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PRACTICAL TELEVISION

AND TELEVISION TIMES

EDITOR
F. J. CAMM

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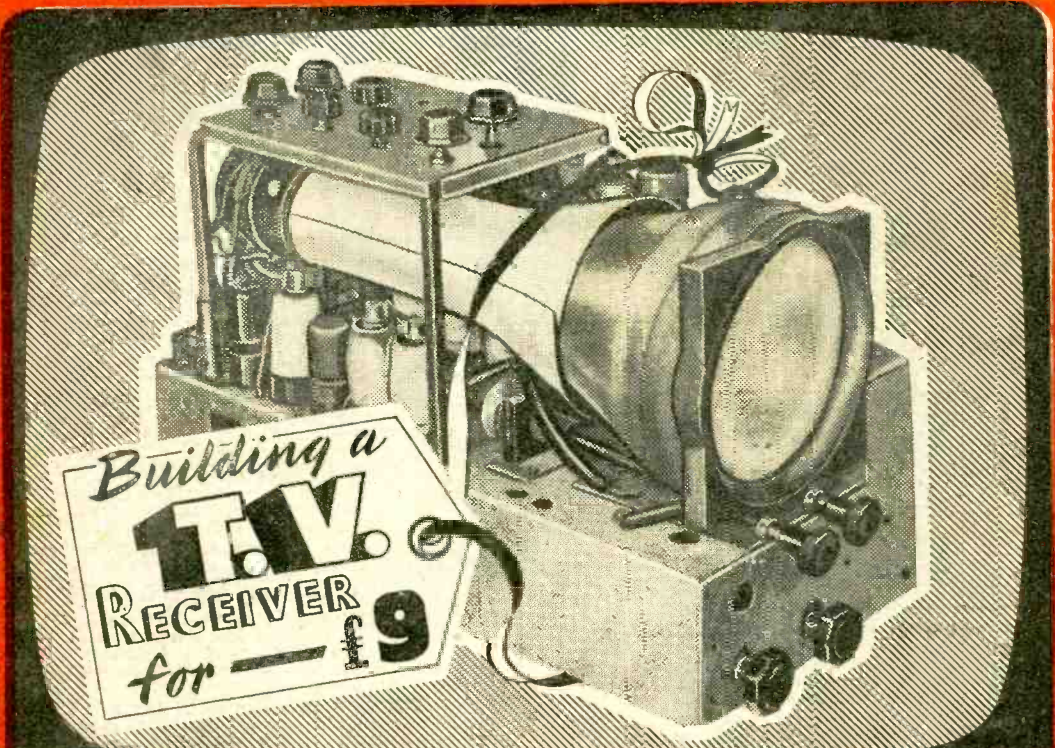

FEATURED IN THIS ISSUE

PRACTICAL TELEVISION

& "TELEVISION TIMES"

Editor : F. J. CAMM

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Televiews

That £1,700,000!

THE previous Government, it will be remembered, proposed to take £1,700,000 from the licence fees for general revenue. Now that they have been defeated at the poll there is speculation as to whether the new Government will drop this proposal. When the matter was originally debated in Parliament Opposition members raised fierce objection to it. Now that they are in power it is reasonable to assume that the proposal will be dropped.

The Television Development Programme has had to be severely cut as a result of rearmament and of this announcement. We learn that there is hope among the staff of the BBC that the Government will allow the Corporation to retain all of the fees received from licences so that the Development Plan as originally formulated can be reinstated.

The sum of £1,700,000 represents a grab of 15 per cent. If it is proposed after all to take this amount it seems inevitable that there must be a single service system for the greater part of each day's programme. In other words, a National Programme.

JOHN LOGIE BAIRD PLAQUE

ON October 22nd Sir Robert Renwick, K.B.E., unveiled a commemorative plaque to John Logie Baird on the front of 22, Frith Street, Soho. This plaque is the 200th to be erected or re-erected by the L.C.C. since 1903. Sir Robert Renwick is, of course, the President of the Television Society, of which Baird was an Honorary Fellow, and it was founded in 1927 as a direct outcome of his experiments. (See page 324.)

Baird, who did so much to draw attention to the possibilities of television, was born in Scotland and educated at the Royal Technical College, Glasgow. He later came south to Hastings, and the house in Queen's Avenue bears a plaque recording his experiments in television which he conducted there in 1924.

At the beginning of 1926 he moved into his attic laboratory in Frith Street, and on January 26th of that year carried out the world's first demonstration of television before an audience of 40 members of the Royal Institution. This experimental transmission was from one room to another.

It is right that the work of this famous pioneer should be commemorated in this way.

EUROPE AND BRITISH TV

GREAT BRITAIN, as a result of Baird's work, has led the world in this new science, and it was 10 years before America started to develop it. They were even slower off the mark in Europe, where 15 years elapsed before experiments were commenced. The Hamburg and Copenhagen television stations are now in operation. Unfortunately, Great Britain will not profit by this, however, because countries whom we expected to purchase British apparatus have rejected it in favour of that produced by a Dutch firm.

The Radio Industry Council three years ago made great efforts to demonstrate our receivers in Copenhagen, but their efforts have proved unavailing. The Continental system makes use of 625 lines as compared with our own 405, to which we are tied for a number of years. There is no special virtue in the higher line transmission. It does not follow that there will be a better-defined picture. The European system is thus following the American.—F.J.C.

The Design of Video Frequency Output Stages—3

THE D.C. RESTORER IS DEALT WITH IN THIS ARTICLE

By K. D. J. Grosvenor.

(Continued from page 255 November issue)

THE action of the D.C. restorer is well known, namely that it maintains the "black level" constant by ensuring that the tips of the sync. pulses are always at earth potential. (Fig. 16.)

In addition to this well-known action, the restorer is also capable of reinserting the low video frequencies that are lost in the R.C. coupling. If the original signal was a low video frequency square wave as shown in Fig. 17a, the resultant signal due to loss and phase shift of the low V.F.'s would be as shown in Fig. 17b. The action of the D.C. restorer will be to make all the tips of the sync. pulses "sit" at earth potential which can be seen to give the original wave-form again.

Thus, when a D.C. restorer is used, it is only necessary that there should be no appreciable distortion between sync. pulses. It is probably due to this fact that some people make the mistake of assuming that (as the lowest component frequency in each line scan is 10,125 c/s.) the normal value of coupling condenser and resistor is 1,000 times better than it need be. As this is a common fallacy the author feels it will be worth while spending a little time exploding it. The fact is that the exponents of this theory have apparently never got past the stage of audio-frequency circuits and consequently ignore the effect of phase distortion.

