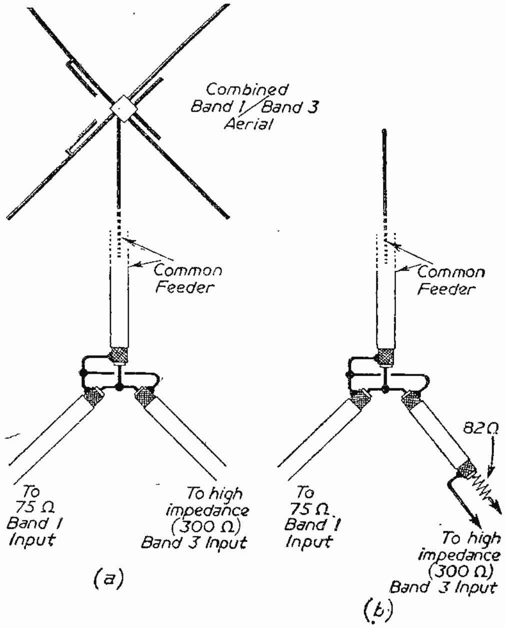


Fig. 22 (a).—A method of splitting a common feeder to feed a 75-80 ohm Band 1 input and a high impedance Band 3 input.

Fig. 22 (b).—The presence of the 82 ohm resistor prevents the Band 1 signal from being short-circuited by the necessarily low impedance of the Band 3 aerial coil.

favourable conditions, however, it is desirable to replace the existing feeder with a good quality low-loss type.

Combined, or dual-band, aerials are also available as complete units, and an array typical in this respect is illustrated in Fig. 25. This is the design of Telerection, Ltd., which can be obtained in various channel combinations at very reasonable cost. It is claimed that this style of array is suitable for reception up to 25 miles from the two transmitters.

Separate Band III Aerials

Where Band III reception at distances in excess of 25 miles from the transmitter is required, and where "ghosting" is troublesome, a separate Band III aerial is almost certainly demanded. Such aerials range from three-element kind to nine-element arrays, and from dipole loaded slots to complex stacked arrays possessing something like 16 elements.

The choice of aerial is governed solely on local reception conditions and no hard and fast rule can be

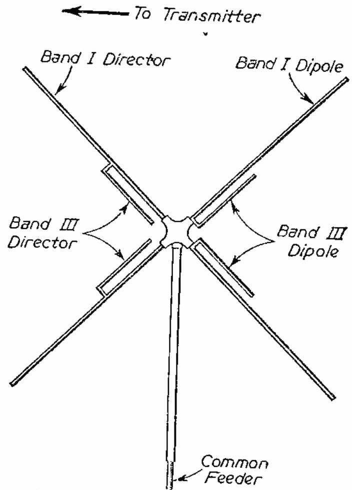


Fig. 24.—Additional Band 3 elements are also available to act as a reflector, where the existing Band 1 aerial is an "H" or "X" type.

made in this connection. For instance, it may be found that in one particular location a good picture is obtained on, say, a six-element Yagi, but that a couple of blocks away a nine-element Yagi is necessary to give equal results.

In Band III fringe areas, the receiver itself is a more critical factor than in Band I fringe areas, for quite large differences in the performance between commercial receivers are observed when such receivers are compared on Band III in fringe districts.

A greater freedom in providing high-gain Band III arrays makes fringe Band III viewing reasonably feasible, for since a Band III aerial is approximately a quarter the size of an equivalent Band I aerial, a nine-element Band III Yagi is not much larger in actual bulk than a four-element Band I Yagi, and a double six-element broadside array, such as produced by Belling & Lee, Ltd., is probably smaller in bulk than a double three-element Band I array.

Moreover, owing to their smaller size, it may be possible to install quite a complex Band III array in a normal roof space which has insufficient height to accommodate an equivalent Band I array. Even though losses do occur by using indoor aerials, these may be made good at Band III frequencies by adding an extra, say, two directors !

In areas of very low signal strength an outdoor aerial should be used where possible and, as we have seen in the first article in this series, it should be mounted as high as possible, preferably above the existing Band I aerial. Low-loss feeder should also be used to connect it to the receiver, and in order to

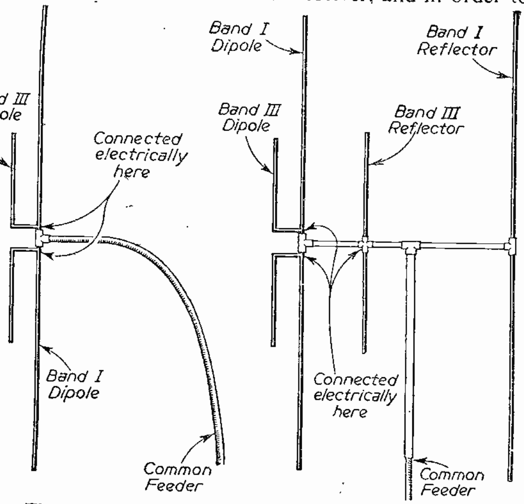
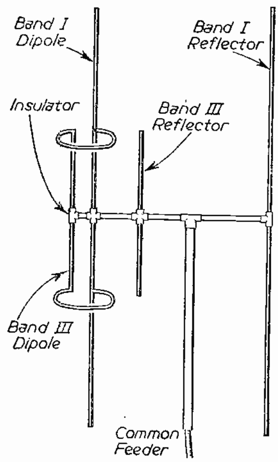


Fig. 23.—A method of connecting a dipole tuned to Band 3 in shunt with an existing Band 1 dipole.

avoid signal losses occurring in a cross-over network, in fringe areas it may be best to employ a receiver having separate aerial input terminals for the two bands or, failing this, it may be found desirable to disconnect one aerial and connect the other one in its place when a channel change is made—a simple change-over switch could, of course, be arranged to perform this function—see Fig. 26.

Owing to the somewhat greater tendency for signal reflection ("ghosting") to occur at Band III frequencies than at Band I, it may be found necessary to install aerials which possess an efficient front-to-



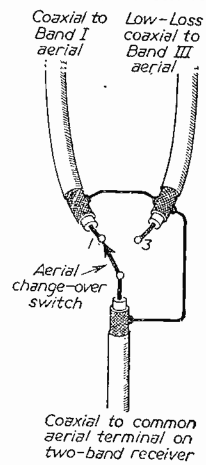
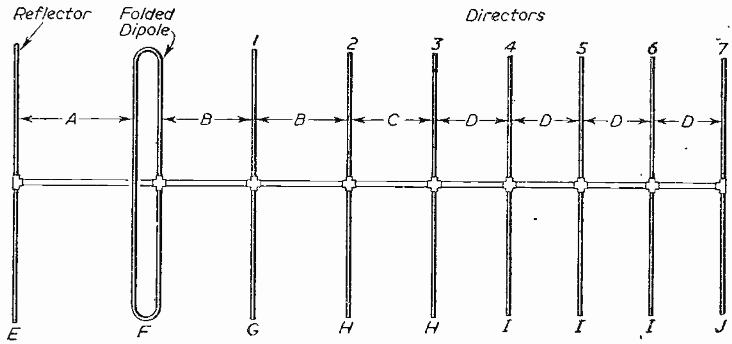


Fig. 25 (left).—A combined Band 1-Band 3 aerial by Telerection, Ltd.
Fig. 26 (right).—A method of using a change-over switch to transfer the outputs of a Band 1 and Band 3 aerial to a receiver with a common input socket—sometimes desirable in extreme fringe areas.

back ratio, even in relatively high signal strength areas. An aerial endowed with such a quality is formed of multi-elements, and is not generally one possessing dual-band features.

Positioning and orientation of a Band III aerial are considerably more critical factors to aid in reducing "ghosting" than what has generally been experienced hitherto in Band I. Shifting the aerial from one corner of the chimney stack to the other, for example, may make the difference between a "just viewable" picture and a very good picture. Similarly, swinging a highly directional array a matter of 10 to 20 deg. may completely lay a ghost that might have been a permanent feature of a Band I picture.

In order to preserve optimum front-to-back ratio, most Band III aerials are cut precisely to the channel on which they are to be used, though, it is understood, one manufacturer has designed a Band III aerial which is relatively equally responsive over 3 channels in Band III. Such an aerial will be of considerable benefit when two or more Band III transmitters are available in any particular location. In this case, however, it will also probably be found that an ordinary aerial which is tuned to the more distant station will function quite satisfactorily on the nearer ones. There may be a case here, of course, for such an aerial to possess a means whereby it can be easily rotated to point to the desired stations, but perhaps we are now looking too far into the future!



Dimensions

Channel	A	B	C	D	E	F	G	H	I	J
8	8"	11"	10¾"	9"	2'-7¼"	2'-5½"	2'-3¼"	2'-3"	2'-2½"	2'-1¾"
9	7¼"	10½"	10"	8½"	2'-6½"	2'-4½"	2'-2½"	2'-2¼"	2'-1¾"	2'-1"

Fig. 27.—Details for a 9-element Yagi array.

Notes for the Home Constructor

The home constructor will undoubtedly want to have a go at producing his own Band III array and with this in mind we intend now to include a few Band III dimensions.

In the first place, let us get some idea how long the actual dipole is to provide a reasonable balance between sound and vision on Channel 9 (the London I.T.A. channel). This will, of course, vary depending on the precise frequency it is required for the aerial to resonate, but most engineers and constructors find it best to have the aerial tuning towards the vision carrier, particularly in fringe areas where it is normally necessary to feed the last microvolt of signal to the vision channel.

Experimentation has shown a 2ft. 4½in. dipole gives a very good compromise slightly towards the vision carrier, but this element may either be reduced by ½in. to get more vision gain, or increased by ½in. to get more sound signal. For Channel 8 (the Midland I.T.A. channel) the dipole should be made 1in. longer.

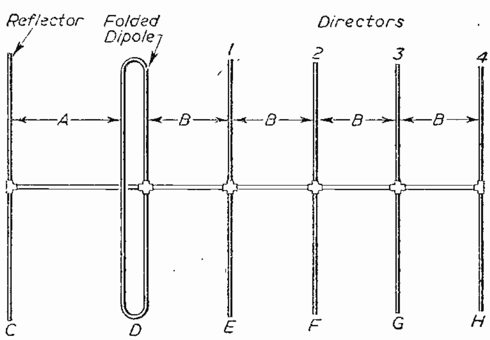
As with Band I aerials, the centre impedance of a dipole on its own is in the region of 75 ohms which, of course, facilitates a ready match to coaxial or twin feeder, but it quickly falls to an extremely low value as the aerial is made more directional and its gain increased by adding directors and a reflector. Even in Band I, on a four-element Yagi, matching presents much of a problem, it being necessary either to fold the dipole or employ a matching stub.

In Band III, where up to nine elements are often necessary on a single array, the matching problem is considerably aggravated. Fortunately, however, the problem is fairly easily solved simply by folding the dipole.

It is interesting to note that the centre impedance of an ordinary unfolded dipole falls to something like 18 ohms when it forms the dipole of a nine-element Yagi (one reflector and seven directors). When the dipole is folded, however, its centre impedance increases by approximately four times, thereby causing it to rise to something like 72 ohms

Matching stubs and other devices could be used to procure matching, of course, but at Band III frequencies this is not so easily achieved owing to the somewhat critical smaller lengths of the tuned circuits.

In order to give the home constructor some idea as to the lengths and spacing of the directors and reflector at Band III frequencies, diagrams of nine and six-element Yagi arrays are shown in Figs. 27 and 28 respectively.



Dimensions

Channel	A	B	C	D	E	F	G	H
8	8"	11"	2'-7"	2'-5½"	2'-4½"	2'-3"	2'-1½"	2'-0¼"
9	7¼"	10½"	2'-6"	2'-4½"	2'-3½"	2'-2¼"	2'-1"	1'-11¼"

Fig. 28.—Details for a 6-element Yagi.

Servicing Television Receivers

No. 15.—FERGUSON 983T AND 988T

By L. Lawry-Johns

THE 983T is the console version with push-pull sound output and two valve H.T. rectifiers. The 988T is the table model with a single valve sound output stage and only one H.T. rectifier. Otherwise the receivers are identical. A possible confusion arises due to production modifications and these will be itemised where they apply to the servicing of these receivers. Before proceeding with a description of the various faults which can occur, we would state that these sets give a good performance on Band III and are easily adapted with any of the converters advertised or described in these pages.

Faults and Their Tracing

In the event of no results at all, plug another appliance into the same mains socket to ensure that the supply is in order. Then check the plug connections and ensure that the supply is reaching the receiver. Do *not* put a test lamp between the fuse and chassis. This may be placed across the on/off switch at the rear of the volume control. With the switch off a light should be obtained across two contacts. With it on across the other two as well. This, of course, is not necessary if a meter is available. If no light is obtained across the other two when switched on this will mean that the switch is defective. Replacement controls should be .5 MΩ with D.P. switch. Assuming the switch is in order, next check the fuse continuity. If this is in order and the mains voltage is reaching this point a small tingling noise should be heard which indicates that the supply is reaching the rectifier(s) but not the complete valve chain. Therefore, if the valves are unheated and the tingling gives evidence that voltage is present at the rectifier, next check the mains dropper. Quite often one section is open circuit thus stopping the heater current from flowing. The heater sections of this dropper are of 60, 65 and 65 ohms, whilst the rectifier anodes are fed via 28 ohm sections. On early models one section was 86 ohms in place of a 65 ohm. This applies to the 983T only, different values being used in the early and later models 988T (149 ohms and 170 ohms). If one heater section is open circuit it may be shunted by a wire-wound resistor of appropriate value and wattage. If, however, the mains dropper is in order, check the thermistor (Brimistor CZ1) and its shunt resistor which has a value of 350 ohms. If these are tested and found in order the reason for the lack of heater current must be that a valve heater is open circuit. There are some short-cut methods of finding which one is at fault and these depend upon knowing the position of the valves in the heater chain. If this is known and a meter is available, the faulty valve can be quickly located. It is always worthwhile, however, to check the PY80

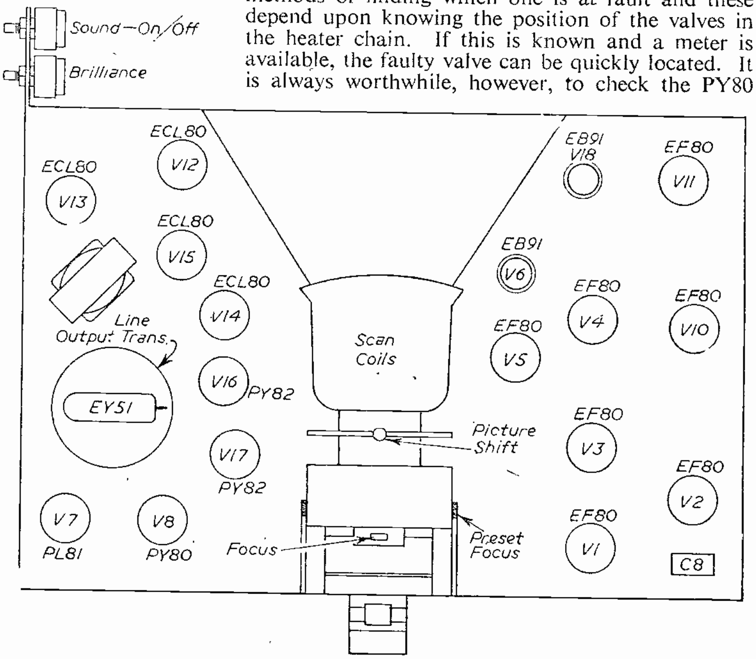


Fig. 1.—Layout showing the valve positions.

heater first. If an internal short in a PY82 has caused the fuses to blow, besides replacing the fuse and valve it is always worthwhile to check the 40 ohm surge limiting resistance in series with the 60 μF section of the main condenser can. If this is open circuit this section, which is the reservoir condenser, will be inoperative and the available H.T. voltage will be low.

On models 983T with serial numbers below 9,000, and 988T lower than 28,900, the chassis is connected direct to one side of the mains. In all later models a 25 ohm resistor shunted by a 100 μF electrolytic condenser is wired from chassis to the H.T. return. In this case, the 60 × 250 μF main smoothing condenser can is returned to H.T. rather than chassis, and so is the heater chain. If this resistor (R82) is open circuited, the set will not operate although the heaters will be glowing normally. The reason for the inclusion of this resistor is to bias the video amplifier valve (V5 EF80). In the early models a cathode bias resistor was employed, as is more normal practice, but this was found to introduce more negative feed-back, and therefore loss of gain, than could be afforded. Thus the cathode of V5 will be found joined to chassis and the control grid returned to the mains side of R82 in all later models. This brings us to a rather common fault which may be puzzling when first encountered. The symptoms are these.

Faint Picture

Contrast not working properly or at least it does not appear to. The picture will be very flat and lacking in detail, and operation of the contrast control will appear to brighten the picture but only momentarily.

As mentioned above, R82 has a 100 μF electrolytic wired across it (positive to chassis). If and when this condenser internally shorts, the video amplifier is left unbiased and this results in the symptoms described.

A similar fault is often encountered on 983T models with serial numbers below 12,000 and 988T below 28,900. In this case, however, advancing the contrast is necessary to obtain a picture, and any reduction results in a very weak picture and loss of sync. Sound remaining normal.