As has been previously stated, phase distortion is zero when the time delay is constant for all frequencies. It can be shown that the time delay is constant when the phase shift in degrees is directly proportional to frequency.

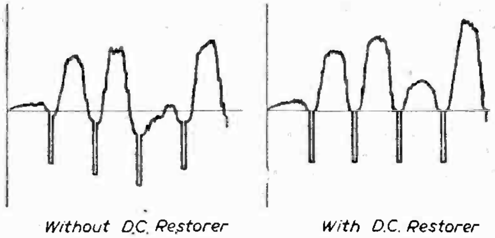


Fig. 16.—Signal after passing through coupling condenser.

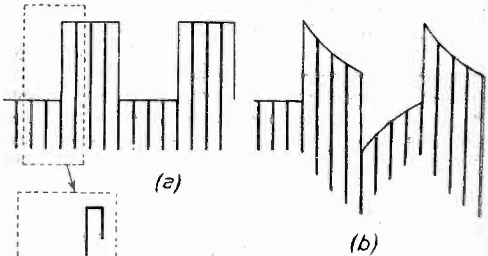
High V.F. Response

In the case of high V.F. response, the phase shift caused by the effect of stray capacitance shunting the anode load, obviously is zero at zero frequency, and increases as the frequency increases. It is found that up to the frequency at which the amplitude response has fallen to 90 per cent. the phase shift is very nearly directly proportional to the frequency, and hence there is no serious time delay distortion up to this frequency due to the effect of C_s.

However, the R.C. coupling circuit (Fig. 18), has a completely wrong phase response, the phase shift increasing as the frequency decreases; thus it is liable to introduce serious time delay distortion. This is the reason why the use of values of R. and C. calculated only on the basis of amplitude response are not sufficient.

Briefly, the argument used is that if one uses a 100 pF condenser and a 1 MΩ resistor the amplitude response at the lowest frequency of importance (10,125 c/s.) is 98.7 per cent., and consequently as the eye cannot readily notice such a small change there is no need to use a larger condenser. However, if one analyses the response of such a combination to a signal such as Fig. 19a, representing a constant white line, it will be found that the resultant waveform will be as shown in Fig. 19b. This is due to the fact that the coupling condenser will have charged up to a value of $100\,(1-\varepsilon^{-t/cR})$ per cent., which for the above values of R. and C. equals 63.2 per cent. after time t. (t being the time taken for one line scan.) The D.C. restorer can do nothing to improve matters as it can operate only at every sync. pulse.

In order that the drop shall not be greater than one per cent. it is found necessary to use a value of C.R. of at least 0.01 mΩ. μF. In practice a value of 0.05 to 0.1 MΩ. μF is used because there is almost certainly a small amount of lower V.F. time delay distortion introduced elsewhere in the circuit.



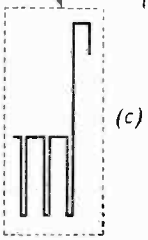


Fig. 17.—V.F. Signal consisting of black and white horizontal bars. (a) This is distorted by Fig. 18 to waveform (b). (c) Enlarged drawing of section of (a) to show sync pulses more clearly.

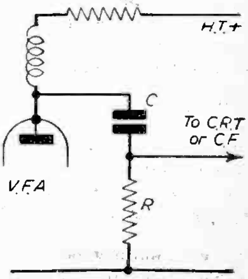


Fig. 18.—Standard C.R. coupling circuit.

When No D.C. Restorer is Used

In this case the response must be flat right down to zero frequency. This makes it essential to use D.C. coupling and to use compensating circuits to keep the response flat and phase distortion negligible. If a large

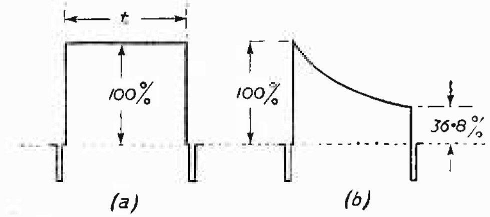


Fig. 19.—(a) Video signal, constant white line ; (b) Video signal after C.R. circuit (Fig. 18), when C.R. is too small (0.0001 secs.).

cathode bias bypass condenser is used (Fig. 20), it will result in the gain decreasing at very low V.F.'s, this is compensated for by the resistance R and condenser C in the anode circuit. The earthy end " X " of C is often returned to the chassis instead of to the H.T. line. Note that a small condenser is always put in parallel with the electrolytic in the cathode as an electrolytic condenser is not effective at high video frequency.

When the cathode bias resistor is not by-passed by a large condenser this compensation circuit is, of course, not required.

When decoupling is used in the anode circuit of the V.F. Output value (Fig. 21), the gain will increase at very low frequencies due to the condenser C_D having a relatively high reactance and the effective anode load consequently increasing to a value of (R_1+R_D). This is compensated for by the network R_A, R_B and C_X ; the action is that, although at zero frequency the gain is $(R_1+R_D)\div R_1$ times the normal gain (due to C_D being non effective), the value of the output fed to the C.R.T. is only $R_B\div(R_A+R_B)$ of what it is at a much higher frequency when C_X effectively shorts out R_A.

Thus, by choosing suitable values of resistors it is possible to arrange that the overall gain at very low frequencies is the same as the overall gain at mid-video frequencies. The value of C_X is chosen so as to ensure that the response is also flat over the frequency range between the very low and the mid-video frequencies.

Another possible cause of poor low-video frequency response is when the screen of the V.F.A. is fed via a dropping resistor.

When the output of the V.F.A. is D.C. coupled to the C.R.T., no decoupling condenser may be used ; this is because there is no simple method of correcting the phase and amplitude distortion introduced by it at low V.F.

When the output is fed via a coupling condenser with appropriate D.C restoration a screen decoupling condenser can be used and a larger gain obtained. (Note, however, that this higher gain does not make the actual maximum output of the V.F.A. any greater, the effect is merely to enable one to get the same maximum output from a smaller input signal.) The decoupling condenser will, however, introduce attenuation and

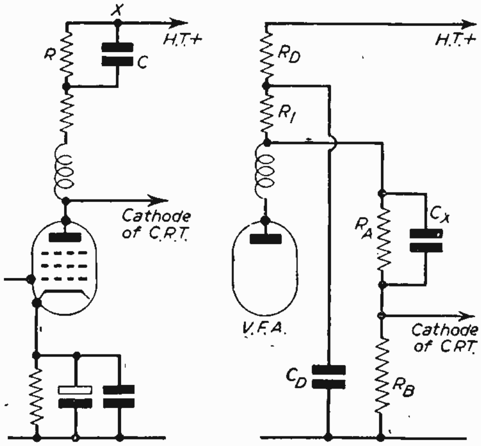


Fig. 20 (left).—L.V.F. Compensation for cathode bias circuit. Fig. 21 (right).—L.V.F. Compensation for decoupling, etc.

phase distortion at the low frequencies unless the condenser is made sufficiently large that the distortion over one line scan (i.e., the distortion the D.C. restorer cannot correct) is very small. A suitable value is obtained by making :

$$R_D \times C_D \simeq 50$$

(R_D in k-ohms. C_D in μF.)