On these early models germanium diodes were used for detection and these often become defective. As in most Ferguson receivers which appeared later, such as the 984T, 989T, 991T, etc., this vision detector diode is incorporated in the final vision I.F. coil can and is thus out of sight. The best check on any crystal diode is replacement with a known good one although as a rough check a meter reading should show a high reading one way and a low reading when the leads are reversed. A faulty diode usually shows a low reading both ways or less commonly a high reading both ways.

The Line Timebase

This consists of a self-oscillating PL81 (V7), a multi-tapped line output transformer with overwind for the EY-51 E.H.T. rectifier and a PY80 efficiency diode. The circuit is quite simple and contains the minimum of components. The cathode of the PL81 is returned direct to chassis and thus is only biased when the valve is oscillating. Therefore damage to the PL81 can result if it is left working but not oscillating. The screen of the PL81 is fed from the H.T. line by a 10k variable resistor which forms the line hold control. Timebase failure, resulting in no E.H.T. and therefore no picture, is often caused by the .1 μF condenser wired from the slider of this control to chassis becoming internally shorted. This can cause the control to burn out and/or the fuse to blow.

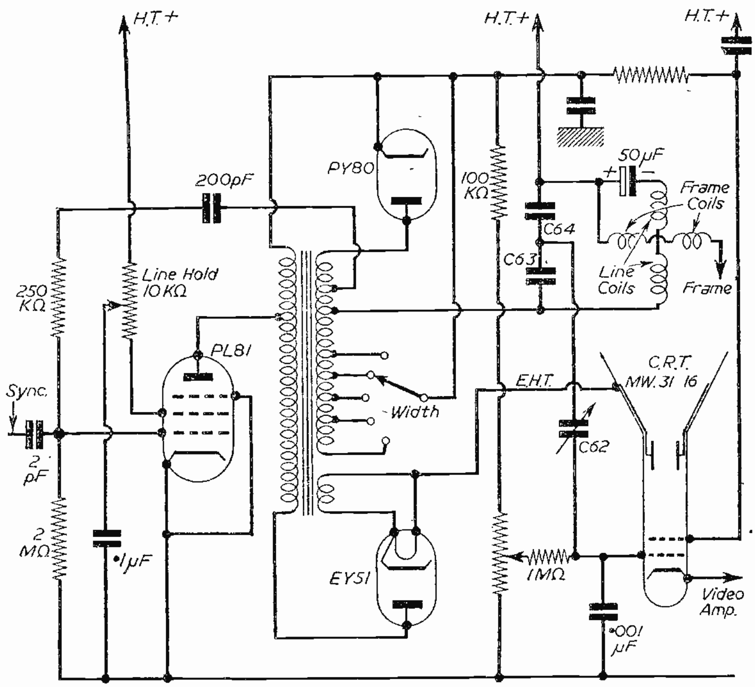


Fig. 2.—The line timebase.

A Peculiar Effect

The control grid of the PL81 is returned to chassis via a 2 MΩ resistor and some strange effects can be caused if this "goes high." At first perhaps only a loss of hold may be experienced, but as the resistor really gains in value loss of width, blurred picture due to low E.H.T., curved verticals and a variety of symptoms including complete timebase failure are common. The writer once investigated a complaint on a 991T receiver where the owner said his screen looked like a question mark or a discontented snake! Replacement of the 2.2 MΩ resistor (in this case) put matters right and got rid of the snake!

To return to the 983 and 988, however, the width is adjustable by a plug and socket arrangement on the line-output transformer. Another tapping feeds the scan-coils, which are returned to the H.T. line via a 50 μF electrolytic.

Across the line coils of all models above 1749 a balancing circuit comprising three capacitors is fitted (C62, C63 and C64). C63 and C64 are .001 μF, wired in series with C62, taken from their junction to the C.R.T. control grid. C62 is a 75-450 pF variable and is intended to be so adjusted that any striations on the left side of the raster are balanced out.

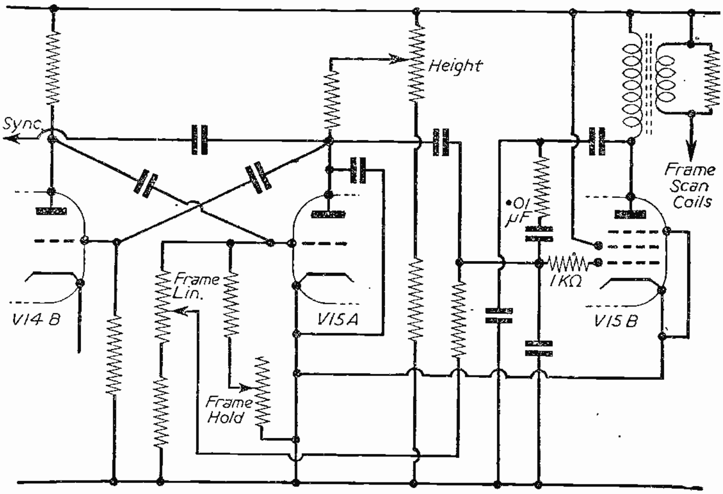


Fig. 3.—The frame timebase.

No Picture

If sound is being received but no picture of modulation of any sort can be resolved on the screen by advancing the brilliance control, the probable cause of the trouble is no E.H.T.

If the line whistle is audible, a screwdriver blade should draw a spark from the anode of the EY51. This small valve is mounted on the top of the line-output transformer. Its single-wire end is the anode. If a spark is obtained, try the double wire end (heater): if no spark is obtainable try to see if the valve heater is glowing. If it is not, replace the valve, ensuring that the soldered connections are well rounded blobs, not sharp-edged " dabs."

If the EY51 is glowing, however, without touching the actual clip, remove the E.H.T. connection to the C.R.T. anode. If the EY51 now comes to life and the clip sparks to any nearby chassis member, there is a possibility that the C.R.T. is defective and may have developed an internal short. In some cases, however, this may only be due to a weak EY51 and turning the brilliance control down to minimum may bring it back to life. It is always as well to check the EY51 first.

Frame Timebase

This consists of one and a half ECL80 valves, the other half is the pentode section of V14 which acts as the sync separator. The triode section of V14 is cross-coupled with the triode section of V15, the second section of this valve serves as the output pentode.

Thus the two triode sections form a multivibrator. In early models the output pentode (V15B) was biased by a separate resistor and bypass capacitor in its cathode circuit. However, on later models bias is obtained from the grid-circuit of V15A (triode) by a variable resistor. As the bias of a frame-output valve affects its linearity, the variable resistor forms the frame linearity control. A fairly common fault is that of frame-creep, which shows up as a cramping at the bottom of the raster, adjustment to the linearity control and height not giving the required correction. Quite often the V15 ECL80 will be responsible and changing the valve will right matters. However, if it does not, turn the set up and on a tag panel near the base of V15 will be found two small brown .005 μF condensers wired together in parallel. A leak through one of them often causes the effect, and cutting one out completely and readjusting the linearity control will right matters. Both capacitors may be replaced, of course, forming a total of .01 μF. Frame-creep which is not severe, is often due to the characteristics of the frame-output transformer, variation due to temperature, etc., and this is common on many receivers.

Sync Separator

As previously stated, this is the pentode section of V14 and operates as a conventional short-grid base

(*Concluded on page 316*)

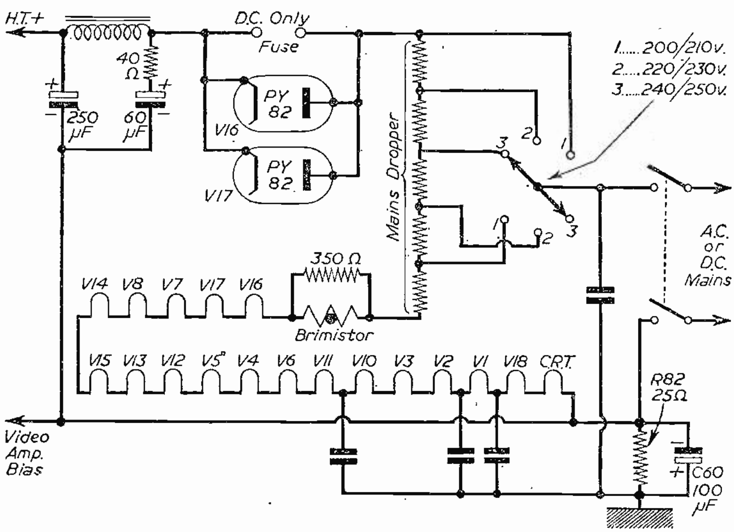
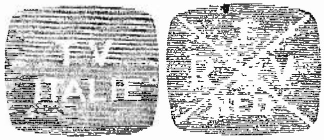
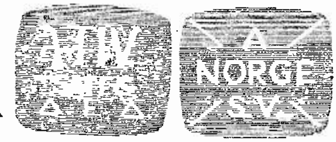


Fig. 4.—Power supply. Note R82 chassis-to-H.T. return.



TV DX



TELEVISORS FOR THE RECEPTION OF EUROPEAN TRANSMISSIONS

By B. L. Morley

(Concluded from page 258 November issue)

IN this section we deal briefly with the main television stations of the world and the systems employed. It should be noted that this is intended as a guide and a fully comprehensive list of stations actually operating is rather beyond the scope of an article. Full details may be found in other published handbooks.

America

There are so many transmitters in America that it would not be practicable to list them all here. In the United States alone there are more than 300.

One point is that they all employ the 525-line American system. There are transmitters at Canada, Cuba, Dominican Republic, Mexico, Puerto Rico, Argentine, Brazil, Venezuela and Uraguay. The chances of receiving any of them in this country are rather remote but that is no reason why an enterprising enthusiast should not have a try!

Asia

In Asia, both Turkey and Thailand have the 625-line C.C.I.R. system. Japan has stations in Tokyo and further transmitters at Osaka and Nagoya are projected. The American 525-line system is employed.

Haiwaii has a commercial station which also employs the American system.

The author has no knowledge of any Chinese transmitters.

Australia

In Australia the 625-line system has been adopted and some notes on this appeared in these pages some time ago.

Africa

The transmitters are mainly in the north of this continent—or rather scheduled for the north as systems are projected for Algeria, French Morocco and Tunisia. A station is operating the 819-line system at Casablanca.

The 819-line system is to be generally employed.

Europe

Many countries in Europe now have television systems and hold some interest for the dx enthusiast.

France

This would appear to be the most likely source of TV from the Continent. The main difficulty is that the 819-line system has been adopted (apart from the 441-line transmissions from Paris which are obsolescent) and timebase modification is necessary.

Besides the 819-line transmitter at Paris we have Lille on 185 Mc/s vision, 174 Mc/s sound; Strasbourg on 164.05 Mc/s vision, 175.15 Mc/s sound, which is shared with Lyon-ville.

There is also a transmitter at Marseilles on 186.55 Mc/s vision, 175.4 Mc/s sound, and Monte Carlo has (or had!) a transmitter on 199.7 Mc/s vision, 188.55 Mc/s sound. This latter station, commercially operated, is beamed on the south coast of France by a special directive aerial array.

Luxembourg

This country has also adopted the 819-line system as it is a commercial station with programmes mainly directed at France.

Belgium

In Belgium two forms are used—the French 819-line system and a 625-line system similar to the C.C.I.R. recommendations excepting that positive video modulation is used and A.M. sound.

The manufacturers of TV receivers have rather a problem as French, Belgium and German transmissions can be received and many televisors are fitted with switching arrangements to cover these systems.

There are two stations at Brussels, one on 819 lines using the French language and the other on 625 lines using the Flemish tongue.

Both are in Band III, the former on 196.25 Mc/s vision and 201.75 Mc/s sound, and the latter on 210.25 Mc/s vision and 215.75 Mc/s sound.

Holland

This country has stations at Eindhoven, 47.75 Mc/s vision, 53.75 Mc/s sound; at Kootwijk (experimental) and Lopik 62.25 vision, 67.75 Mc/s sound.

The C.C.I.R. 625-line system is employed.

Germany

In Germany the 625-line system is used. There are stations at Berlin, 182.25 Mc/s vision, 187.75 Mc/s sound: at Hambourg using the same channel; at Hanover on 195.25 Mc/s vision, 201.75 Mc/s sound; at Cologne on the same channel and at Langenburg using the same channel as Berlin.

Denmark

The transmitter here is at Copenhagen and operates on the 625-line system on 63.25 Mc/s vision, 67.25 Mc/s sound.

Further transmitters are planned for Aarhus and Odense.

Switzerland

A transmitter is located at Lausanne using the 625-line system on 62.75 Mc/s vision and 67.75 Mc/s sound.

Italy

There are several high-powered stations in this country, which employs the 625 line system.

We have at Rome a station on 201.25 Mc/s vision, 206.75 Mc/s sound. At Mont Serra vision on 175.25 Mc/s, sound on 180.75 Mc/s. At Mont Penice vision on 62.25 Mc/s, sound 67.75 Mc/s. At Turin, vision on 83.75 Mc/s and sound on 87.75 Mc/s.

Russia

There are two stations at Moscow employing the modified C.C.I.R. system. They are on 49.75 Mc/s vision, 56.25 Mc/s sound, and 59.25 Mc/s vision, 67.75 Mc/s sound. At Kiev vision is on 77.25 Mc/s and sound is 83.75 Mc/s. At Leningrad we have vision on 59.25 Mc/s and sound on 65.75 Mc/s.

The foregoing details are not intended to be fully comprehensive ; fresh countries are opening up new transmitters and experimental transmissions are taking place constantly.

Under the different systems certain specific channels have been allocated and it may be of assistance to have the channel information to hand.

With the French system the channels operate as follows :

	Channel	Vision (Mc/s)	Sound (Mc/s)
	1	46.00	42.00
	2	52.40	41.25
Band I	3	56.15	67.75
	4	65.55	54.40
	5	164.00	175.15
	6	173.40	162.25
Band III	7	177.15	188.30
	8	185.25	174.10
	9	186.55	175.40
	10	190.30	201.45
	11	199.70	188.55
	12	203.45	214.60
	13	212.85	201.70

The Russian system is the modified C.C.I.R. system using a wider bandwidth. The number of channels within the specified spectrum are therefore fewer.

Russian Channels

	Channel	Vision (Mc/s)	Sound (Mc/s)
	I	41.75	48.25
Band I	II	49.75	56.25
	III	59.25	65.75
	IV	77.25	83.75
	1	145.25	151.75
	2	153.25	159.75
	3	161.25	167.75
	4	169.25	175.75
Band III	5	177.25	183.75
	6	185.25	191.75
	7	193.25	199.75
	8	201.25	207.75
	9	209.25	215.75

The European system as recommended by the C.C.I.R. on 625 lines operates on the following channels :

	Channel	Vision (Mc/s)	Sound (Mc/s)
	1	41.25	46.75
	1A	42.25	46.75
	2	48.25	53.75
Band I	2A	49.75	55.75
	3	55.25	60.75
	4	62.25	67.75
	4A	82.25	87.75
	5	175.25	180.75
	6	182.25	187.25
	7	189.25	194.75
	7A	192.25	197.75
Band III	8	196.25	201.75
	8A	201.25	206.75
	9	203.25	208.75
	10	210.25	215.75
	11	217.25	222.75

In the American system Bands I, III and IV are in operation. Channel 1 on Band I is not used. The Band IV stations operate in 69 channels from 471.25 Mc/s to 889.75 Mc/s. The stations transmitting in colour are operating in Band IV.

	Channel	Vision (Mc/s)	Sound (Mc/s)
	2	55.25	59.75
	3	61.25	65.75
Band I	4	67.25	71.75
	5	77.25	81.75
	6	83.25	87.75
	7	175.25	177.75
	8	181.25	185.75
	9	187.25	191.75
Band III	10	193.25	197.75
	11	199.25	203.75
	12	205.25	209.75
	13	211.25	215.75

Logging Stations

Those who would like to attempt reception of TV stations over long distances are recommended to keep a log of the stations whose transmissions are seen. Reports can be sent to the originating station and these reports are generally welcomed.

Besides the date, time, duration and quality of the received signal the weather conditions should be noted (the local barometer reading is often of interest), and the channel on which the station is operating should be noted.

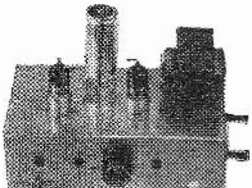
The author would be pleased to hear of any *verified* reports giving the data above and an article may be arranged at a later date giving a summary of the results.

Should the peak winter period be unfruitful then the experimenter should try again in the peak summer period when conditions are generally more favourable.

Please note that it is not possible to answer queries on the identity of indefinite signals.

BAND 3 T/V CONVERTER—186 Mc/s-196 Mc/s

£2-5-0 post free.



This Unit comprising drilled chassis, 7in. x 4in. x 2½in., two miniature valves and met. rect., wound coils, res., cond., etc., is a slightly modified version of the circuit shown in *Wireless World*, May, 1954. It has proved itself highly successful—over 1,000 sets have already been sold to buyers all over England. We invite you to visit us and see it in operation for yourselves. Suitable for most types of T/V sets. T.R.F. or Superhet. Blueprint and circuit details will be sent on application by return of post, 1/6, post free. Supply voltages required 200-250 v., 20 mA H.T. 6.3 v. 1 a. L.T.

Power pack components to fit chassis as illustrated, 30/- extra. Complete set wired, tested and aligned ready for use 20/- extra. Band 1, Band 3 Ae switching can now be added, switch kit, 7/6. Full range of Band 3 aerials in stock. Adaptors from 7/6 per set, dipole from 6/6 each.

Band 1-Band 3 Cross-over filter unit. 10/6.

Volume Controls

Midget Ediswan type. Long Spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Megohms.

No Sw.	S.P.Sw.	D.P.sw.
3/-	4/-	4/9

COAX PLUGS ... 1/2
SOCKETS 1/-
COUPLER 1/3
OUTLET BOXES ... 4/6

80 ohm CABLE COAX

STANDARD ¼in. diam. Polythene insulated. GRADE "A" ONLY.

8d. yd.

SPECIAL. — Semi-air spaced polythene, 80 ohm Coax ¼in. diam. Stranded core. Losses cut 50%. **9d. yd.**

BALANCED TWIN FEEDER per yd. 6d. } 80
TWIN SCREENED FEEDER per yd. 1/- } ohms
50 OHM COAX CABLE 8d. per yd., 1⅛in. dia.

TRIMMERS, Ceramic, 4 pf. - 70pf., **9d.** 100 pf. 150 pf., **1/3** ; 250 pf., **1/6** ; 600 pf., **1/9. PHILIPS** Beehive Type—2 to 8 pf. or 3 to 30 pf., **1/3** each.

RESISTORS.—Pref. values 10 ohms 10 megohms.

CARBON

20% Type. ¼ w., **3d.** ; ½ w., **5d.** ; 1 w., **6d.** ; 2 w., **9d.**
10% Type. ½ w., **9d.** ;
5% Type, ½ w., **1/-**.
1% Hi-Stab. ½ w., **2/-**.

WIRE WOUND

5 w. / 10 w. / 15 w.	25 ohms—10,000 ohms	1/3 / 1/6 / 2/-
5 w. / 10 w.	15,000—33,000 ohms	1/9 / 2/3

WIRE-WOUND POTS.

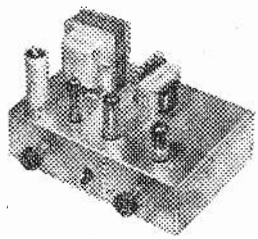
Pre-Set Min. T/V. Type. Knurled Slotted Knob. All values 25 ohms to 30 K., **3/-** ea. 50 K. **4/-**. Ditto Carbon Track 50 K. to 2 Meg., **3/-**.

3w. LAB COLVERN, Etc.

Standard Size Pots. 2¼in. Spindle. High Grade. All Values. 100 ohms to 50 K., **5/6** ; 100 K., **6/6**. **W/W EXT. SPEAKER CONTROL.** 10 Ω, **3/-**.

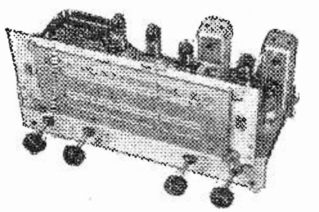
CONDENSERS.—Mica, S. Mica, Ceramics. All pref. values. 3 pf. to 680 pf., **6d.** each. **Tubulars,** 450 v., Hunts and T.C.C. .0005, .001, .005, .01, .02 and .1 350 v., **9d.**, .05, .1 500 v. Hunts Moldseal, **1/-**. .25 Hunts, **1/6**. .5 Hunts, **1/9**. .1 1,500 v. T.C.C. (Simplex), **3/6**. .001, 6 kV., T.C.C., **5/6**. .001 12.5 kV. T.C.C., **9/6**.

SILVER MICA CONDENSERS.—10%.
5 pf. to 500 pf., **1/-**. 600 pf. to 3,000 pf., **1/3**.
1% 1.5 pf. to 500 pf., **1/9**. 515 pf. to 5,000 pf., **2/-**.



3 VALVE AMPLIFIER

With variable Tone and Volume controls. 3 Midget B.V.A. valves. 4 watts output. Neg. feedback. Chassis isolated from Mains. A.C. 200/250 v. A quality amplifier at an economical price. **PRICE £3.19.6.** Carr. 2/6. Wired and tested, 15/- extra. Circuit and instr. free



ALL WAVE RADIOGRAM CHASSIS
THREE WAVEBANDS. FIVE VALVES

S.W. 16 m.—50 m. LATEST MIDGET
M.W. 200 m.—550 m. B.V.A.
L.W. 800 m.—2,000 m. SERIES.

Brand New and Guaranteed. A.C. 200/250 v. Four position Wavechange Switch. Short-Medium-Long-Gram. Pick-up connections. High Q iron-dust cored coils. Latest circuit technique, delayed A.V.C. and Negative feedback. Output approx. 4 watts. Chassis size 13½ x 5½ x 2¼in. Glass Dial—10in. x 4½in. horizontal or vertical type available, lit by 2 Pilot Lamps. Four Knobs supplied. Walnut or Ivory to choice, aligned and calibrated ready for use. Chassis isolated from mains. **PRICE £9. 15. 0** Carriage and Insurance, 4/6. 8in. or 10in. speakers to match available.

BARGAIN VALUE IN RECORD CHANGERS

Recommended for above chassis

B.S.R. MONARCH.—Latest Model 3 sp. Auto-Changer Mixer Unit. Famous Magidisc, 7, 10 and 12in. Record Selector. Modern Cream Styling Dual Xtal Cartridge Stylus for Hi-Fi reproduction. As used by leading manufacturers. Bargain price.

9½ Gns. post free.

NEW BOXED VALVES ALL GUARANTEED

1R5	7/6	6Q7	8/6	EF41	10/6	MU14	8/6
1S5	7/6	6SN7	9/-	EF50		PCC84	12/6
1T4	7/6	6V6	7/6	Mullard		PCF80	12/6
1S4	7/6	6X4	8/6		10/-	PCF82	12/6
3S4	8/-	6X5	8/-	EF50		PL81	12/6
3V4	8/-	EA50	2/-	Equip.	5/6	PL82	10/-
3D6	3/6	EBC41		EF80	10/6	PL83	12/6
5Z4	8/6		10/6	EF86	13/6	PY80	11/-
6AM6	8/6	EB91	7/6	EF91	8/6	PY81	12/6
6AT6	8/6	EBC33	8/6	EL41	11/6	PY82	10/-
6CH6	10/6	ECC83	12/6	EL84	12/6	SP41	5/6
6H6M	3/6	ECH42	10/6	EM80	12/6	SP61	6/6
6K7	6/6	ECL80	12/6	EY51	12/6	U22	8/6
6K8	9/-	EF39	7/6	EZ40	10/-	U25	12/6

SPECIAL PRICE PER SET
1R5, 1T4, 1S5 and 3S4 or 3V4 ... ... 27/6
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5 ... ... 35/-

SPEAKER FRET. Expanded Bronze anodised metal 8in. x 8in., **2/3** ; 12in. x 8in., **3/-** ; 12in. x 12in., **4/3** ; 12in. x 16in., **6/-** ; 24in. x 12in., **8/6**, etc.

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire ends		8+16/450 v. Hunts	5/-
25/25 v., 50/12 v.	1/9	16+16/450 v. B.E.C.	5/6
50/50 v. 4,500 v.	2/-	16+16/450 v. T.C.C.	6/-
100/25 v.	2/-	16+24/350 v. B.E.C.	5/-
8/500 v., Dub.	2/6	32/350 v. B.E.C.	4/-
8+8 500 v. Dub.	4/6	32+32/450 v. B.E.C.	6/6
8+16 450 v. Hunts	5/-	60+350 v. B.E.C.	6/7
16/450 v. B.E.C.	3/6	60+100/350 v.	11/6
16+16/450 v. T.C.C.	5/6	60+200/275 v.	12/6
32/350 v. B.E.C.	4/-	100+200/275 v. B.E.C.	12/6
32/500 v. Dub.	5/-		
32+32/350 v. B.E.C.	5/6	1,000+1,000/6 v. B.E.C.	6/6
Can Types, Clips, 3d. ea.			
8+8/450 v. T.C.C.	4/6	500 mfd. 12 v.	3/-

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES.—K3/25 2 kV., **4/3** ; K3/40 3.2 kV., **6/-** ; K3/45, 3.6 kV., **6/6** ; K3/50 4 kV., **7/3** ; K3/100 8 kV., **12/6** ; K3/160 14 kV., **18/-** ; **MAINS TYPE.**—RM1, 125 v., 60 ma., **4/-** ; RM2, 100 ma., **4/9** ; RM3, 120 ma., **5/9** ; RM4, 250 v. 275 ma., **16/-**.

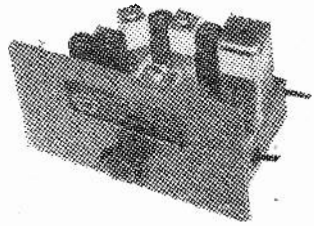
ENGRAVED CONTROL KNOBS for ¼in. Spindle. 1⅜in. diam. Walnut or Ivory. Gold filled. 16 Standard engravings, **1/6** ea. Plain knobs to match above, 1⅜in. **10d. ea.**, 1⅛in. dia., **8d. ea.** Superior Unmarked Knobs with Gold Ring. Very stylish and becoming highly popular. Walnut or Ivory. 1⅜in., **1/-** ea. ; 1in., **9d. ea.** Pointer Knobs, Black with White Line, **9d.**

WEARITE "P" TYPE COILS. All ranges. 1 to 7, **2/6** ea. Osmor Q Series Coils. Slug tuned. All ranges from **3/6**. Full range popular Coil Packs.

REACTION COND.—.0001, .0003, .0005 mfd., **3/6** ea.

MAINS DROPPERS.—Silicone coated, with 2 slider clips. .15 amp. 1,500 ohms, **4/3** ; .2 amp. 1,000 ohms, **4/3** ; .3 amp. 1,000 ohms, **4/9** ; .3 amp. 750 ohms non-coated, **4/6**.

LOUDSPEAKERS P.M., 3 OHM. Richard Allen, 5in., **16/6** ; 6½in. Goodmans, **17/6** ; 7 x 4in. Elliptical, **18/6** ; 8in. Goodmans, **18/6** ; 8in. Elac., **20/-** ; 10in. Plessey, **25/-** ; 10in. R. and A., **25/-** ; 12in. Plessey, **37/6**.



F.M. TUNER-UNIT (87 mc/s—105 mc/s) by Jason. —As tested and approved by Radio Constructor. Complete Kit of parts to build this modern highly successful unit, drilled chassis and J.B. dial, coils and cans. 4 BVA miniature valves and all components etc., for only **£6.10.0,** post free. **SUPERIOR TYPE GLASS DIAL.**—Calibrated in Mc/s and edge lit by 2 pilot lamps, **12/6** extra.
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The Lichfield Station

FURTHER DETAILS OF THE MIDLAND ITA TRANSMITTER

WORK on the 450ft. tower for the Independent Television Authority's Midland Transmitting station at Lichfield is proceeding according to schedule, and has progressed beyond the 90ft. level. This represents a good proportion of the total, as the main mass of metal is embodied in the 90ft. section; the tower, being tapered, will use progressively smaller girders at the higher levels and, given good weather conditions and adequate supplies of materials, progress should be rapid.

The construction of the tower is being carried out by Marconi's Wireless Telegraph Co. Ltd., who are also responsible for the design and construction of the aerial array and feeder system. This company, it will be recalled, made the technical survey and the field strength measurements for the Midland area.

Equipment

The transmitting equipment which is to be installed at the Midlands Area ITA station at Lichfield is being constructed by Pye Limited, of Cambridge. The vision transmitter is designed to give a peak white power output of 20 kW and to operate with an associated sound transmitter of 5 kW. Besides the transmitters, a complete set of ancillary control room equipment is being supplied by Pye, together with a telecine machine of the latest design.

The station itself has been designed in close co-operation with the ITA within the last ten months, and the construction of the building is going ahead rapidly. Extremely high pressure is being applied to the work in connection with this station and its equipment in an attempt to reduce by approximately half the normal time of two to three years for such a project.

The final power amplifying stage of the vision transmitter comprises two water-cooled valves operated in a twin cavity circuit as a Class B linear amplifier. The amplifier is driven by the grid-modulated medium power amplifier, which consists of two air-cooled valves.

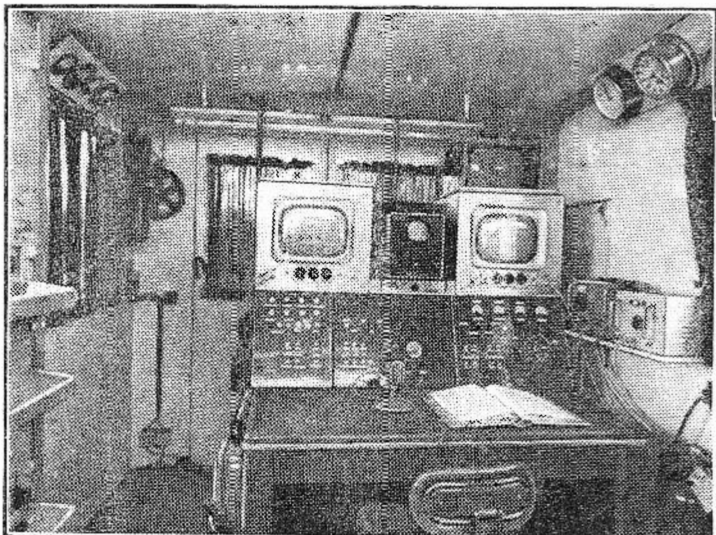
The 5 kW sound transmitter has one modulated water-cooled valve in its cavity type output stage and is also driven by two medium power air-cooled valves.

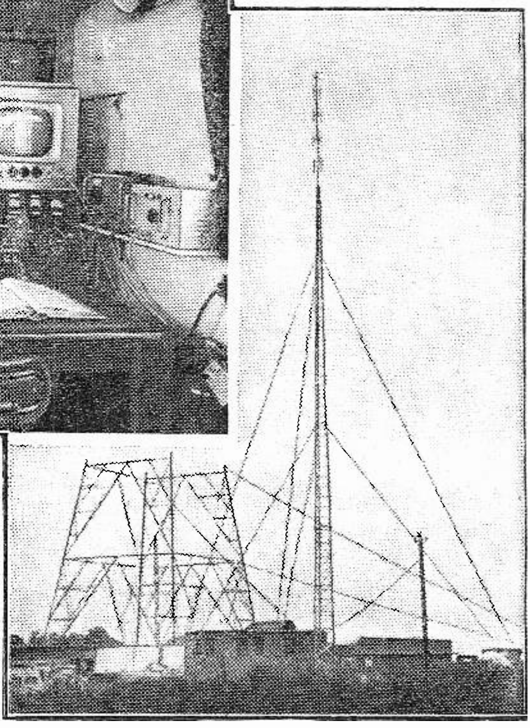
The outputs from the vision and sound transmitters are fed through 51.5 ohms coaxial feeders into the combining unit containing elements by which the vestigial sideband characteristics are obtained.

Later a further similar set of transmitters will be installed at Lichfield, which are intended to be operated in parallel with the first set to provide a service with complete stand-by facilities.

The medium power sections of the transmitter can be operated without a high power amplifier, the vision output being nominally rated at 4 kW peak white power, but capable of being increased to 5 kW peak power, and when run in parallel with another similar transmitter the combined peak power would be up to 10 kW. The sound transmitter is rated at 1 kW. output.

The radio-frequency portions of the sound and





Inside of the Belling-Lee trailer housing the temporary transmitter and the temporary aerial.

vision transmitters have been made similar to one another wherever possible, to simplify construction and maintenance. The frequency control of both transmitters is obtained from similar oven-controlled crystal drive units and carrier frequency stabilities of better than one part per million are obtained. These units, together with the phasing equipment for paralleling purposes, are located in the master control room. The output from these drives at about 16 Mc/s is applied to the first unit of the transmitter, where the frequency is multiplied to carrier frequency and the power increased to 30 w. This power is then raised to approximately 300 w. by the low power air-cooled drive amplifiers which feed the above-mentioned medium power amplifiers.

The sound and vision signals are fed into the station in duplicate, this again being done to provide good stand-by facilities, and are terminated in the Post Office equipment room. The sound signals are conveyed to the station by landlines, but microwave links are employed for the vision signals. The signals are then fed to the control room where the duplicate sets of sound and vision input equipment are accommodated. Either set of equipment can be selected for use by the operator pressing the appropriate button on the control desk.

Comprehensive monitoring facilities under the control of the operator and actuated by means of push buttons mounted on the control desk have been incorporated to assist in the routine operation of the station and rapid fault clearance.

The new type of telecine machine included in the station equipment uses a staticon camera tube. This will enable the station to transmit film for test or other purposes when required.

The transmitting station is provided with all test equipment necessary to ensure the maintenance of its high technical standards.

Experimental Transmissions

The following are details of the present test transmissions which are being carried out by Messrs. Belling & Lee, who are responsible for the quality, material, manning and finance of the temporary transmitter :

Site : Lichfield, Staffs.
Grid Reference : 43/161044.
Height of site above sea level : 500 feet.
Vision carrier frequency : 189.75 Mc/s.
Sound carrier frequency : 186.25 Mc/s.
Vision peak white E.R.P. : 1 kW (approximately).
Constancy of vision power output : ±2 dB.
Type of aerial : Four bays of folded dipoles, each bay consisting of four folded dipoles arranged in turnstile.