It is permissible to make this value of $R_D \times C_D$ as low as 10 if economy is essential.

(To be Continued)

Television Training for Dealers in Kirk O'Shotts Area

THE new BBC Television Station at Kirk O'Shotts, which is scheduled to open next year will create an urgent need for many expertly trained television service engineers to deal with the installation and service problems which will arise.

To ensure that owners of " His Master's Voice " and Marconiphone television receivers in this new area will enjoy the same unequalled service facilities as are available in the London, Midlands and northern areas, E.M.I. Sales and Service Ltd.—the distributing and servicing organisation for these companies—are beginning a series of " on-the-spot " training courses for dealers and members of their service staffs. Suitably equipped premises at our Scottish depot, 131/135, Renfield Street, Glasgow, are being used for this purpose.

E.M.I. Institutes Ltd.—E.M.I.'s own Electronics College—will be co-operating with E.M.I. Sales and Service Ltd., in the running of the courses and will be providing experienced tutors and instructors.

No Charge

These courses will be free of charge, and in addition to giving a general theoretical background of television, will familiarise dealers with the circuits, features and operation of all current " His Master's Voice " and Marconiphone models. Courses of 10 days' duration will be arranged initially, the first of which was scheduled to commence on November 12th, 1951.

Local accommodation will be found for those attending the courses who may have some distance to travel into Glasgow.

The HOLME MOSS TRANSMITTER

TECHNICAL DETAILS OF THE EQUIPMENT WHICH IS BEING USED FOR THE NORTHERN TRANSMITTER

HOLME MOSS is the second high-power transmitting station to be completed under the BBC's post-war plan for extending the television service. It will bring television within reach of 11 million people, over and above the 18 million already served by the existing stations at Alexandra Palace and Sutton Coldfield.

The station comprises a building housing the two main transmitters, a smaller building for two standby transmitters, a 750ft. mast supporting the main transmitting aerial, and a 150ft. mast for a standby aerial. The main vision transmitter, operating on a carrier frequency of 51.75 Mc/s (5.8 metres) has a peak-white output power of 45 kilowatts, and is the most powerful television transmitter in the world. The main sound transmitter, which operates on a frequency of 48.25 Mc/s, has a carrier power output of 12 kilowatts. In addition, there are standby vision and sound transmitters of 5 kilowatt and 2 kilowatt power respectively.

Holme Moss will transmit the same programmes as the Alexandra Palace and Sutton Coldfield stations. The vision programme signals are sent from London via Birmingham and Manchester over coaxial cables provided and operated by the G.P.O. The signals can be sent in both directions simultaneously.

Estimated field-strength contours for the vision transmission,

calculated from the results of site tests, are shown on the map on p. 298.

The general layout and planning of the buildings have been the work of the specialist departments of the engineering division of the BBC, and the station has been constructed under their direction and supervision. The equipment, supplied by British manufacturers to BBC specifications, has been the particular responsibility of the corporation's planning and installation department. The mast has been designed to conform with a BBC detailed specification of requirements in the matter of wind-load, materials, workmanship and erection.

Site

The station is on a 150-acre site adjoining the Holmfirth—Woodhead road (B. 6024), some 8 miles south of Huddersfield, 17 miles east of Manchester, 22 miles south-west of Leeds and 19 miles north-west of Sheffield. The altitude of the station is 1,750ft., which with the 750ft. mast brings the transmitting aerial to a height of 2,500ft. above sea level. Holme Moss is far and away the highest of any of the BBC television stations, either existing or projected.

The Mast

The mast is 750ft. high and has an all-up weight of 140 tons. The maximum downward thrust on the mast base under the most severe conditions is 350 tons.

The base is located by a 2in. diameter steel ball in a socket, which forms a pivot to allow angular movement of the mast in high winds. Up to the 610ft. level the cross-section is triangular, each face being 9ft. across. Between 610ft. and 710ft. the cross-section is circular. The eight tiers of four slots in the surface of this part will form an aerial for V.H.F. sound broadcasting, should this system be adopted at Holme Moss in the future. Above the circular section is a short square-section topmast which supports the television aerial.

The steelwork was galvanised by the hot dip process after fabrication, the zinc coating amounting to about 2oz. per sq. ft. of surface.

The mast is supported by four sets of stays. The stay ropes are of fully locked coil construction in steel with a breaking stress of 120 tons per sq. in. The chief merits of this type of rope, which consists of concentric layers of circular wires surrounded by an outer layer of shaped interlocking wires, are the comparatively high modulus and the relative absence of inelastic stretching that can be obtained. The factor of safety is four under the most severe conditions, which include a coating of ice ½in. thick throughout, simultaneously with a wind pressure of 65lb. per sq. ft. at the mast head. This corresponds to a wind velocity of 125 m.p.h. at the masthead.

Vision Transmitter

The vision transmitter is the most powerful in service anywhere in the world, having a peak white power of 45 kilowatts. It is grid-modulated in the final R.F. stage.

The transmitter has an overall length of 31ft., which includes a power distribution cubicle 10ft. long. The transmitter is built in 8 cubicles placed side by side. Viewed from the front, the radio-frequency stages are arranged in order of increasing power from left to right and the modulator stages from right to left. Thus, the radio-frequency output stage is next to the final modulator stage.

The radio-frequency section of the transmitter comprises the following :

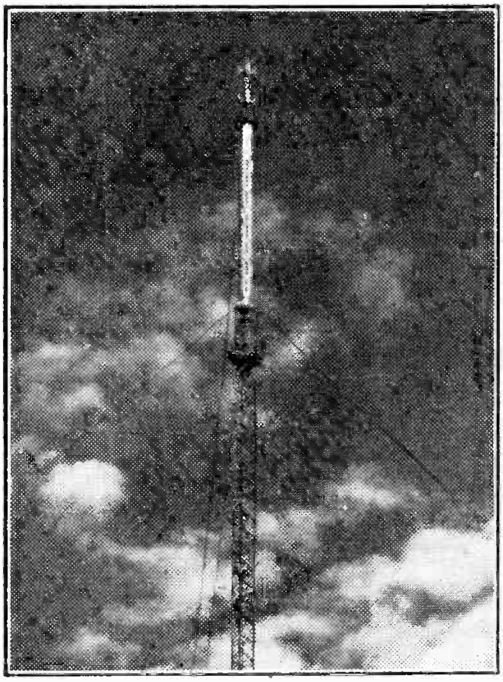
1.—*Drive unit*, consisting of a quartz-crystal oscillator working at one-sixth of the carrier frequency, followed by two stages of multiplication and an amplifier.