Main height above ground level of aerial : 85 feet.
Hours of transmission (B.S.T.) (public and bank holidays excepted) : The first G9AED Lichfield test card was seen at 11.30 a.m. on Monday, October 10th. Transmissions are taking place at the moment as follows :—*Monday to Friday*, 9.30 a.m. to 12.30 p.m., 2.00 p.m. to 5.30 p.m., 7.30 p.m. to 8.30 p.m. *Saturday* 10.00 a.m. to 1.00 p.m.

Nature of Transmission—Vision : Continuous radiation of the G9AED test card.

Nature of Transmission—Sound : Radiation of a 600 c.p.s. (approx.). Tone interrupted at 15-minute intervals from the hour for a short vocal announcement of identity.

I.T.A. Children's Advisory Committee

THE Independent Television Authority announces the setting up, under the Television Act, 1954, of a Children's Advisory Committee to give advice in connection with the broadcasting of children's programmes. The following persons, who have experience and special interest in the welfare and education of children and young persons, have kindly consented to become members :

Mr. W. Hamilton, B.A. (Chairman), *Headmaster of Westminster School.*

Dr. W. P. Alexander, L.H.D., Ph.D., Ed.B., M.A., B.Sc., F.B.Ps.S., *Secretary of Association of Education Committees.*

Lady Banwell, *Honorary Secretary of Broadcasting and Television Sectional Committee, National Council of Women.*

Miss J. M. Bosdêt, B.Sc., *H.M. Inspector, Ministry of Education.*

Mr. John Brown, C.B.E., M.C., LL.D., *The Education Officer, London County Council.*

Sir Ronald Gould, M.A., Hon.F.E.I.S., *General Secretary, National Union of Teachers.*

Miss D. Reader Harris, B.A., *Headmistress, Sherborne School for Girls.*

Mr. A. W. Hurll, C.B.E., *Chief Executive Commissioner, Boy Scouts Association.*

Mrs. Jean Law, *a leading member of the Mothers' Union.*

Mr. J. L. Longland, M.A., *Director of Education for Derbyshire.*

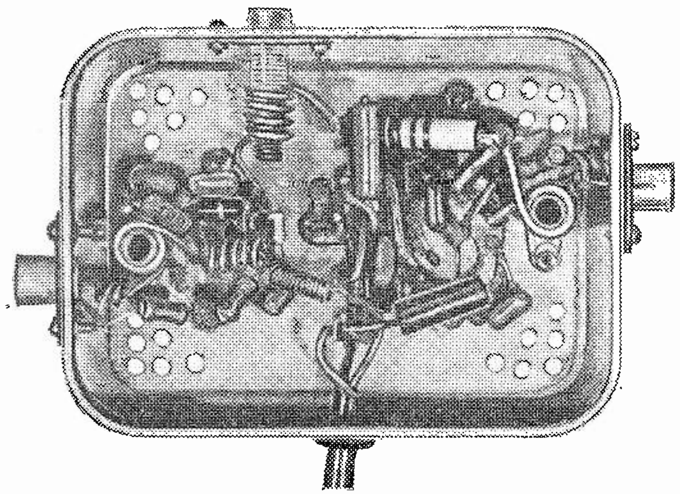
Miss Dorothy J. Neale. *Headmistress of Hartsholme, County Infants School, Lincoln.*

Miss M. O'Connor, O.B.E., *Chairman of the Education Committee, Isle of Wight County Council.*

The first meeting of the Committee will take place shortly.

"noise" would also be likely to provoke uneven "firing" of the frame and line timebases and difficulty may be experienced in locking the picture on the tube. The only possible way of improving reception in these circumstances is by concentrating on improving the efficiency and pick-up property of the Band III aerial.

On other types of commercial two-band receivers, on certain home-constructed receivers, and on receivers using a Band III adaptor or converter the maximum sensitivity limit may not be achieved. When this is the case the raster is almost free of grain when the receiver is switched to Band III, the aerial removed and the contrast and sensitivity controls set at maximum. Here, then, it is possible that the receiver or receiver converter combination would not respond at all to a weak signal, even though the aerial is one of complex design and orientated for maximum pick-up.



Underside view of the pre-amplifier.

This is where a Band III pre-amplifier may help and make the difference between no picture at all and one of entertainable value. The most important point to remember, however, is that it is absolutely useless to employ a Band III pre-amplifier if the set is already designed for maximum usable sensitivity, in an endeavour to resolve a picture out of a background of grain (" noise ").

We could make a small qualification in this connection, though, and that is a pre-amplifier may assist, even in this latter respect, if the first stage of the receiver or receiver-converter combination happens to be excessively " noisy." A pre-amplifier may also be required when two or more receivers are used on a common aerial system.

The Circuit of a Pre-amplifier

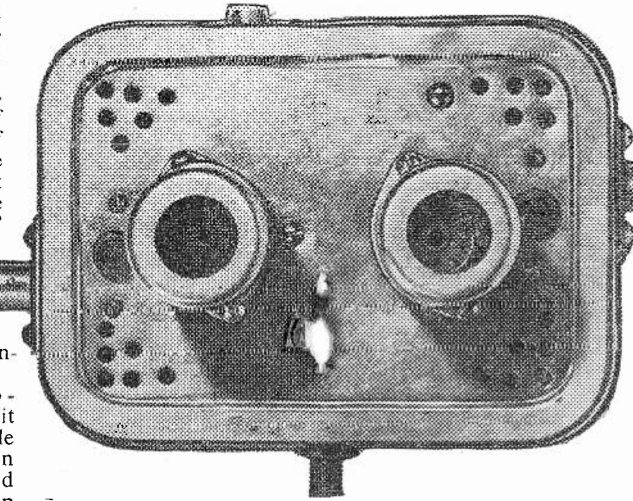
At Band III frequencies the most important design consideration is in obtaining the utmost signal transfer from the aerial feeder to the first amplifier valve with the very minimum of " noise." This cannot be achieved by employing the conventional Band I amplifying techniques, as the " noise " developed in the first stage tends to outweigh the small Band III signals.

A triode first stage is desirable and as a means of getting a certain degree of gain a double-triode valve arranged in a cascode circuit provides a good compromise of gain and low " noise." Once the signal has been amplified and a good signal-to-noise ratio achieved it can, if desired, be further amplified by using a more conventional R.F. pentode valve.

A two-stage circuit after this style is shown in Fig. 1, and when built up in accordance with the following details it creates a very versatile Band III amplifier which has a number of applications. The amplifier has been checked on the Belling and Lee low-power test signals at a distance of about 60 miles from the transmitter using a commercial two-band receiver of relatively low Band III gain. Without the amplifier the receiver was utterly dead on Band III; its employment, however, really brought the receiver to life and made it approximately as sensitive as a commercial receiver with very high Band III gain. It should be mentioned that the amplifier was tried with a high-gain Band III receiver, but it was of small assistance since the first stage " noise " of the receiver itself introduced the limiting factor from the sensitivity aspect, along the lines already considered.

The amplifier was connected to a 12-outlet distribution system and provided a Band III signal at each outlet slightly higher than that at the aerial feeder.

The circuit is quite conventional and, as may be seen, a neutralised cascode amplifier is coupled from the top end of L4 to the signal grid of a pentode amplifier—the neutralising components being C2 and C3. The small inductor L3 serves to improve the gain of the cascode section by tuning out the output capacitance of the first triode (V1A) and the input capacitance of the second triode (V1B).



Plan view of the pre-amplifier.

The signal input and signal output circuits are isolated from the chassis by capacitors C1 and C11 respectively. The coaxial input and output sockets should be of the insulated kind, so that no direct connection is made to the chassis. This becomes important if the amplifier is powered from a receiver of the A.C./D.C. type, or from a receiver in which the chassis is connected to one side of the mains supply.

The Mullard double-triode valve type ECC81 is used in the cascode section, while a Mullard type EF80 is used in the second stage. The power requirements are 6.3 volts at 0.6 amp and 240 volts at 20 mA. Voltage readings relative to chassis are indicated at various points on the circuit.

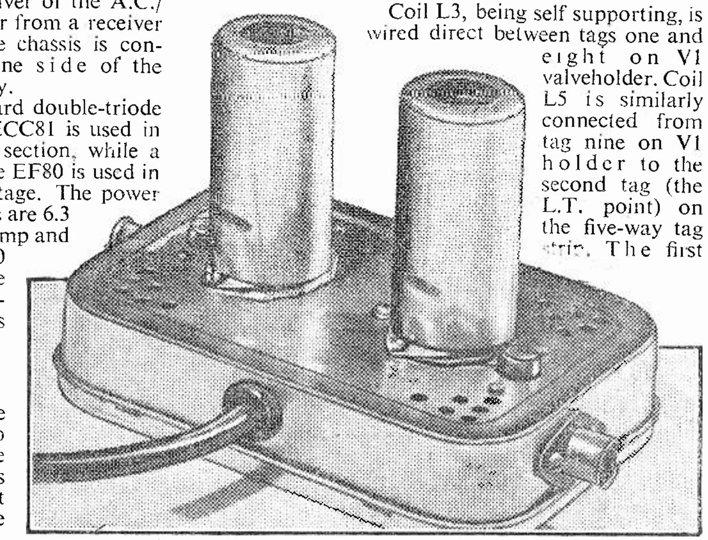
Construction

Band III amplifiers do not require a lot of space, as it is essential to arrange the various circuits so that the shortest possible connecting wires may be used. With this in mind it was, therefore, decided to build the complete unit in a 2oz. square tobacco tin to match up with the Band III converter unit.

Fig. 2 shows how the tin is divided up to take the components; it also shows the wiring and the precise position of all the components. It will be seen that three earthing points have been selected on the chassis to which the appropriate components are soldered. The centre tag on the five-way tag strip is also connected to chassis, and it is at this point that the H.T. negative/L.T. power lead is connected, together with C12.

Ventilation holes are drilled in each corner of the chassis, not so much because the components inside are apt to overheat, but because considerable heat is actually transmitted to the inside of the chassis from the valves themselves.

The valve holders and coils should closely follow the positions as shown in Fig. 2, so that the connecting wires can be kept as short as possible. The layout illustrated leads to optimum stability without the necessity of additional screening. When soldering the capacitors and resistors into the circuit the heat should be transferred away from the component by gripping the connecting wire with a pair of long-nosed pliers. The small metal cyclinder in the centre of the valve holders should be connected direct to chassis as shown, and this point can then be used as an earth (chassis connection) for the appropriate valve electrodes and decoupling capacitors.



A general view of the unit.

Coil L3, being self supporting, is wired direct between tags one and eight on V1 valveholder. Coil L5 is similarly connected from tag nine on V1 holder to the second tag (the L.T. point) on the five-way tag strip. The first tag on this strip is used to anchor the H.T. positive supply lead, and this is also connected to tag four, which carries C12, R4 and R7. Tag three (the centre tag) is fixed to the chassis and connects to the H.T. negative supply lead and C12. Tag five connects L4 to R4 and C6.

The unearthed tag on the two-way tag strip serves to anchor the start of L6, R7 and C8. The earthed tag is not used.

It should be noted that the cathode resistor of V2 (R8) is located beneath the associated decoupling capacitor C13, between V2 valve holder and the five-way tag strip.

Before commencing drilling the tin to take the valve holders, coil formers, coaxial sockets, tag strips and power cable the paint should be removed by vigorous application of a suitable solvent—this gives the tin a chromium-plated finish.

LIST OF COMPONENTS

- 1 2oz. tobacco tin for chassis.
- 2 B9A ceramic valve holders.
- 2 B9A valve screening cans complete with base.
- 3 Aladdin-type ¼in. low-loss formers with high " Q " cores.
- 1 5-way tag strip with centre chassis fixing.
- 1 2-way tag strip with chassis fixing.
- 2ft. 16 s.w.g. tinned copper wire.
- 6in. 18 s.w.g. tinned copper wire.
- 1ft. 22 s.w.g. tinned copper wire.
- 2 insulated coaxial sockets.
- 1yd. 3-core p.v.c. covered power cable, ¼in. diameter.
- 1 ¼in. rubber grommet.
- 10 plated 6 B.A. nuts and bolts.
- 6 plated 8 B.A. nuts and bolts.
- 1ft. p.v.c. covered wire.
- 10 0.001 μF midget ceramic capacitor.
- 1 5 pF midget ceramic capacitor.
- 1 3 pF midget ceramic capacitor.
- 1 50 pF midget ceramic capacitor.
- 2 220 K. 1/10 watt carbon resistors (R1 and R5).
- 1 470 K. 1/10 watt carbon resistor (R3).
- 1 100 Ω ½-watt carbon resistor (R2).
- 1 2.2 K. ½-watt carbon resistor (R4).
- 1 180 Ω ½-watt carbon resistor (R8).
- 1 1 K. ½-watt carbon resistor (R7).
- 1 1.5 K. ½-watt carbon resistor (R6).
- 1 ECC81 valve (Mullard).
- 1 EF80 valve (Mullard).

Coil Winding Data

L1—1 turn p.v.c. covered wire wound between last two turns (earthy end) of L2. The coil held in position by twisting the ends ready for connection to the signal input socket (see Fig. 2).

L2—4½ turns 16 s.w.g. tinned copper wire. Turns spaced approximately the diameter of the wire.

L3—5 turns 18 s.w.g. tinned copper wire. Coil made self supporting 3/16in. diameter. Turns spaced approximately the diameter of the wire.

L4 — 4½ turns 16 s.w.g. tinned copper wire. Turns spaced approximately the diameter of the wire.

L5 — 14 turns 22 s.w.g. tinned copper wire. Coil made self supporting ⅛in. diameter. Turns spaced as close as possible without shorting.

L6 — 4 turns 16 s.w.g. tinned copper wire. Turns spaced approximately the diameter of the wire.

L7—1 turn p.v.c. covered wire wound between last two turns (R7 end) of L6.

Coils L2, L4 and L6 are best formed by winding on the shank of a ⅛in. twist drill. After removing they can then be pushed on to the low-loss coil formers without damage. Coils L3 and L5 can be formed similarly by winding on a drill shank of correct diameter.

When soldering coils L2, L4 and L6 to the appropriate components and valve holder tags, the coil wire near the tag should be gripped with a pair of long-nose pliers to transmit the heat away from the former and prevent it from distorting.

Operation

The amplifier can either be powered from the receiver itself or from a separate power unit, and it can be used internal or external to the receiver. If it is installed internally the lid of the tin may be drilled and screwed on the inside of the receiver cabinet; the amplifier may then be pushed on the lid, which holds it secure.

If used externally and powered from the receiver it must be remembered that the chassis is liable to be "live" to earth if the chassis of the receiver is connected to one side of the mains supply.

If the amplifier is to be used to provide sufficient signal for operating more than one receiver from a common aerial a separate substantial power-pack should be used, and the power-pack and amplifier housed in the roof carrying the aerial.

The amplifier will tune over channels 8 and 9 provided it has been constructed according to the foregoing specifications. Tuning simply involves adjusting the cores in coils L1/2, L4 and L6/7 for maximum picture consistent with optimum definition.

Noise

The addition of this pre-amp, as well as a Band III converter may be found in some cases to produce a very noisy picture—evidenced by severe "rain" on the picture. In such a case use the best possible aerial and allow the pre-amp and converter to run at maximum gain, turning down the R.F. gain on the Band I receiver. Do not attempt to reduce the noise by cutting down the gain of either the pre-amp or the converter as this will only make matters worse.

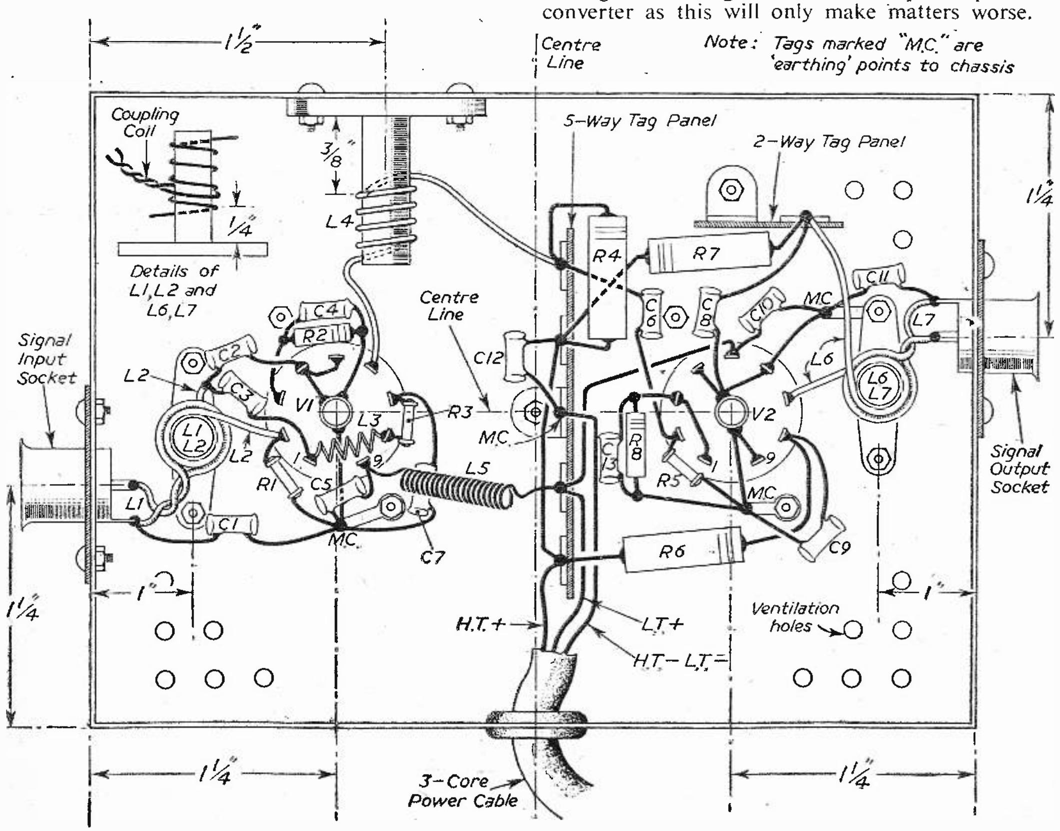
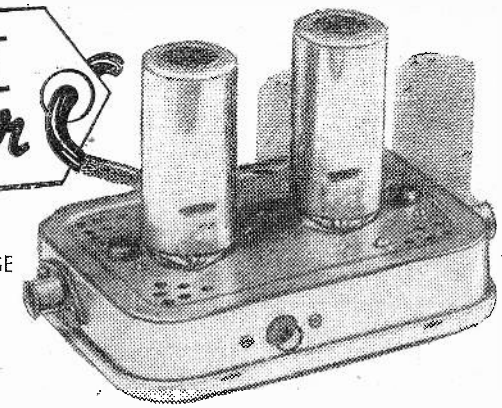


Fig. 2.—Wiring details and (inset at top left-hand corner) coil details.

A BAND-III Pre-Amplifier



A VALUABLE ACCESSORY FOR FRINGE AREA VIEWERS

By Gordon J. King, A.M.I.P.R.E.

WITH the coming of transmissions on Band III many of us will find that we are initially situated in an area where the signal strength due to the nearest I.T.A. transmitter is considerably less than the signal strength due to the local BBC transmitter on Band I. As the result of this we shall have to install somewhat more complex and loftier aerial systems on Band III than those necessary on Band I. The most important factor governing successful Band III reception in a fringe area is in picking up sufficient signal and conveying it to the first stage of the receiver with as little loss as possible.

This problem is aggravated by the fact that the sensitivity of a two-band TV receiver is between three and five times less on Band III as compared with Band I. It has to be remembered that the maximum usable sensitivity on Band III is limited essentially by the receiver signal-to-noise ratio and, as we are aware, this ratio reduces as the frequency is increased.

A number of commercial two-band receivers are designed to this limit, which means that entertainable Band III reception is possible only when the input signal is greater than the noise signal generated by the first stages of the receiver. For example, the picture due to a weak signal on receivers of this type would be considerably masked by grain (picture noise). The

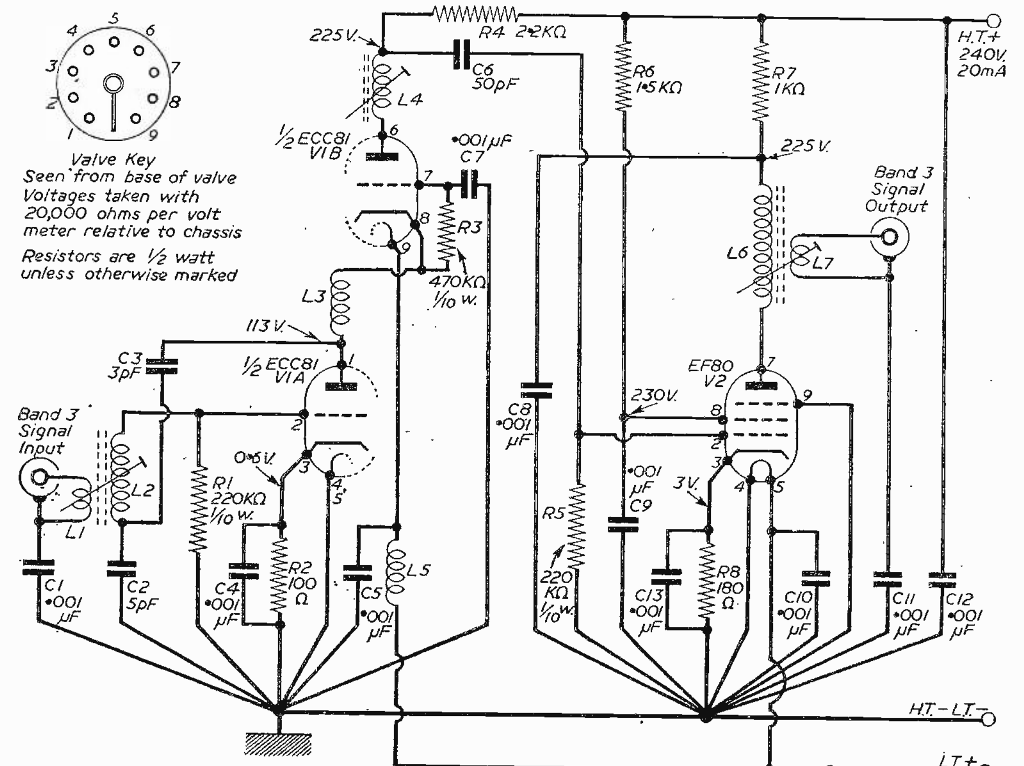
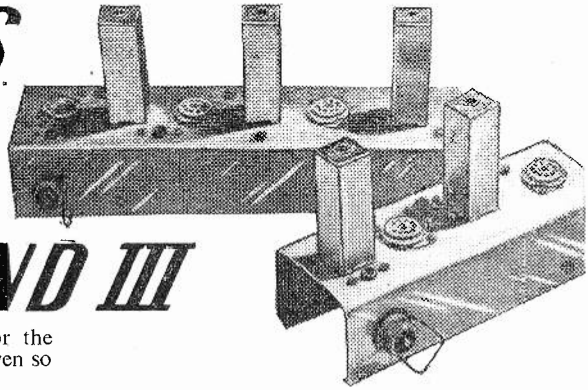


Fig. 1.—Theoretical circuit of the pre-amplifier.

CONVERTERS FOR BAND III

TABULATED COIL DATA FOR THE SERVICE AND FRINGE AREA MODELS DESCRIBED IN PREVIOUS ISSUES



THESE further notes on the coil data for the Service and Fringe Area Models are given so as to provide assistance to the novice.

The data has been presented in a new form, dealing with each individual coil, but these notes must be read in conjunction with the original text.

The Service Area Model

Coil L1. This is the aerial coil and is wound as given in Fig. 6 of the article (reproduced below) on a ¼in. coil form tuned with an iron-dust core.

Turns. Two complete turns spaced at ⅛in. tapped at half a turn from the bottom.

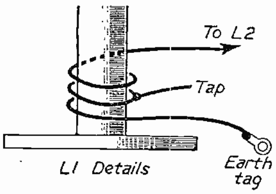
Wire. 22 s.w.g. bare wire. Enamelled wire can be used.

Wiring. The tap is taken to the aerial socket (centre pin), the bottom end is taken to chassis, and the top end to coil L2.

Coil L2. This is the filter coil and has a single winding which is wound at the bottom end of the coil form. The coil form is by Haynes using an iron-dust core.

Turns. As given in Table I, adjacent turns touching.

Fig. 6.—Details of coil L1 for both models.



Wire. 28 s.w.g. enamelled or silk and cotton insulated.

Wiring. The bottom end is taken to the top end of L1 and the top end is taken to the grid (pin 2) of V1a. A 10 pF condenser is wired across the side wires within the coil can.

Coil L3. This coil is designed to resonate within the capacitance of the valve and associated wiring to the Band III signal. It is wound on a ¼in. coil form tuned by an iron-dust core.

Turns. 5 turns of wire spaced at about ⅛in.

Wire. 22 s.w.g. bare wire but enamelled wire can be used.

Wiring. The bottom end goes to pin 1 of V1a and and the top end to pin 8 V1b.

Coil L4. This is a Band III coil and is wound similarly to L1 on a ¼in. coil form tuned with an iron-dust core.

Turns. 2½ turns as given on page 168 spaced at ⅛in.

Wire. 22 s.w.g. bare wire but enamelled wire can be used.

Wiring. The bottom end goes to pin 6 of V1b and the top end to the centre tap of L5.

Coil L5. This is the oscillator coil and is wound on a ¼in. coil former tuned with an iron-dust core. It has a tap at the centre of the coil.

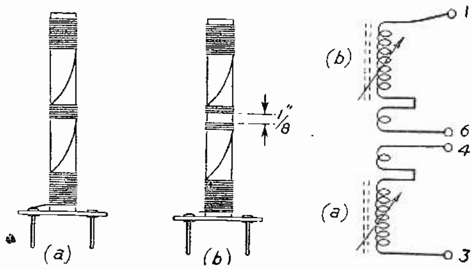


Fig. 8.—Details of the I.F. coils. (a) and (b) windings are identical.

Turns. Five turns are required tapped at 2½ turns up from the bottom.

Wire. 22 s.w.g. wire. Bare wire preferred but enamelled can be used.

Wiring. The bottom end goes directly to C6 and the top end to pin 8 of V2. The tap is wired directly to the top end of L4.

Coil L6. This is an I.F. coil for feeding into the receiver. It is damped by R6 to broaden the tuning. It is wound on a Haynes coil form and uses an iron-dust core for tuning.

Turns. The turns are as given in Table II. The turns for the anode coil are wound on; the turns for the coupling coil are then wound on with a spacing between the two coils of about ⅛in. The number of turns for the coupling coil are as given for the "Coupling Coil" in Table II.

Wire. 28 s.w.g. enamelled or silk and cotton covered wire.

Wiring. The bottom end is taken to pin 7 of V2 and the top end to R7. The small coupling coil has the bottom end taken to "earth" and the top end to the centre of the coaxial cable. Note that in Fig. 7, pin 9 of V2 should go to chassis.

The Fringe Model

Coils L1, L2, L3 and L4. These coils are similar to the corresponding numbers in the Service Area model and above data applies.

Coil L5. This is the oscillator coil and is wound on $\frac{1}{4}$in. coil form tuned by an iron-dust core.

Turns. Five turns spaced at about $\frac{1}{8}$in.

Wire. 22 s.w.g. bare wire. Enamelled wire can be used.

Wiring. The bottom end of the coil goes to C9 and the top end to pin 1 of V2. Note that paragraph 4 of page 171 has a misprint. *R*9 should read *R*15.

Coil L6. This is an I.F. coil and uses a Haynes former with two iron-dust cores for tuning.

Turns. These are as per Table II. Example : If the coil is for Channel 1 wind on 11 turns and then spiral

TABLE I.
Coil Data.

Channel 1	11 turns
Channel 2	9 turns
Channel 3	8 turns
Channel 4	7 turns
Channel 5	6 turns

to three additional turns as shown in Fig. 8. Continue with the extra turns as given in the data and spiral to 11 turns at the top. Each coil on this former consists of a main coil of 11 turns with a coupling coil of three turns, used for the anode circuit and a coupling coil of three turns with a main coil of 11 turns for the grid circuit.

Wire. 28 s.w.g. enamelled or silk and cotton covered. Adjacent turns touching.

Wiring. The primary coil has R8 connected across the pins of the coil as shown in Fig. 11. The bottom end (coil pin 3) is taken to C7 and the top end (coil pin 1) to chassis. Coil pin 4 is taken to the anode of V2 (valve pin 6) and coil pin 6 is taken to the grid of V3 (valve pin 2).

Coil L7. This is identical to L6 of the Service Area model.

R16 is connected across the primary (the coil with the greatest turns) and the secondary (the small coil) is taken to the coaxial cable.

TABLE II

	Anode coil	*Coupling coil*
Channel 1 ...	11 turns	3 turns
Channel 2 ...	10 turns	3 turns
Channel 3 ...	9 turns	2 turns
Channel 4 ...	8 turns	2 turhs
Channel 5 ...	7 turns	2 turns

Valves. Note that the 6.3 volt equivalent valve of the PCF80 is now available and can be used thus avoiding the necessity for 9 volt heater supply.

SERVICING THE FERGUSON 983T AND 988T

(*Continued from page 304*)

pentode with low anode and screen voltage.

The only component likely to cause trouble is the .1 μF coupling condenser which passes the picture and sync pulses to the control grid from the anode circuit of the video amplifier. If this is slightly leaky the picture will tend to tear with changing picture content. This gives the impression of faulty line-hold, but adjustment of the line-hold control does not stop the tearing.

Sound Output

In the 983T push-pull, ECL80 valves are used V12 and V13, the pentode sections forming the actual output valves, whilst the triodes operate V12A as the A.F. amplifier with V13A as the phase-splitter. These are connected in a paraphase circuit. Instability which may show up as a screeching noise can be due to the ECL80 valves being mismatched, or to a grid-leak resistor going high. The sound section is decoupled from the main H.T. line by a 2.2 KΩ resistor and an 8 μF electrolytic condenser. Instability will, of course, result if this condenser goes open-circuit.

Distortion of Sound

This is usually due to the 3.3 MΩ anode load resistor of V18A (EB91) noise-limiting diode going high. Its colours are easily identified : orange, orange-green. The anode load resistors of V12 and V13 triode sections should also receive attention in the event of low and distorted sound. Always check ECL80 valves. Early models incorporating a crystal diode sound-detector should also have this part of the circuit checked in the same way as the vision detector. Two sound I.F. amplifiers are employed, and both valves are EF80's. The first (V10) has its control-grid returned to the detector stage for AGC purposes.

Sound on Vision

As in most superhet receivers, V2 is the frequency changer and is of the self-oscillating pentode type (EF80). Reference to the top chassis view shows the position of C8, which is the oscillator tuner. Sound on vision and vision on sound is nearly always due to this adjustment being improperly made. Sound on vision appears as bars across the screen when loud passages of sound are received. Vision on sound appears as a buzz, which changes with the picture content. The adjustment of C8 should be made carefully, as its correct setting is quite critical.

Final Notes

Picture jitter, that is constant vertical vibration of the picture, is most often due to a faulty V15 ECL80, but on early models where valve replacement does not effect a cure, the fitting of a 1k resistor as shown in Fig. 3 will provide a cure. This is already fitted in models with serial numbers higher than 9,000 (983T) and 28,900 (988T).

Picture Shift

The picture shift adjustment lever is just in front of the focus control. Side-to-side movement produces vertical shift, whilst screwing up and down moves the picture left and right.

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1L4	7/6	80	8/6	12SR7	7/6	EF50 (Red		HL23DD	
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1S4	7/6	6SG7GT	6/6	6A8G	8/6	KT2	5/-	QP25	6/6
1T4	7/6	6SJ7GT	8/6	TZ40	35/-	VP2	8/6	QP21	8/-
1R5	7/6	6SK7GT	8/6	0Z4	7/-	SP2	8/6	TP22	8/6
3S4	7/6	6SN7GT	9/-	25Z5G	8/6	TDD2A	8/6	ATP4	4/-
3V4	7/6	6SL7GT	9/-	25Z6G	8/6	VP2B	8/6	MS/PEN	7/6
1LN5	8/-	6SC7	10/-	35Z4GT	8/6	215SG	4/-	PX25	12/6
1LD5	8/-	6V6G	7/6	35Z5GT	8/6	866A	15/-	6A6	10/-
5U4G	8/6	6V6GT	7/6	35L6GT	8/6	354V	5/-	46	10/-
5Z4G	8/6	6F6G	7/6	50L6GT	8/6	4D1	4/-	AC/PEN	10/-
5Z3G	8/6	6AC7	6/6	25A6G	8/6	9D2	4/-	FC13C	10/-
MU14	8/6	6AG7	12/6	KT33C	10/-	8D2	4/-	FC13s/c	10/-
6B8	7/6	6C5GT	5/-	KT66	12/6	PEN46	7/6	42SPT	6/-
6K8G	9/-	6J5GT	5/-	EBC33	8/6	AC6PEN	6/6	PENDD4020	
6K7G	6/6	12A6	7/6	EF54	6/-	VP41	7/6		12/6
6J7G	6/6	12K7GT	8/6	EB34	3/6	TH233	10/-	VT501	7/6
6N7GT	7/6	12K8GT	8/6	EA50	2/-	41MP	7/6	U19	10/-
6L7	7/6	12Q7GT	8/6	D1	2/-				

EY51	12/-	UL41	11/-	EF80	10/6	PL81	12/6	12AT6	8/-
EF41	11/-	UY41	11/-	EABC80	10/-	PL82	10/-	12AT7	9/-
EL41	11/-	UF41	11/-	ECC85	10/-	PY81	10/-	12AU6	9/-
EZ40	10/-	DK40	10/-	EZ80	9/-	PY82	10/-	12BA6	9/-
EM34	10/-	50B5	10/-	EM80	10/-	PCC84	12/6	12BE6	10/-
35W4	8/-	50C5	10/-	ECL80	12/6	PCF82	12/6	6X4	8/6

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3in. mirror scale : scaled 30-0-30 F.S.D. 100 micro-amps. Brand new with leather case (original price, £14/10/-). **79/6.**

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This converter which is built around two valves type EF80 (Z719) is for use with T.R.F. or Superhet band 1 Television receivers. Complete set of Teletron coils only, with practical and theoretical wiring diagram **15/-** post free. Chassis measuring 7in. x 3in. x 1½in. ready drilled to specification, **3/9** plus 9d. packing and post. Alternatively construction details only with separate individually priced parts list, 6d. post paid. The complete kit as specified, including all the above, valves, etc., down to the last nut and bolt, can be supplied at **48/6** only, plus 2/- packing and post.