2.—*Low-power stages*, consisting of a push-pull amplifier using two TT12 beam tetrode valves followed by a push-pull amplifier using four TT 16 tetrode valves.

3.—*Third radio-frequency amplifier*, consisting of two BR.125 air blast-cooled triodes in a balanced push-pull circuit, hard driven in Class C so as to stabilise the output voltage.

4.—*Cathode follower stage*, consisting of two BR.125 triodes in push-pull, operating in Class B in a balanced bridge circuit. In this circuit arrangement the output is taken from across an impedance between the cathodes and earth. The use of a cathode follower gives a low output impedance, so that the R.F. drive voltage to the final stage is largely independent of the varying input impedance of the circuit.

5.—*Final modulated output stage*, consisting of two BW.165 water cooled thoriated-filament triodes in push-pull in a balanced bridge, linear, wide-band amplifier. This stage is grid modulated and is tuned by varying the characteristic impedance of the parallel line element forming the anode circuit inductance. The impedance of this element is varied by altering the spacing between the two legs of the line. The output from this stage is coupled to the feeder through a wide-band coupling circuit and balance-to-unbalance R.F. transformer.



The slotted aerial at the top of the mast which is designed for use on V.H.F. sound broadcasting, should the BBC decide to adopt this system in the future.

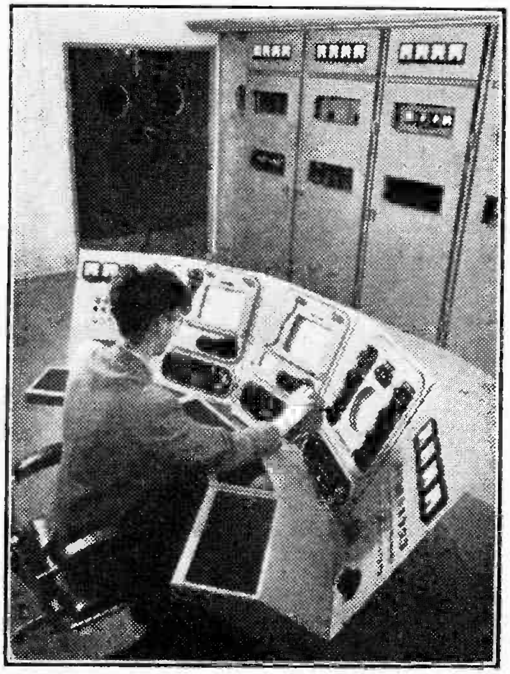
The modulator may be divided into sections as follows :

1.—*Pre-amplifier*. This accepts a vision signal having an overall amplitude of 0.7 volt and a picture : synchronising-signal ratio of 70 : 30 in terms of amplitude. The signal is amplified to 20 volts and the picture :

synchronising-signal ratio is adjusted so that a radiated ratio of 70 : 30 is obtained The curvature of the input/output characteristic of the pre-amplifier is also adjusted to compensate for unavoidable curvature in that of the modulated R.F. amplifier stage. The synchronising signal amplitude leaving the pre-amplifier is also rendered independent of variations in the amplitude of the incoming signal. Duplicate pre-amplifiers have been provided so that a minimum of programme time will be lost in the event of a fault developing in this relatively complicated unit.

2.—*Sub-modulator*. This consists of an amplifier followed by a cathode follower, both of which are of the shunt regulated type. The input level of 20 volts is raised to 150 volts at the output, and the output impedance is approximately 30 ohms.

In the shunt regulated amplifier, the anode load of the amplifier valve is formed by a second valve which is excited by the voltage across a resistance connected between the cathode of the second valve and the anode of the first. The output voltage is taken from the cathode of the second valve. The output impedance of such an amplifier is much lower than that of a conventional amplifier, and consequently its bandwidth is greater. The shunt regulated cathode follower, similarly, uses a second valve as the cathode load of the cathode follower valve, the grid excitation for the second valve being obtained from a small resistance in the anode circuit of the cathode follower valve. The output is taken from the anode/cathode junction of the two valves. The output impedance of a shunt boost cathode follower such as this is much lower than that of a conventional cathode follower. The D.C. potentials of the grids of the regulator valves are adjusted by chains of series-connected neon stabiliser tubes, which offer practically zero impedance to A.C., but have a constant D.C. potential drop across them. Many of these neon chains are used throughout the modulator, and they are mounted in interchangeable units which can be plugged in. The plugs in individual amplifiers or cathode followers are arranged to select the correct number of neons when a neon unit is inserted.



The control desk for the medium-power stand-by transmitters, parts of which may be seen in the background. These have a power of 5 kW. (vision) and 2 kW. (sound).

3.—*Black level clamp unit*. This consists of a shunt regulated cathode follower, the grid of which is A.C. coupled to the sub-modulator and the output D.C. coupled to the modulator unit. This cathode follower grid is clamped to the correct D.C. level during the black level period after the synchronising pulse. This D.C. level controls the black level radiated by the transmitter and three methods of control are available for selection by means of a switch, namely :

(*a*) Normal black level clamp. This is controlled by a clamping pulse of 2 micro-seconds duration, applied during the 5 micro-seconds of black level which occur after the line-synchronising pulse.

(*b*) Controlled clamp. This is basically a negative feedback system which monitors the radiated black level line by line and applies any correction required to the clamp unit at line speed. This is followed up by a slow-acting correcting voltage covering a wider range than the fast-acting correcting voltage, the purpose of which is to compensate for mains voltage variations that would alter the radiated black level. The line-speed control voltage is able to correct for hum in the transmitter output and permits of considerable economics in the smoothing circuits of the power supplies to the R.F. stages.

(*c*) Sync. bottom restorer. This is a simple arrangement of diodes which can be switched into use in the event of failure in the more complicated clamping circuits. The circuit is more efficient than the usual D.C restorer, but still permits black level variations with picture content which, although small, are noticeable to the critical observer.

On switch positions (*a*) and (*b*) the variations in black evel with picture content are less than 1 per cent.

4.—*Modulator unit*. This is fed with an overall signal amplitude of 140 volts from the clamp unit and delivers a 1,200-volt modulating signal to the grids of the modulated R.F. amplifier. It comprises a shunt-regulated amplifier using two ACM3 valves followed by a shunt-regulated cathode follower using a total of six ACM3 valves. The ACM3 valve is a forced air-cooled triode with an indirectly heated oxide-coated cathode. It has a mutual conductance of about 20 and a maximum anode dissipation of 2 kW.