VIBRATOR PACKS, Etc.

Input 12 v., output 244 v. at 44 mA. ... **25/-**

Input 6 v., output 180 v. at 40 mA. ... **21/-**

Vibrator Transformers 6 v. 180 v. 40 mA ... **7/6**

Vibrator Transformers 6 v. 250 v. 80 mA ... **8/6**

Vibrator Transformers 12 v. 250 v. 80 mA ... **8/6**

Vibrators 6, 12 or 24 v. 4 pin **5/-**

Vibrators 6 v. 7 pin synchronous ... **12/6**

Vibrators 12 v. 7 pin synchronous ... **12/6**

Vibrators 2 v. 7 pin synchronous ... **7/6**

"TWEETERS" Electrostatic H.F. Speakers for use with amplifiers or sets. Supplied with full data and circuit diagrams. **LSH75** 7-18 kc/s. 20 dbs. inherent cap. 800 p.f. Polarising voltage 300 v. D.C., maximum A.C. voltage 60 v. For outputs up to 7 watts. Size 2½ x 2½ x ¼ in. **12/6**

LSH100. As above, inherent cap. 1,100 p.f. For outputs up to 20 watts. Size 5 x 3 x ⅜ in., **21/-.** Post free.

RECEIVER TYPE 25/73

(The receiver section of TR1196). Supplied complete with full data for conversion to 3-wave-superhet receiver. Unit is complete with 6 valves 2-EF39, 2-EF36, EK32 & EBC33, also standard I.F.T.s 465 kc/s. Price **27/6** plus 2/6 P. and P.

TR1196 TRANSMITTER PORTION

We can also supply the transmitter portion of the above receiver incorporating valves, EL32, EF50, CV501. Type 600 relay transformer, coils, switches etc. Limited quantity at **12/6** only, plus 2/6 P. and P.

CRYSTAL MICROPHONE INSERTS

7/6 POST FREE

7/6 POST FREE

Ideal for tape recording and amplifiers. No matching transformer required.

SPECIAL REDUCTION

1A7GT, IN5GT, 1H5GT, 1A5GT (or 1Q5GT) ... ... **40/- Set**

10 EF50 (Ex: Brand New Units), 5/- each ... ... **45/- „**

6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G ... **37/6 „**

1R5, 1S5, 1T4, 1S4 or (3S4 or 3V4) ... **27/6 „**

TP25, HL23/DD VP23, PEN25 (or QP25) ... ... **25/- „**

6K8G, 6K7G, 6Q7G, 25A6G, 25Z5 (or 25Z6G) ... ... **37/6 „**

12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT (or 50L6GT) ... ... **37/6 „**

12SA7GT, 12SK7GT, 12SQ7GT, 35Z4GT, 35L6GT (or 50L6GT) ... ... **37/6 „**

R.F. UNITS

R.F.24 20/30 Mc/s ... **12/6**

R.F.25 40/50 Mc/s ... **15/-**

R.F.26 50/65 Mc/s ... **30/-**

R.F.27 60/80 Mc/s ... **35/-**

Brand new, carr. free.

CATHODE RAY TUBES

(Brand New)

VCR97 (slight cut-off) **15/-**

VCR 97 guaranteed full T/V Picture ... **40/-**

VCR517C, guaranteed full T/V Picture ... **35/-**

VCR139A, guaranteed T/V Picture... ... **35/-**

3BP1, guaranteed full T/V Picture... ... **30/-**

Carr. & packing on all tubes, 2/-.

WALKIE-TALKIE SETS TYPE 38

Complete with 5 valves, 4 VP23 and ATP4, Throat Microphone, Junction Box and Whip Aerial, all in good condition. All sets air tested and guaranteed. **59/6,** carr. 5/-. (Suitable new batteries and leads, **£1.2.6** set.)

24 v. Blower Motors, U.S.A. Type, Miniature ... **12/6**

12 v. Blower Motors, U.S.A. Type, Small ... **12/6**

12 v. Geared 3 Speed Motors **12/6**

RT40/APNIX

U.S.A. Altimeter containing 13 valves, 3-12SJ7, 4-12SH7, 1-12H6, VR150/30, 2-955, 2-9004, plus 4 relays, magnetic sounder condensers and precision resistors. Also 12 volt dynamotor output 285 v. 75 m/a.

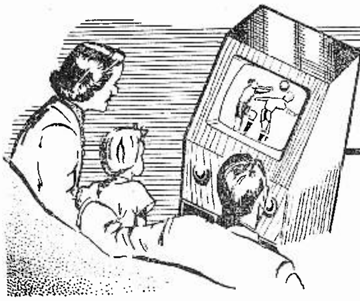
BRAND NEW ORIGINAL CARTONS

65/-

23-page Catalogue, **3d.** Open Mon.-Sat. 9-6. Thurs. 1 p.m.

5, HARROW ROAD, PADDINGTON, LONDON W.2 TEL.: PADDINGTON 1008/9, 0401.

ALL GOODS POST FREE—UNLESS OTHERWISE STATED.



UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

IN these days of crazy comedy and goonatic shows on radio and TV, it was quite a surprise to find that two of the originators of this type of humour—Flanagan and Allen—were not really so crazy after all. They certainly highlighted the Jack Hylton show on A.R.-TV, and their cross-talk act, put over with perfect timing was sheer delight. But then I am a Flanagan and Allen fan and it was their "signature tune," *Underneath The Arches*, which suggested the title of this column some years ago. Following an illness Chesney Allen has not been on the stage for a long time and Bud Flanagan has been starring with the Crazy Gang shows. CTV has demonstrated that the old partners have not lost their sure touch and that it is high time that they were seen together again more often. Perhaps Bud and Ches will give an encore in another Jack Hylton show.

VARIETY'S NEW-OLD LOOK

IT was to be expected that a show put on by the Grand Order of Water Rats in celebration of their sixty-sixth anniversary would be a bumper show with a nostalgic flavour. This ninety-minute programme featured about thirty-five top-line variety artistes, each of whom made a definite contribution to the entertainment, not a mere appearance. It was delightful to see Robb Wilton, Dave O'Gorman, G. H. Elliot, Albert Whelan and other long-established stars putting over their acts with vim and vigour, while Tommy Trinder, Jimmy Wheeler, Nat Jackley, Bobby and Sally Ann Howes, Charlie Kunz, Max Bygraves, Nat Mills and dozens of others introduced new material at a fast pace. Some of the items were particularly good, one of the most hilarious being the sketch in which Nat Mills tried vainly to coax Nat Jackley and Jimmy Lee to perform some elementary ballet steps. Nat Jackley must surely be one of the funniest visual comedians on TV—his recruiting sketch seen on the BBC TV a few days earlier had also scored heavily. Many other well-known artistes took part in the minstrel ensemble or simply played tiny "walk-on" parts, and the show wound up with a presentation by Ronny Waldman on behalf of the BBC to Fred Russell, aged 93, and four times King Rat.

A great deal of the credit for the streamlined slickness of this mixture of new and old music hall must go to Graeme Muir, the BBC producer, and to Wee Georgie Wood and Hy Kraft, who devised and wrote much of the show, which must be one of the biggest undertakings of its type offered by the BBC either on radio or TV.

MORE STUDIOS FOR TV

IT only seems the other day that the only studio stage space devoted to TV in Britain was the two small stages at the Alexandra Palace. Almost every week now, announcements are made of new TV studios being opened in London or elsewhere. The Granada Group are building a 15-storey TV centre in Manchester which will have at least seven or eight stages and the fullest facilities on a 6¼ acre site. Granada are also planning to open branch studios in Leeds and Liverpool. Enterprise on this scale must represent a huge capital investment and demonstrates the faith of the main contractors in the success of TV.

Bernard Delfont's Television Productions Ltd. have announced that

Capt. Drew, of H.M.S. Ark Royal, addressing members of the crew over the television installation on board.

the Pigalle Restaurant will be taken over for the telerecording of lavish floor shows for British and American commercial television. Robert Nesbitt, producer of spectacular floor shows televised from Las Vegas on Amercan TV, has been engaged to produce. The Delfont organisation will also be responsible for elaborate TV presentations of Norman Wisdom, Winifred Atwell, Ruby Murray, and others, together with filmed programmes produced by Herbert Wilcox.

The BBC have now announced the purchase by them of Ealing Studios for their TV film division. This means that another five studio stages having a floor area of about 28,000 sq. ft. will turn over from feature film production to television. The Ealing films will be made elsewhere after January and the BBC will take possession of a compact and well-planned film production plant having a diesel-electric power plant, dozens of cutting rooms, dressing rooms, carpenters' and plasterers' shops, prop rooms and three theatres. It has not yet been stated whether any of the valuable camera, sound recording or lighting equipment is being taken over.

FILMING TV SETS

EALING Studios recently put on their own Radio Exhibition—in the form of a reconstruction of the real thing in their largest stage, with stands, sets, aerials, salesmen and spectators. This was for a sequence in the Benny Hill comedy, "Who Done It?" The script called for live television sets—dozens of them—all to be picked up at the same time by the cine camera. One of the scenes in the film takes place at the National Radio Show of 1956. Crooks and the police are chasing Benny Hill, who is hiding somewhere amongst the stands. Unwittingly he steps in front of a closed-circuit TV camera and his close-up image appears on every TV set in the Show. In one shot thirty or forty TV receivers are seen at the same time. This apparently simple set-up posed several problems. Hitherto, the photographing of television sets in action has been accomplished by the use in the film studio of back-projection, the pre-filmed image being projected on to a small ground-glass screen in a dummy TV cabinet. If more than one set was in the picture at the same time, additional back-projection machines are required. In a recent production at Pinewood, nine back-projection machines were interlocked to produce nine TV images. The Ealing script called for so many TV sets that another method had to be used. A closed-circuit TV camera was set up at one end of the studio and fed to all the sets on the stands—to Murphy, Bush, Sobell, Masteradio, Pye, Pilot and other standard TV sets which were not "hotted up" in any way. The motion picture camera was altered to shoot at 25 instead of 24 frames per second, exact and precise synchronisation with one of the fields of the interlaced TV image being accomplished by a special satellite shutter with eyepiece attached to the film camera, and very fast film was used. The result was highly successful. Incidentally, one of the stands at this dummy show was that of PRACTICAL TELEVISION!

The "Practical Television" and "Practical Wireless" Stand at the 1956 Radio Show in the film "Who Done It?" mentioned in the first column on this page.

"THE HAPPY HYPOCRITE"

WHAT a happy thought it was to precede the transmission of "The Happy Hypocrite" with tape recordings of an interview with the author, Sir Max Beerbohm who wrote this light-as-a-feather playlet in 1896. Here was a stylish creation in words which had the impact of a classical ballet, exquisitely produced for television by Victor Menzies. For this type of production the playing by artistes and the technical values must be absolutely impeccable: any blemishes or crudities would have broken the spell of what was really a classical fairy story. Vernon Greeves had the voice and bearing which well sustained the difficult role of Lord George Hell, a part once played with great brilliance by Ivor Novello, and Patricia Cree was moving and lovely as Jenny Mere, the country maiden. I cannot recall having seen either of these players before on TV, but have made a special note of their names for future reference. Maybe TV has once again been responsible for the creation of new starlets—if not stars.

TELENEWS

Television Receiving Licences

THE following statement shows the approximate number of television receiving licences in force at the end of September, 1955, in respect of stations situated within the various postal regions of England, Wales, Scotland and Northern Ireland.

Region	*Number*
London Postal	1,175,035
Home Counties	542,090
Midland	874,346
North Eastern	720,524
North Western	711,545
South Western	290,381
Wales and Border Counties ...	267,350
Total England and Wales ...	4,581,271
Scotland	274,270
Northern Ireland	28,308
Grand Total	4,883,849

Channel Islands Tube Service Station

AT present dealers in the Channel Islands have to return tubes which have failed within the guarantee period to the mainland. This involves expense and loss of time.

Mullard, Ltd., have therefore arranged for their tubes to be tested on one of their standard factory type test boards by Messrs. J. J. Eastick and Sons, Ltd., of St. Helier, Jersey, who will be authorised to issue replacements subject to the usual terms of guarantee.

Colour Television

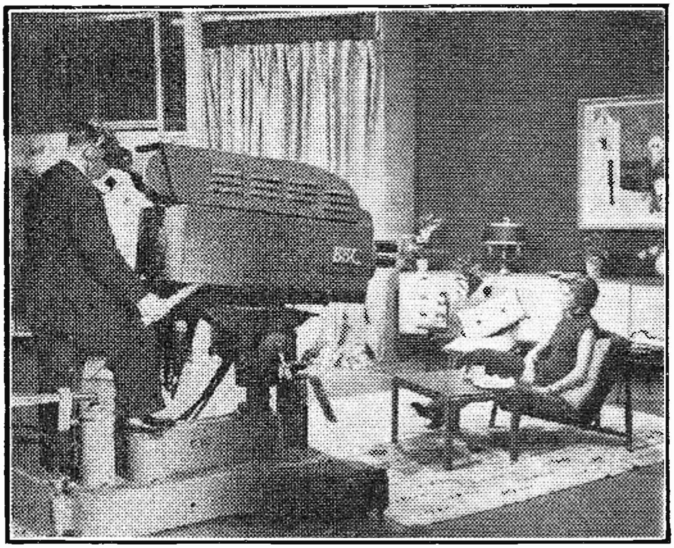
THE secretary of the British Radio Equipment Manufacturers Association recently made the following announcement after the BBC colour tests:

"Our manufacturers are extremely interested in the BBC colour television tests. They are co-operating with the BBC in every possible way and looking forward to results which will enable progress to be made towards the choice of a suitable colour system for Britain.

"Our estimate, however, is that it will be at least two years before any decision can be made as to the system to be used and allowing for all the design, development and production stages it will be three or four years before colour television reception can start.

"The time lag on colour television can be judged from the United States. With all their resources there are only four hours of colour television per week even in New York. The cheapest set costs the equivalent of £300. It was recently stated authoritatively that only 25,000 had been made and only 10,000 sold.

"Out of seven million television sets expected to be made in the United States next year only 156,000 are expected to be colour sets."



One of the new BBC colour cameras photographing Ann Veronica Matthews, Secretary to the Head of TV Section, Designs Department during the recent test.

The Crystal Palace Transmitter
Vestigial Sideband Characteristic

IT has been decided, after consultation with the G.P.O., the radio industry and the trade, that the new BBC television station at the Crystal Palace, which is to be opened early in 1956, will use the same method of transmission of the vision signals as is used at all the post-war BBC television stations, the upper sideband being partly suppressed. In this respect the new station will differ from the existing station at Alexandra Palace, which transmits both sidebands equally. The new station will use the same frequencies and polarisation as Alexandra Palace. The actual date when it will come into service will be announced as soon as practicable.

The change to the vestigial sideband method of transmission will not affect reception on receivers of types now on sale because they are all designed for it. In some older receivers a slight adjustment may be necessary to achieve the best results. In a few cases some modification to the receiver may be advisable and there may be some slight loss of detail in the picture: owners of old receivers who have any difficulty should consult a competent radio dealer. The great majority

Our next issue, dated Jan., 1956, will be on sale on Thursday, Dec. 22nd.

of viewers will not need to make any change in their receivers or aerials, except possibly to reorientate the latter.

Crystal Palace Mast

THE BBC has agreed to share its new mast at the Crystal Palace with ITA. This is as a result of the recommendation of the Television Advisory Committee, and means that there will now be a delay of 18 months in completing the mast. In turn this means that the BBC's extended coverage from the London area, promised for next spring, will also be delayed. The new plans will involve the halving of the BBC Band I aerial array, as the top of the mast must now be redesigned. It will carry the BBC Band I aerial and the ITA Band III array, with provision for a second Band III stack—for either BBC or ITA.

Long-range Reception

REPORTS continue to arrive of long-distance reception of the ITA transmitter in London. The greatest distance so far logged is 175 miles, and reports of satisfactory reception have been received from Sheffield, Sidmouth, Bristol and Guernsey.

L.C.C. Aerial Ban

THE London County Council have announced that after tests by its engineers on the reception of commercial television programmes on L.C.C. estates round London the rules on the erection of outside aerials are to remain.

This means that, as with BBC television, outside aerials are banned, though individual applications will be considered.

Two Radio Shows Announced

THE Radio Industry Council announces that the 23rd annual National Radio and Television Exhibition ("the Radio Show") will be held at Earls Court, London, from August 22nd to September 1st, 1956, with a preview for overseas and other special guests on August 21st.

The Radio and Electronic Component Manufacturers Federation announces that its annual private exhibition will be at Grosvenor House, London, W.1, from April 10th to 12th, with—for the first time—a preview for overseas and other specially invited guests on the afternoon of April 9th. Application for admission has to be made in advance to the Radio and Electronic Component Manufacturers Federation, 21, Tothill Street, London, S.W.1.