The modulator has an output impedance of approximately 5 ohms and is capable of dealing with the R.F. stage grid current, which varies from zero to 3 amperes with picture brightness, and also with the capacitance loading of about 400 pF., the current through which depends on the picture waveform.

Vision Transmitter Power Supplies

The power conversion plant for the transmitter is contained in an enclosure 35ft. long, which is located behind the transmitter.

High-voltage supplies are obtained from hot-cathode mercury-vapour rectifiers. The phases of the 415-volt A.C. supply to the transmitter are stabilised and phase-balanced by three separate moving-coil voltage regulators. In addition, the high-voltage D.C. supplies from which constancy of output is important are provided with shunt valve stabilisers, which result in the supplies having very low output impedances. The modulator is arranged to work with a single high-voltage supply of 3.5 kV. at 6 amperes, which has both positive and negative terminals insulated from earth. A stabiliser is provided to give this supply a source impedance of 0.5 ohm and an additional stabiliser results in an impedance of one-sixth of an ohm between the negative supply terminal and earth. These low source impedances are necessary because the varying R.F. stage grid current returns through this supply and because the modulator anode current varies with signal level.

The smoothing circuit associated with the anode supply to the modulated R.F. stage is built out to have a constant resistive impedance of 67 ohms from zero frequency up to 5 Mc/s in order to give a linear modulation/frequency characteristic.

The filaments of the valves in the last three R.F. stages of the transmitter are supplied with D.C. from a motor generator set. This set has an electronic regulator, which keeps the output voltage constant to within 0.1 per cent. and limits the filament current to 110 per cent. of normal when starting from cold. All the remaining valves in the transmitter are A.C. heated.

Sound Transmitter

The sound transmitter is 15ft. 6in. long, with a power conversion plant enclosure 14ft. 3in. long, and is similar to the sound transmitter at Sutton Coldfield. It has a carrier power of 12 kW. and employs high-power Class B modulation with the usual negative feedback circuits, which result in total harmonic distortion figures of less than 2 per cent. at levels of modulation up to 95 per cent. over the normal range of modulating frequencies. The carrier noise level is better than 60 db below 100 per cent. modulation.

The drive unit and the first three R.F. amplifiers are similar to those in the vision transmitter. The fourth and final R.F. stage uses a single BR128 air-blast-cooled valve in an earthed grid coaxial type circuit. This stage and the previous stage are anode modulated. It is necessary to modulate the penultimate stage, for with an earthed grid final stage some of the power from it is fed to the aerial. The output from the final stage is passed through a filter to remove R.F. harmonics and then via a switch (main aerial—reserve aerial—load) to the unit that combines the outputs from the vision and sound transmitters.

The anode and bias supplies are provided by rectifiers in the power conversion plant enclosure, which is behind the transmitter. All valve filaments are A.C. heated except that in the modulated output stage which is supplied from D.C. from a motor generator. This generator has an electronic regulator similar to the one associated with the vision transmitter.

All the valves in the sound transmitter are air-cooled.

Valve Cooling Plant

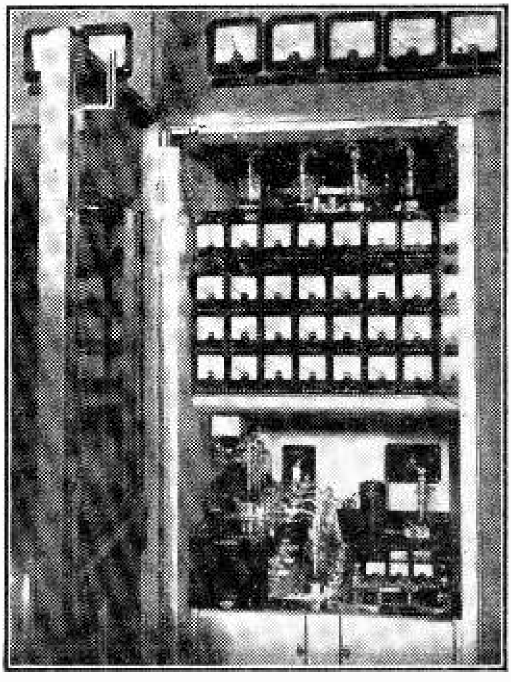
Each transmitter has its own valve cooling plant contained in a separate room. This arrangement has been adopted in order to isolate the noise of the cooling plant from the rest of the transmitter area. The air from each blower can be circulated round a closed system until its temperature is raised to a suitable value and then surplus warm air may either be circulated round the building or exhausted to atmosphere. Thermostatically controlled motor-driven dampers determine the path that the air follows.

Vestigial-sideband Filter

The vision transmitter supplies a double sideband signal to the output feeder. The upper sideband of this signal is attenuated in the vestigial sideband filter, which is connected between the transmitter output and the combining unit. The filter comprises a high-pass and a low-pass section, and is mounted on the wall behind the transmitter. The low-pass section is terminated by the 51.5 ohm feeder leading to the aerial, and the high-pass section by a water-cooled constant-resistance absorber load which dissipates about 1 kW. when normal pictures are being transmitted. The lower frequency sideband is transmitted fully, but the upper sideband is increasingly attenuated for vision frequencies above 0.75 Mc/s. At 53.25 Mc/s the carrier frequency of the sound transmitter in the adjacent channel, the attenuation introduced by the filter is approximately 12 db.

Transmitter Output Combining Unit

This unit is mounted on the wall above the sound transmitter. It combines the outputs from the sound and vision transmitters, and feeds the combined output to the 51.5 ohm coaxial feeder leading to the aerial. To avoid cross-modulation between the transmitters, only a negligible proportion of the output power from one transmitter should reach the other. The combining unit is basically a balanced bridge circuit, with the vision and sound transmitter outputs applied to the opposite corners of the bridge. Two of the opposing arms of the bridge are formed by the load of the aerial feeder and a wideband resistance load. The other two arms are formed by complimentary networks, which present a low impedance at the vision carrier frequency and a high impedance at the sound carrier frequency and vice versa. The power dissipated in the resistance load under working conditions is about 300 watts. At the Sutton Coldfield station the vision and sound R.F.



The final stage of the modulator in the main vision transmitter.

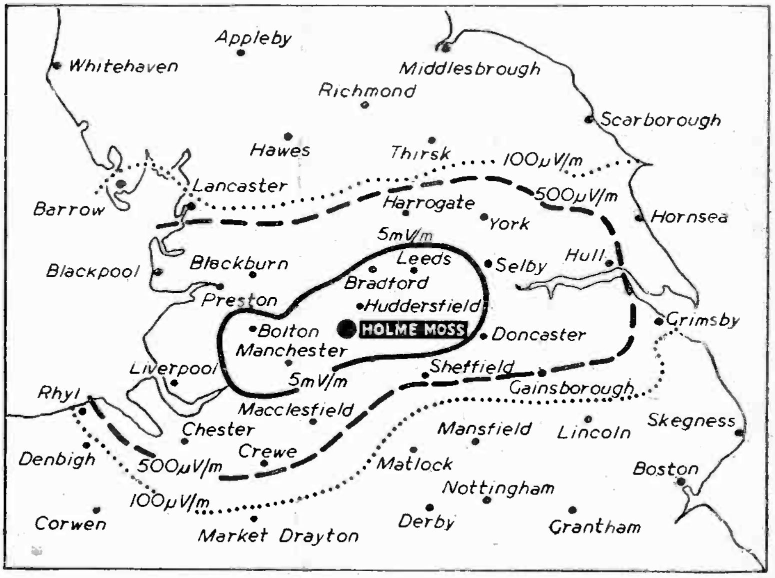
signals are combined in a diplexer at the top of the cylindrical section of the mast. Advances in technique have now made possible the more convenient arrangement adopted at Holme Moss in which the signals are combined in the transmitter building.

Feeder System

A concentric feeder having an outer diameter of 5in. and a characteristic impedance of 51.5 ohms, carries the combined outputs of the sound and vision transmitters to the aerial at the top of the mast. The feeder is built up from 12ft. sections, with an expansion joint every 150ft. to accommodate changes in length resulting from temperature variations. To prevent condensation, dry air is blown into the feeder from a unit located in the sound cooler room.

At the top of the mast the feeder arrives at a T-junction, one leg being fed directly to an unbalance - to - balance transformer, and the other leg via an extra quarter wavelength of line to a second unbalance-to-balance transformer. The two outputs from the second transformer are therefore lagging in phase by 90 deg. on those from the first transformer. The connections between the transformers and the aerial are so arranged that the dipoles in both tiers are phased 0 deg., 90 deg., 180 deg., 270 deg. Compared with the straightforward method of feeding all the dipoles in phase, this method not only increases the power gain of the aerial, but also results in a more constant input impedance over the frequency band.

The standing-wave ratio as measured at the output of the combining unit is 0.96 : 1.



Estimated field-strength contours for the Holme Moss station.

Aerial

A single array radiates the sound and vision signals. It consists of eight vertical folded dipoles arranged in two identical groups placed one above the other and separated by a distance of approximately one wavelength. Each of the four dipoles in the two groups is mounted on one face of the square-section topmast, the dipoles on opposite faces being approximately two-fifths of a wavelength apart. The average gain of the aerial in a horizontal direction is approximately 4 db. The dipoles are constructed of galvanised steel strip and incorporate 7½ kW. heaters to prevent ice formation. They are improved versions of those used at Sutton Coldfield.

Reserve Aerial System

A separate 150ft. mast carries emergency sound and vision aerials for use if the main aerial or feeder system breaks down. These emergency aerials are fed with coaxial cables of 85 ohms impedance, separate cables being used for the sound and vision aerials. Owing to the limitations of the cable, the maximum power on the emergency aerials must be restricted to 20 kW. vision and 5 kW. sound.

Control Room

Both transmitters are operated from a single control desk in the control room. Windows between the control room and the transmitter hall afford the engineer on duty a clear view of both transmitters.

Meters on the desk indicate the voltage of the various power supplies and also the anode currents of the more important valves in the transmitter.

The centre section of the desk houses a waveform monitor which can be switched to examine the output at various points in the modulator chain and also at monitoring points on the outgoing R.F. feeder. Also on the centre section of the desk are switches which select the input signal fed to the transmitters, enabling either locally generated or line signals to be radiated. The locally generated signals normally consist of either test wave-forms or the output from one of the two monoscopes. The monoscopes provide test card or apology captions as required.

The 12in. picture monitors mounted side by side in front of the desk display the picture at the modulator input and as radiated, thus enabling a direct comparison to be made.

Line Termination Rooms

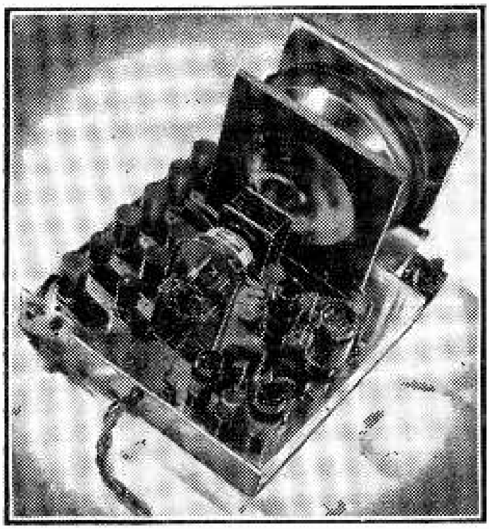
The vision signal from London travels over coaxial cable via Manchester and is demodulated by G.P.O. equipment in the fully screened vision line termination room before being passed to the vision transmitter via the control room.

The sound line termination room contains the sound line termination and test equipment, and the rebroadcast receivers. A vision receiver is fed from an aerial directed on Sutton Coldfield and mounted at the 600ft. level on the mast. It will be used only in the event of a breakdown on the cable link. The pictures from this receiver have so far been free from fading and of good quality, but occasionally suffer from slight car ignition interference.

Modifying the "P.T." and "Viewmaster" Receivers for Holme Moss

DETAILS OF THE ALTERATIONS REQUIRED AND NEW PEAKING FREQUENCIES

PROBABLY the two most popular home-constructor receivers are the "Viewmaster" and our own "Practical Television" Receiver. Both of these receivers were, of course, originally designed for the London (double sideband) transmission. Later, when the Midland (Sutton Coldfield) transmitter opened up, coil modification details were published. The London transmitter is, of course, the only double sideband transmitter which the BBC proposes to construct, and the single sideband transmitter provides slight difficulty not only in separating the sound signal from the vision circuit, but also in adjacent channel interference in certain localities. Fortunately, rejectors, or wave-traps as they used familiarly to be called, are not difficult to fit, and, as many London viewers have found, it is even advisable in some cases to fit a rejector in the double side-band receiver, especially if the receiver is tuned to receive the lower sideband only. The London frequencies are 45 Mc/s for vision and 41.5 Mc/s for sound, and for the Midland 61.75 Mc/s for vision and 58.25 Mc/s for sound. The Northern transmitter, on Channel 2, has frequencies of 51.75 Mc/s for vision and 48.25 Mc/s for sound, and it will be seen that this comes somewhere near the London frequencies. As a result it may be possible to use London coils for a Holme Moss receiver, with suitable tuning and rejector circuits.