Russian Receivers

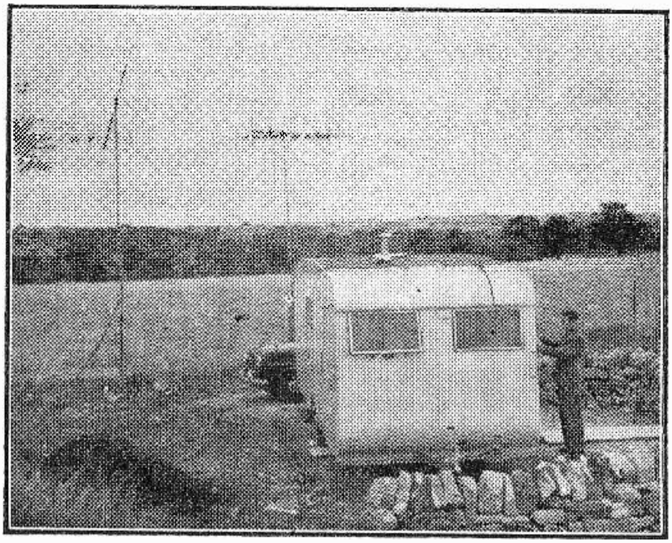
IT is reported by Moscow radio that by the end of the year 700,000 receiving sets will have been produced in Russia.

Two Programmes on One Channel

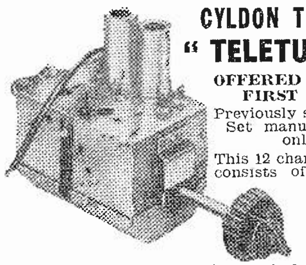
A PROPOSAL was recently put forward in America for two programmes on one channel. Scrambling would not be used, but a single "commercial" would be radiated until the viewer inserted a coin in a slot, when the commercial would be replaced by a programme. The suggestion was put forward by Paramount Pictures, and it was stated that eventually two programmes on one channel would be commonplace, two programmes being "interleaved" and the selector device cutting out the unwanted programme.

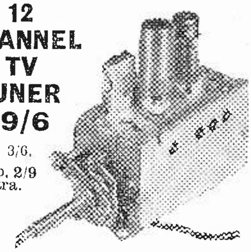
Experts Clash on Colour

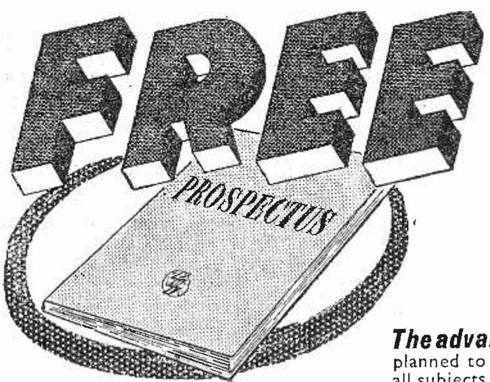
AFTER the recent inauguration of colour tests by the BBC considerable controversy arose as to the future of this type of transmission. There is wide support for a suggestion to scrap the existing definition system and go over to the standard Continental arrangement of 625 lines. It is claimed by the supporters of this move that it will simplify colour transmissions and also enable the trade to export standard equipment without having to make specially for the export market.



A caravan home at Windrush in the Cotswolds, showing the aerial array on which the owner, Mr. J. O. Presslie, receives perfect pictures from the London ITA transmitter. The distance is about 80 miles.







COMMERCIAL T.V. NEWS

MIDLANDS ADDITA NOW AVAILABLE

Our ADDITA Band III converter which is enjoying such a huge success in the South is now available for Midlands viewers who will have heard that test transmissions are about to commence. Please be advised and order early, price is as for London model.

OUR MONEY-BACK GUARANTEE

"We guarantee to refund the full purchase price if after giving our ADDITA Band III Converter a fair trial it does not work to your complete satisfaction."

We are having such good results ourselves and receiving so many repeat orders that we can make the above offer with complete confidence. Every post brings us letters like these:

"I am receiving the commercial programmes loud and clear on my four-year-old Viewmaster. Please send another kit by return. —E. W. B., S.W.1."

BETTER THAN FROM FACTORY-BUILT SET

Other constructors report better results from the converter than from factory built Band III televisors. At Eastbourne one of the latest models by a very famous maker would not receive the commercial signal on its own proper channel circuit despite trimming. However, with the ADDITA a reasonably clear and loud signal was received on Channel 1 without any adjustment.

PRICE AND DETAILS

The price of the complete kit to build the ADDITA, including valves, ready wound coils, drilled and prepared chassis, handsome stoved enamelled case, in fact everything, including transfers to decorate the front and identify the controls is **£4.5.0**, or **£5.5.0** if mains components are also required. Post and insurance is 2/6 in each case. Data is included free with the parts or available separately price 2/6. When ordering please, state whether for Midlands or London area. Made-up models for either area available, price **£7.10.0.**

ADDITA AND T.R.F. TELEVISORS

Certain technicians have been of the opinion that our ADDITA would not be suitable for T.R.F. receivers. Full power transmissions seem to have disproved this theory, however, for we have heard from many viewers with T.R.F. sets that they are getting good results. For instance, in to-day's post we heard from Mr. L. Campling, of Tolworth, Surrey, as follows:

"I would like to inform you that I have tested one of your converters on both adapted Band I and on Band III aerials. The reception was 100 per cent. These tests were carried out on low power conditions and the aerials were only about ten feet from ground level. The set was the home made 'Electronic'."

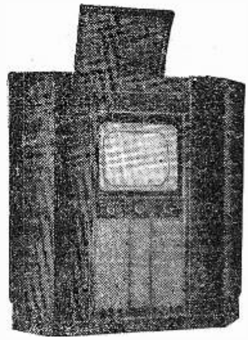
THE ADDITA IS EASY TO MAKE

Proof that it is easy to make comes from another letter in which our customer states that he has just made up his fifth converter and had it working in less than two hours.

THE ADDITA LOOKS "PROFESSIONAL"

Proof that the ADDITA is a well-liked and practical unit comes from the fact that several constructors are developing quite large businesses making these up in quantities for external fitting to their customers' televisors.

PROBABLY YOUR LAST CHANCE TO SECURE THIS BARGAIN



Corner Console. A massive cabinet but being corner fitted is not out of place even in a modern small living-room. Overall dimensions of this cabinet are 47in. wide x 31in. (deep to corner) x 50in. high. Made to house "15" Televisor. Radio Unit, Amplifier, Tape Deck, etc. Originally £18—our price, **£10**, plus 30/- carriage.

ELECTRONIC PRECISION EQUIPMENT, LTD.

Post orders should be addressed to Dept. 5, 123, Terminus Road, Eastbourne.

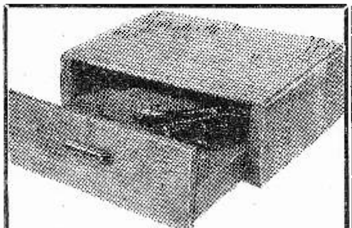
Personal shoppers, however, can call at:

42-46 Windmill Hill, Ruislip, Middx. Phone: RUISLIP 5780. Half day, Wednesday.

152-3, Fleet Street, E.C.4. Phone: FLEet 2833. Half day, Saturday.

29, Stroud Green Road, Finsbury Park, N.4. Phone: ARChway 1049. Half day, Thursday.

249, High Road, Kilburn. Phone: MAIda Vale 4921. Half day, Thursday.



£4/19/6. CONVERT YOUR RADIO. Playing desk 15 x 22 x 7in. Walnut finish, drawer front with 78 r.p.m. motor, turntable and pick-up. Press lever start places High Impedance Magnetic pick-up on records 10in. or 12in. Auto Stop. Brand new in original makers' boxes. 200/250 v. A.C. **£4/19/6.**

CONDENSERS.—New stock. .001 mfd. 7 kV. T.C.C., **5/6.** Ditto, 12.5 kV., **9/6**; 2 pf. to 500 pf. Micas, **6d.**; Tubular 500 v. .001 to .01 mfd., **9d.**; .05, .1, **1/-**; .25, **1/6**; .5, **1/9**; .1/350 v., **9d.**; .1/600 v., **1/3**; 1.1/500 v., **3/6.**

CERAMIC COND.—500 v., .3 pf. to .01 mfd., **1/-.**

SILVER MICA CONDENSERS.—10%, 5 pf. to 500 pf., **1/-**; 600 pf. to 3,000 pf., **1/3.** **DITTO** 1% 1.5 pf. to 500 pf., **1/9**; 515 pf. to 1,000 pf., **2/-.**

C.R.T. LOW LEAKAGE ISOLATION TRANS. Ratio 1 : 1.25, 25% boost, 2 v., **10/6**; 4 v., **10/6**; 6.3 v., **10/6**; 10.8 v., **10/6**; 13.3 v., **10/6.** Ditto mains primary, **12/6.** **MAINS TYPE** Multi Output.—2, 2¼, 2½, 2¾, 3 v. 2 amp., **17/6.** **MAINS TYPE** Multi Output.—2, 4, 6.3 v., 7.3 v., 10 v., 13 v., two taps boost output 25% or 50%, **21/-.**

NEW ELECTROLITICS. FAMOUS MAKES.

TUBULAR		TUBULAR		CAN TYPES	
1/275 v.	2/-	100/25 v.	2/-	8+16/450 v.	5/-
2/450 v.	2/3	8+8/500 v.	4/6	16+16/450 v.	5/6
4/450 v.	2/-	16+16/500 v.	6/-	16+24/350 v.	4/6
8/450 v.	2/3			32+32/350 v.	4/6
8/500 v.	2/9	**CAN TYPES**		32+32/450 v.	6/6
16/450 v.	3/6	Clips	3d.	64+120/275 v.	7/6
16/500 v.	4/-	16/500 v.	4/-	60+100/350 v.	11/6
32/500 v.	5/6	32/350 v.	4/-	100+200/275 v.	10/6
25/25 v.	1/9	60/350 v.	5/6		
50/25 v.	1/9	250 350 v.	5/6	1,000+1,000/6 v.	6/6
50/50 v.	2/-	50/12 v.	3/-		

Screw Base Type 512. 8/500 v. **3/-**; 16/500 v. **4/-.**

VALVES

All Boxed — New & Guaranteed

- **6/6**: 6AL5, 6J5, 6K7G, EB91
- **8/6**: 6AC7, 6AT6, 6C9, 6SN7, 7S7, ECH42
- **12/6**: EY51
- **1/6**: EA50
- **7/6**: OZ4, 1R5, 1S5, 1T4, 1S4, 3S4, 3V4, 6BE6, 6BW6
- **3/6**: 3D6, 6H6M
- **7/6**: 6F6, 6K6, 6K8, 6SA7, 6SL7, 6V6G, 6X4, 6X5, 12AX7
- **2/6**: 2X2
- **7/6**: 12BE6, EC91, EF39, EF92, EL32, HVR2A, U22, UF41, VP23
- **15/- EACH**: 6P25, ECC84, ECF82.
- **5/6**: 6AG5, 6B8, EF50
- **10/6**: 6AM6, 6J6, ECL80, EF55, EF80, EL41, PY82, 12K8, 25Z4, 35L6

Volume Controls

Long spindles. Guaranteed 1 year. All values 10,000 ohms to 2 Meg.

No Sw.	S.P.Sw.	D.P.Sw.
3/-	4/-	4/9

EXT. SPKR. TYPE, 3/-.

80 ohm CABLE COAX

Semi-air spaced Polythene insulated. ¼in. dia. Stranded core. Losses cut 50% **9d.** yd.

STANDARD ¼in. **Coax 7d.** yd.

SIMPLEX TV. 12 gns. COMPLETE KIT of parts with punched and drilled chassis screens and tube supports to build, 6in. **ELECTROSTATIC MODEL** detailed list S.A.E. **6in. VCR97 Tested full picture, £2.**

WIRE-WOUND POTS, 3 WATT. FAMOUS MAKES

Pre-Set Min. T.V. Type All values 25 ohms to 30 K., **3/-**, 50 K., **4/-.**

Standard Size Pots, 2¼in. Spindle. 100 ohms to 50 K., **5/6**; 100 K., **6/6.**

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CORRESPONDENCE

The Editor does not necessarily agree with the opinions expressed by his correspondents. All letters must be accompanied by the name and address of the sender (not necessarily for publication).

THE 1124 RECEIVER FOR TV SOUND

SIR,—With reference to the article in the October issue, I should like to point out that the metal rectifiers are referenced reading from top of diagram to bottom—W1, W3 and the lower one (between C20 and C19) W2. The 10 k. resistor joined to R3 is R34, and the 1 k. resistor in the anode circuit of V4 is R14. In the diagram Fig. 1 the 200-ohm resistor in the cathode circuit of V3 should have been shown by broken lines.—J. STEBBINGS (Altrincham).

LOW CURRENT E.H.T. TUBULAR RECTIFIERS

SIR,—There appears to be some confusion existing among amateurs concerning the ratings of our low current tubular rectifiers, which have apparently been specified in circuits in PRACTICAL TELEVISION. The position has been aggravated by advertisements by dealers quoting two voltage ratings for the same rectifier—both of which are correct, depending on the application.

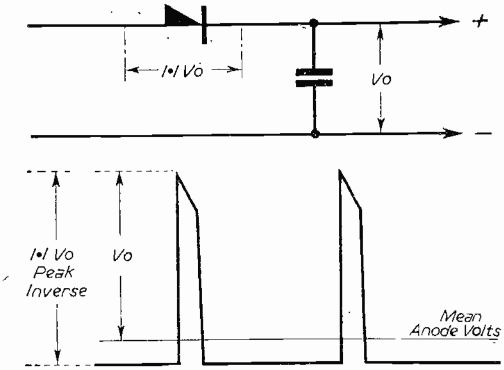
Extracts from a letter we have recently received from a private individual will serve as an example :

" A few days ago I purchased from my dealer a SenTerCel rectifier type K3/40 . . . the rectifier lasted for about three hours . . . and has become disconnected internally." (No doubt a voltage breakdown.)

" . . . on page 402 of the February, 1955, issue of PRACTICAL TELEVISION, Fig. 6 shows the K3/40 in use on a 50-cycle input of 2.5 Kv. and supplying an estimated current of about 600 μA."

Reference is also made to an article in PRACTICAL TELEVISION, page 440, March, 1955. The writer goes on to say :

" . . . the decision by my dealer to replace the K3/40 or not rests upon any reply which you may be kind enough to send me."



Pulse Input Circuit.

From the details we have been given, it would appear that the rectifier was not faulty, but used incorrectly and consequently not the dealer's liability which is unfortunate for the customer.

The object of writing this letter is that if the information we have been given is correct, you may wish to publish a note on the application of this type of rectifier, to try and clear up the general misunderstanding that appears to be existing among amateurs.

We give below a short note on the voltage rating of these rectifiers which may be of interest.

Referring to the diagrams it will be seen that one half cycle lies just below the mean, whilst the following half cycle lies well above the mean. Rectifying such a wave form gives a peak inverse voltage across the rectifier of 1.1 x Vo, compared to 2 x Vo for a rectified sine wave. (Vo = D.C. output volts.) As the rectifier and capacitor have to withstand the peak to peak value of the input wave, it is apparent that for a given D.C. output voltage a rectifier having a lower voltage rating may be used in pulsed circuits compared to a sinusoidal input. In a sinusoidal input circuit the output voltage is one half of the peak to peak voltage (ignoring losses) and in a pulsed circuit the output voltage is approximately 0.9 of the peak to peak input.

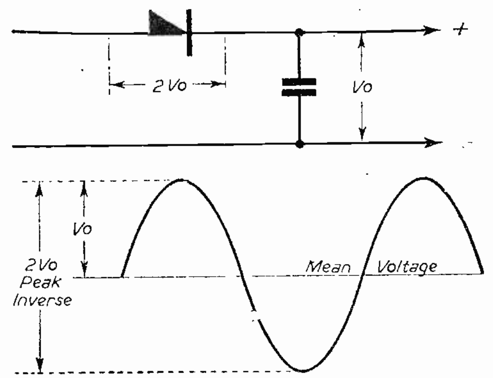
It should be borne in mind, however, that although a lower peak inverse exists in the pulsed input case it occurs for a much longer period, i.e., 84 per cent. of the time and care has to be exercised to ensure that the reverse leakage current is negligible at this voltage.

In view of the foregoing, two voltage ratings exist for pulsed sinusoidal input voltage waves.—D. G. WATSON for E. E. BIVAND (Standard Telephones and Cables, Ltd.).

RECEIVING I.T.A.

SIR,—Last week-end I wrote asking if there was any method of getting rid of the patterning on the screen when receiving I.T.A. programmes.

One matter I would like to mention, as you may have others with the same trouble.



Sinusoidal Input.

I bought a convertor kit with power supply. On assembling I could not get an I.T.A. signal through on the then low power.

I checked the voltage and found it was only 75 volts and passing 10 mA. The mA. consumption rather proved that there was no condenser short.

Returning the transformer, I had another which registered 85 volts.

I changed all condensers as there are so few, but no improvement.

When full power came on the I.T.A. I could then get the test card, but it was cloudy for 1½in. top and bottom.

Disconnecting the transformer H.T. I wired the rectifier directly in the mains with a 1,000 ohm resistance in circuit and the picture except for patterning was perfect, this on 130 volts from rectifier.

I put the transformer back with another rectifier and the original conditions returned.

I have now cut out the H.T. secondary and left the rectifier directly in the mains with a resistance and everything is again O.K.