A general view of the main chassis of the "Practical Television" Receiver.

The range of inductance variation given by the core of the coils specified is quite wide but will, of course, vary according to the self-capacities introduced by the wiring, and this will vary with each individual constructor. However, if it is found that the core will not enable the coil to be tuned to the peaking frequencies given below, the inductance of the coil should be reduced—either by stripping off from ½ to 1½ turns or by opening out the end turn or two. As the exact amount of modification cannot be stated for the reasons mentioned above, it is best to start by taking off half turn only, or by pushing the end turn a short distance from its neighbour, and then testing the tuning. If still too high another half turn should be removed, or the next turn pushed away, and so on. An extra trap or rejector coil will have to be used in the cathode circuit of V4, and this should be wound as for the sound input coil in the London receiver. The connections will be as shown in the booklet on this receiver, and a 20 pF. silver-mica condenser should be shunted across it. If, due to the particular locality, it is found that sufficient sound rejection cannot be obtained with this single rejector coil, a further similar coil should be connected in the same manner in the cathode circuit of V3.

In addition to the above, it is also recommended that the aerial coupling coil as specified for the London range be reduced to 1½ turns for Holme Moss, and the tapping on the sound input coil be reduced to 1 turn.

Peaking Frequencies

The peaking frequencies required for the Northern signal are as follows:

Vision	L1—49 Mc/s.
	L2—51.75 Mc/s.
	L3—50 Mc/s.
	L4—51.75 Mc/s.
	L5—49 Mc/s.
Rejector	L9—48.25 Mc/s.
Sound	L6—48.25 Mc/s.
	L7—48.25 Mc/s.
	L8—48.25 Mc/s.

In the above references L1 is the aerial input coil, and the remaining coils are numbered consecutively. The rejector coil is L9, and if a second coil has to be added this would be L10.

With practically all single sideband receivers it will be found that maximum performance cannot be obtained unless the coils are correctly peaked and a signal generator is almost essential for this purpose.

The "Viewmaster"

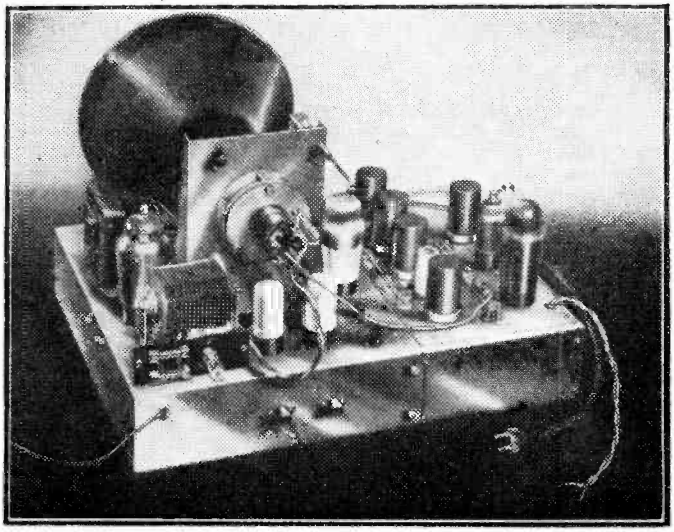
The alterations for this are neither expensive nor involved. A new set of Wearite tuning and filter coils wound to the new frequency and costing £1 8s. and one additional resistor are all that are required. The work perhaps requires a little more patience in view of the other components already assembled, and not normally in position when building up the receiver, but should present no difficulties.

The 14 new Wearite coils are identical in appearance with those used in Model B (Midland model), but are consecutively numbered L201 to L215. They replace coils numbered L101 to L115 respectively.

To remove the existing coils, snip off the coil leads at a point as close as possible to their connections with valveholders, etc., but do not separate the four small ceramic condensers at this stage.

Before actually removing the coils it is advisable to make up a small tool to facilitate the removal and replacement of the nuts by which the coil formers are secured to the chassis. A 4 or 5in. length of ¼in. round mild steel should have a slot filed in one end which is just a press fit across the flats of the nuts.

The nuts can then be easily removed and replaced, the head of each screw being held against turning on the top of the chassis.



A general view of the " Viewmaster " chassis.

When all nuts have been removed the coil assemblies can be lifted clear. The unsoldering of the ceramic condensers is then more easily accomplished.

Carefully sort out the new coils for their respective positions and bare the leads as shown necessary by the old coils. Mount each coil on the chassis (using the home-made tool), so that the leads lie towards their connecting points, exactly as the old coils. All leads must, of course, be as short and as direct as possible.

Make the various connections to all the coils strictly in this order :

L201/202

Centre tap to C1.

Two ends of primary winding to outer tags on aerial terminal strip.

Lower end of secondary winding to earth tag on C5, and upper end to Pin 7 of V1.

L204 and L206

Lower end of each coil to earth via soldered tag on Micadiscs.

L208

Lower end to anode tag on V4.

L204

Wind upper lead clockwise 1½ turns round the centre of the paper covering on L203 and solder end to pin 7 on V2.

L206

Wind upper lead clockwise half turn only round the centre of the paper covering on L205 and solder end to pin 7 on V3.

L208

Wind upper lead 1½ turns round the centre of L207 and solder end to centre tag of C16.

L203, L205, and L207

Solder lower end of each coil to pin 2 on V1, V2 and V3, and the upper end of each coil to pin 3 on V1, V2 and V3, respectively.

L213

Upper end to pin 7 and lower end to pin 8 of V6.

L214

Upper end to pin 3 and lower end to pin 2 of V6.

L215

Lower end to pin 5 and upper end to pin 6 of V7.

L209

Wind lower free end 1½ turns clockwise around the top of the former of L201/202 and connect with the upper free end through one of the ceramic condensers previously used in Model B.

L210

Wind lower free end 1½ turns anti-clockwise around top of former of L203 and connect with the upper free end through a ceramic condenser as above.

L211 and L212

Couple as above with coils L205 and L207, respectively, but with only half turn in an anti-clockwise direction, completing circuit with a ceramic condenser as before.

In addition to the foregoing alterations two further modifications are necessary. To obtain the correct degree of damping for high-quality definition, a resistor must be connected across the coil L204. This resistor is a 22,000Ω Morganite type T and is connected between pin 7 of V2 and the earth end of R12.