I have found that a satisfactory picture is resolved with 105 volts H.T.

The trouble appears to be that the majority of small transformers only have 220 to 240 volt tappings, whereas the mains here are 200 volts; the 85 volts from the transformer would be increased by 20 to 25 volts if a lower tap was provided to bring the current up to a working margin.—S. A. TURNER (Welling).

COLOUR TV RESULT ?

SIR,—I have been a regular reader of your PRACTICAL TELEVISION and *Practical Wireless* for a number of years, but have never written to you before, but thought you might be interested in a peculiar thing that happened recently while I was looking at the I.T.A. Peaceful Atom programme on a 6in. VCR97 tube. At times, the revolving planets were picked out in colour, red, yellow, blue, etc., this has puzzled me and I was wondering if any of your readers had the same experience. I cannot think what caused this. Can you explain it?—G. F. REMMETT (Addiscombe).

AQUADAG COATING

SIR,—In your current issue dated November, 1955, you have a section entitled "Your Problems Solved." On page 287, replying to the query regarding Baird P2114, you refer to "Aquadag coating."

Your meaning is perfectly clear, but I would like to draw your attention to the fact that "Aquadag" refers to a product of one particular firm, whereas this company also supply conductive coatings for both the inside and outside of cathode ray tubes, and consequently the coating referred to could possibly be ours.

If I might suggest it, a term which would cover all the possibilities concerning the manufacture of exterior coating would be to refer to "the exterior conductive graphite coating" on the tube.—A. H. COLLISTER (Managing Director, Graphite Products Ltd.).

BAIRD P2114

SIR,—Referring to Cyril Mellie's query in the November issue, I have found this trouble on several of the models mentioned, and the first time it occurred I was stumped. However, I believe the theory following, and the subsequent cure will be helpful.

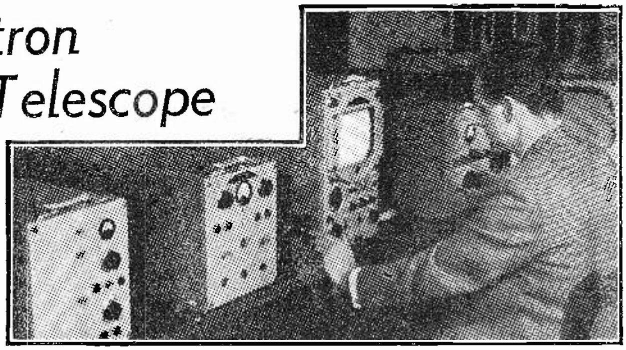
On some of the 2014/2017 series the EY51 heater winding is four turns. The manufacturers later issued a modification to reduce this to three turns, indicating that the heater is overrun. This is the first step to the cure.

The second concerns the earthing contact on the external coating of the tube. It is a single phosphor-bronze strip with a dome-shaped indentation where it touches the tube. This gives one single and minute contact area. This contact area is part of the E.H.T. smoothing circuit and therefore carries a 10,125 c.p.s. ripple current. Also, should this contact go dis, the coating of the tube is no longer earthed and charges up from the internal aquadag forming the anode. Thus the E.H.T. voltage, or near enough, is now present across the dis contact. Of course, the contact breaks down before this happens and sparking takes place. These surges cause unpleasant jumping and flashing on the screen and the coating of the tube is destroyed at the contact point. The cure lies in replacing the contact strip with one of the multi-contact types which touch the coating with each contact over about ½in.

I have also found that it is possible to remove the earth from the coating and allow it to "float." This has no apparent bad effects on the smoothing of the E.H.T. The only disadvantage is that the tube coating must be treated with respect and not have any conductors, insulated or not, nearer than 1in. or so to it; this idea is not recommended for obvious reasons.

The two modifications mentioned have been successful for more than a year on two 2017's and one 2014 following three failures of the EY51 in the 2014 before the cure was found.—S. J. THORN (Tiverton).

An Electron Astronomical Telescope



DETAILS OF THE LATEST APPLICATION OF TV TO ASTRONOMY

WHEN Dr. Peter Fellgett of the Cambridge Observatories read his paper on television astronomy at the Ninth General Assembly of the International Astronomical Union at Dublin recently, he described how the enterprise of the Pye company, together with the astronomers of the Cambridge Observatories, has placed Britain in the lead in exploring this new field of astronomy.

The modern astronomical telescope is fundamentally a light-gathering device, which, in conjunction with photographic methods, has greatly extended the range at which very faint objects, such as the distant galaxies, can be recorded. The giant 200in. reflecting telescope at Mount Palomar has already photographed galaxies at the range of two thousand million light years. To achieve this result an exposure time of one hour was required, using the most suitable photographic plates specially conditioned in order to give optimum results. Owing to the limitations imposed by the background illumination of the sky and the scattering of blue light in the atmosphere, it is unlikely that fainter objects at greater distances can be detected by using an even larger instrument.

The cost of the Mount Palomar telescope was $6,000,000 and it took 20 years to build. The nature of the engineering problems to be overcome in conjunction with the limitations due to the presence of the earth's atmosphere render improbable the construction of a larger telescope using purely photographic recording methods.

The nature of light is such that sensitive receivers like the human eye or the photographic plate are capable of responding to only a fraction of the light "particles" or photons reaching them, the rest being totally ineffective. For instance, the fraction for a photographic emulsion is about 1/100 and may be as low as 1/1,000 for the type of plate used in long astronomical exposures. In the case of the human eye the fraction is of the order of a few hundredths. The rate of progress in the production of special emulsions for astronomical use during the last 50 years has resulted in a gain of approximately half a stellar magnitude. From this fact it would appear that any considerable improvement in photographic emulsions is improbable in the near future, and in consequence the exploration of an alternative method of making more effective use of the light collecting power of existing telescopes is being undertaken at Cambridge.

Picture of the moon taken through the TV equipment during the International Astronomical Congress this year.

Solution Proposed

In 1951 a possible solution to the problem was proposed by Mr. Bruce Somes-Charlton, an amateur astronomer on the staff of Pye, Ltd. The project involves the development of an electron telescope based on the light storage properties associated with certain types of photoelectric television camera tubes.

With the approval of the technical director of Pye, Ltd., Mr. B. J. Edwards, an approach was made to the Cambridge University Observatories with a view to securing advice and co-operation in conducting initial experiments. With the enthusiastic support of Dr. Fellgett, tests were carried out using a new 12in. horizontal solar tunnel instrument and the 25in. Newall refractor. The results achieved using substantially normal television equipment were so encouraging that it was decided to proceed at once with the design of more specialised equipment to exploit the possibilities of special tubes produced by Cathodeon, Ltd., Vacuum Physics Division of the Pye organisation. Photographic images were obtained showing details of the sun's disc in ultra-violet and infra-red light. The solar telescope and spectrograph developed by Dr. von Klüber was used, and spectrum phenomena which had never before been viewed directly were observed and recorded; previously, many of the sun's phenomena obtained spectrographically were extremely difficult to photograph without being able to view directly beforehand.

Successful results were also obtained using the Newall refractor for observations on the moon, Jupiter and Saturn. The focal images produced by the 25in. objective were sufficiently large and bright to reveal detail such as the cloud belts on Jupiter and small lunar craters. Comparisons were made with photographs obtained under the same conditions which revealed the advantages of the electronic technique over photography in overcoming the effects of atmospheric tremor.

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

MARCONI VT73DA

The raster collapses to a thin vertical line unless the height control rheostat is fully to the left when viewed from the rear, The picture is rather cramped on the right and wide-spaced on the left and the controls on the focus magnet assembly will not centre the picture. The vertical hold control is extremely critical as slight movement either way gives a blurred picture or frame slipping. This means constant adjustment of the vertical hold while the set is warming up to operating temperature. The screen appears to be slightly lighter on the right-hand side.

On switching off, the picture collapses to a blur which moves to the top left-hand corner of the screen and disappears. I have changed the B36 valve. The associated resistors and the four sliders, height, width, vertical and horizontal hold, are all serviceable.—J. A. Bell (Sutton Coldfield).

Your remarks definitely indicate that the height control is open-circuited (or short-circuited) at one end of its track. You should check this and replace the control.

Horizontal cramping may be caused by a worn KT36 valve and/or an alteration in the value of some of the smaller components associated with the line timebase. Faults in this section may also be responsible for the uneven illumination on the screen.

A worn or dirty slider or resistance related to the vertical hold control often causes erratic operation of this control.

FERRANTI T.1125

My trouble is sound on vision, and slight vision on sound. The tuning on the back of the set does not remove the trouble.

Are the two trimmers inside the set anything to do with the rejector circuits ?

I would add that the set has always had this trouble though not serious enough to really worry about (it is no worse at present). A ticket on the back of the set states that it is tuned to Holme Moss, and as I am on the Birmingham station would the fact that it must have been retuned to Birmingham have anything to do with the trouble ?— Raymond Moseley (Northampton).

There are many more than two trimmers inside your Ferranti. If the two you mention are those situated beside the oscillator tuning control then they may have an effect on the symptoms you describe. First you should adjust the oscillator tuning for maximum sound, consistent with minimum sound and vision, and then adjust the two trimmers (R.F. and aerial) for correct balance between sound and vision. If this does not clear the effects the I.F. stages may require re-aligning or the aerial signal may need attenuating. This would probably be the case if a reasonable picture can be obtained even with the contrast control at minimum.

PYE VT4

The essential details are as follows :

1. Sound is O.K.

2. Picture disappeared (screen blank, no raster, no illumination even with advanced brilliance).

3. Heaters of all valves intact.

4. Voltages on all electrodes of C.R.T. appear normal. E.H.T. not measured but "plenty" available.

5. Voltages on timebase valves and sync valves appear normal.

6. Using an Avo minor (500 v. range) on A1 of C.R.T. gave very low reading (as would be expected) but on removing meter lead a flash of picture was observed on the screen.

7. The 10 megohm resistor and 0.1 μF decoupling condenser on A1 were replaced by new ones without altering the situation.

8. The connection of a 1.5 meg. or 2 meg. resistor from A1 on C.R.T. to earth restored the picture. The picture thus obtained has lasted two weeks.—P. H. Lomax (Berkhamsted).

We can only assume that a defect is present in the C.R.T. which is minimised by the presence of the additional resistor. We have not met this fault before, so we are unable to offer a better explanation.

In any event, if the picture is satisfactory with the resistor fitted it can do no harm to operate indefinitely in this way.

MAINS VOLTAGE

My fault appears to be in synchronising or generator circuits. I have no service sheet. On switching on, line lock is O.K., but after about four minutes it starts to waver at the top of picture. This spreads until the whole of the picture is out of synchronism. Line hold is at end of its travel. Valves have been tested and found O.K. Picture will hold if filament voltage is lowered by means of tag at back, but is then too dull for viewing. I am working on 220 tapping with a 230 v. supply, adjusted so by a dealer, which has given satisfactory results for some months.—W. Neale (Acocks Green).

(*Continued on page 335*)

BRAND NEW. R.F. 26 or 27, **27/6;** 24, **10/6** (postage 2/6); R.F.25, soiled, **10/6;** I.F. Amplifier 178, 16.5 mc/s, with valves, **22/6** (post 2/-); R1355, new improved type, **37/6** (carr. 7/6); R1392A, 100/150 mc/s, 13 valves, used, good cond., **£5/10/-** (carr. 10/-); RxP101, 45 mc/s, with 10/VR91, 3/VR92, new, **45/-** (carr. paid). Condensers, electrolytic, 13 samples, range 4 mfd to 1,000 mfd. **7/6** (post free); Bak. tubular. 0.1/1.2 kV, .5/800v, .25/800v, **9d.** each; .03/2.5 kV, .05/3.5 kVw, .25/1.5 kVw, **1/-** each; USA Bathtubs, 600 vw. 2 mfd, **1/6;** single, .1 or .25, **9d.;** double, .1 or .25, **1/-;** 1 mfd, **1/3;** treble, .1, **1/6;** .1/2, .5 kV, **3/6.** Responser RDF1, 160/220 mcs, new, 11 valves (less 5Z4), **25/-** (carr. 7/6); VCR138, CRT, new, **25/-.** List and enquiries, s.a.e. please! Terms: Cash with order. Postage extra. Immediate despatch. Callers and Post. W. A. BENSON, 308, Rathbone Rd., Liverpool, 13.

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METER. Taylor 170A Electronic; new; **£17.** 183, Petre St., Sheffield (4).

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It is important to adjust the mains voltage tapping to correspond as closely as possible to the voltage of the mains supply in your district. As adjusted at present, you are over-running the receiver by 10 volts. If you are sure as to the condition of the line timebase valves the trouble most likely lies in the line blocking oscillator transformer. This component can only be conclusively tested by substitution.

PHILIPS 1100D

My set has developed vertical white bands (faint) on the picture from the left-hand side extending to a third of the way across the picture.

Can you suggest a cure please ?—R. J. Elsten (Brighton).

There is no balancing capacitor fitted on the scan coils of this model to reduce the striations. However, a slight adjustment to the width coil core may minimise the effect.

TV SOUND ON BROADCAST SET

When I tune my receiver to 24 Mc/s or 23.5 Mc/s approximately, I can hear the BBC TV Sound transmissions, though faint.

I would be glad if you could tell me the reason for this.

I also hear Police and Fire, etc. Is this normal for this wavelength ?—W. R. Moodie (Halifax).

Reception of sound is due to the Holme Moss 48.25 Mc/s sound transmission being exactly double that of the receiver tuning (image). This is quite common and there is always at least one part of the dial where this type of harmonic interference will be experienced.

PYE V4

I have a Pye V4 table model with which I am having trouble. At first the line hold-control would lock the picture only at the extreme end of its travel. On changing the line oscillator valve, ECL80, and adjusting the line pre-set condenser, I got a picture lock in the middle of the line-hold travel. After a few days, however, the picture slipped again, and although it can be locked by readjusting the line-hold control, the set only runs for a few hours, when the picture breaks up again making further adjustment of the line-hold control necessary. I have changed all the valves in the line circuit, PL and PY81s and the sync-separator EF80.—D. Drake (Halifax).

Try changing the 1 MΩ resistor which is mounted beside the pre-set line drive condenser. This is actually in series with the line-hold control, and may be varying in value. The line drive is that pre-set which is just above the pre-set line hold. The .1 μF condenser across line stabilising coil (L21) may be at fault, but its replacement will necessitate retuning L21. This can only *accurately* be done by employing an audio oscillator, this being tuned to 8,500 c/s.

PHILCO BT1410

My Philco 9in. model has given good results for quite a long time, but now the picture has gone, and only a horizontal line appears across the centre of the screen. I should be glad if you could inform me the reason and what can be done to put it right.—C. Bradbury (Walsall).

Check *both* heaters of 6SN7 valve. Both heaters should be visible when the set is on. If the valve is tested and is in order, check the 1.5 MΩ resistor in the anode section of the first half of the 6SN7. A less common cause is the failure of the 6L18 frame output triode.

PYE FV1

I would appreciate your help with a few snags that have arisen. I am unable to remove broken flyback lines from the picture. There is a narrow vertical band of light running down the screen. Also, I do not seem able to get sufficient black or contrast into the picture. I am running the set with brilliance right down, vision sensitivity and contrast controls at average settings. Increasing the contrast control distorts the picture, advancing the brilliance swamps the picture with light and gives continuous flyback lines. Regarding the vertical band of light—when the line-hold control is operated this band moves in the opposite direction from the picture. The set is being operated from an indoor " X " aerial.—Walter F. Craine (Liverpool, 8).

A worn picture-tube frequently causes this symptom ; if, by reducing the setting of the brightness control and adjusting the contrast to suit, a picture of reasonable *contrast ratio* can be obtained in a darkened room, you should suspect the tube.

Regarding the vertical band of light : this is generally the result of a flashover in the lines can transformer during the line flyback and is caused by impaired insulation between the windings. A mismatch in the aerial, or a poor aerial signal, tends to aggravate the disturbance. You should also check the condition of the PY80 valve.

VALVES FAILING

I have a Marconi television set : Console VC53DA, A.C./D.C. mains, running on D.C. Over the last few months when switching on the picture is all right for a short time ; then it starts to fade out and break up. After half an hour the picture remains quite good for the rest of the evening. There is also a fault in the sound. After moving the set so that my wife could clean the floor, the sound has been blurred ever since. —G. Duggan (Deptford).

Gradual fading of the picture as the receiver warms up is almost certainly caused by worn valves, or even a worn-out tube ; you should check these possibilities by having the valves time tested for emission ; replace where necessary.

Poor and intermittent sound may be caused by inefficient connections between the valve pins and valve holder sockets. This possibility can generally be proved by rocking the valves in their holders while the set is operating. If this action provokes or cures the effect, the pins on the valve responsible should be carefully cleaned with fine emery cloth.

QUERIES COUPON

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PRACTICAL TELEVISION, DECEMBER, 1955.

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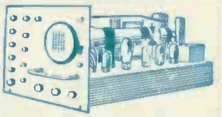
5Z3	8/6	6G6G	6/-			10P13	11/6			EY51	13/6					150A(B)	4/6



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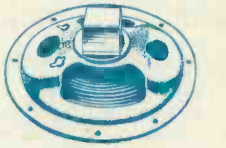

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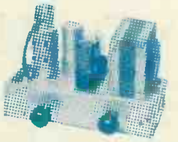

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