The 22Ω resistor R102 is now unnecessary and must be removed. The centre tag on C14 and pin 6 on V3 are directly connected as in V2.

The " Viewmaster " receiver as altered will, of course, need realigning to the following frequencies :

L202	.. 49	Mc/s.	L208	.. 51.75	Mc/s.
L203	.. 49	,,	L209	.. 46.75	,,
L204	.. 51	,,	L210	.. 48.25	,,
L205	.. 49	,,	L211	.. 48.25	,,
L206	.. 51.75	,,	L212	.. 53.25	,,
L207	.. 51	,,	L213	.. 48.25	,,

The Televiewers Association

WIDE and narrow black lines accompanied by black dots has been blotting out television screens in various parts of the country.

The Televiewers Association—the national body of televiewers—has undertaken investigations on behalf of viewers. They report that the cause of the annoyance is due to V.H.F. (very high frequency) from certain high tension pylons carrying current to its B.E.A. grid system.

So far the British Electricity Authority and the General Post Office have been unable to give any reasons or name any remedies for the interference.

The T.A. has contacted the authorities, placing before them certain suggestions for their consideration and investigation.

TV for the Experimenter

FEATURES OF EXPERIMENTAL EQUIPMENT AND HOW TO MODIFY AN EXISTING DESIGN

By W. J. Delaney (G2FMY)

MANY amateurs are keen on experimenting in this new branch of radio, but so far practically all published constructional designs which are available are for television receivers which are designed primarily for home entertainment. Such a receiver does not always lend itself easily to experiment as it will be found that at a large number of points working characteristics, etc., are interdependent. To take one popular instance—the E.H.T. supply. In many designs this is obtained from the line fly-back voltages, and the line output transformer is designed to operate with a certain type of valve and normal H.T. supply, at which the E.H.T. voltage will be, say, 7 kV. Suppose now, one wishes to try out or use a different type of picture tube —one of the aluminised type which requires 10 kV or more. If the existing transformer is used without modification the 7 kV which is supplied will result in a dull picture—probably worse than the brilliancy obtained with the original tube, and thus the advantages of the aluminised tube will be lost. It might be possible, of course, to fit some type of booster to the E.H.T. line, but if a receiver is to be built for experimental use only—as distinct from one designed to provide regular viewing for the family—then special circuits or adaptations must be used. The purpose of this article is to try to show at what points "independence" should be attempted, and thus indicate how a standard commercial or sponsored circuit may be modified for experimental use.

Vision and Sound

The first point at which interdependent working is usually found is at the input to the receiver where it is very common to find that one or more stages are common to both sound and vision. In a superhet the frequency changer may be common to both receivers, and provide separate beats for vision and sound. In a T.R.F. circuit the first two stages are generally flatly tuned and cover both sound and vision. This is, no doubt, quite a good idea from the economy point of view, but if, for instance, one is using a superhet with common frequency changer and wishes to try out a straight circuit for say, sound, the operation of the frequency changer may be upset on disconnecting the sound circuit. Obviously, then, vision and sound receivers are best constructed on separate chassis so that either may be changed as required, and the input should be taken to both. In my own experiments I have found that most flexibility is obtained by using screened coaxial as distinct from balanced cable from the aerial, and a simple ½ watt 68 ohm resistor joined between the aerial or input sockets of the two chassis. It is much simpler to wind an input coil for an unbalanced line, and you can connect or disconnect either chassis without any noticeable effect on the other chassis. This arrangement, furthermore, permits each chassis to be tuned to give maximum performance on its own channel, which is especially valuable in the case of the London (double-sideband) signal.

Sync and Picture

Going through the circuit the next point where one can adopt independence is in the taking off of the sync pulses. In most designs the sync pulses are taken off from the anode of the video stage, with the result that some compromise has to be effected in that stage so as to preserve the sync pulses and at the same time provide good frequency response for the picture. From the series of articles now running on the design of the video stage it will be apparent that best "picture working" cannot be effected without some modification of the sync pulse, and as a result of the amplification given by the video stage a stronger picture signal has to be removed by the sync separator stage or stages. By taking out the sync pulse earlier in the vision receiver it is possible to eliminate the picture pulses much more easily, and although the sync pulses are naturally weaker, it is a simple matter to amplify these, and the amplifier can also act as a further picture pulse eliminator. You are thus left with a good clean sync pulse, and any experimental work can be carried out without any worry as to the effect on picture —and vice versa. There are several ways of taking out the pulse after the detector, two of which are illustrated in Figs. 2 and 3. In an existing design the simplest way is to add across the video load the resistor and condensor (R1 and C1) in Fig. 2, taking out the sync, from the junction of the two as shown. This arrangement is, of course, for the circuits in which the picture tube is cathode modulated, and it provides a negative sync pulse. R1 can be a standard ½ watt resistor but C1 may prove a little troublesome in the initial setting up. One of the small tubular, ceramic silver-mica condensers with a value of 2 to 5 pF mounted well clear of the chassis will answer—best results in an experimental set-up being found by using a stand-off insulator 1½in. high so positioned that the resistor and condenser in series are bridged from the grid pin of the video stage with the minimum of connecting wire left on the two components. In the second arrangement the modifications provide a negative picture signal for picture tube grid modulation (which also has certain advantages), the sync pulse remaining negative. The sync output lead should be kept to less than 12in. in length if possible, and not allowed to pass near the aerial side of the vision or sound receiver

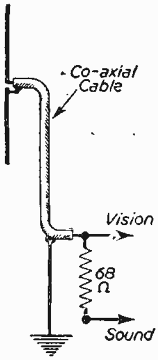


Fig. 1.—Coupling sound and vision receivers.

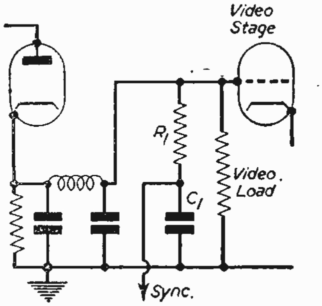


Fig. 2.—Taking off the sync pulse before the video stage.

nor near the input leads to the tube. If there is any instability due to inability to keep this lead short owing to the physical characteristics of the particular receiver, it is preferable to fit a U.S.W. short-wave choke direct to the cathode of the diode, with a 5 or 10 pF condenser connected direct to earth, and a 1 kΩ resistor should be joined to the grid pin of the sync amplifier valve.

A further advantage of this isolation of the sync pulse is that it is possible during periods when there is a transmission on the air, to use the sync pulses for locking the raster, but to eliminate the picture by short-circuiting the video grid to earth. Interlacing, linearity and similar checks may then be made with a clear raster.

E.H.T. Supply

The next point concerns the E.H.T. supply which may be derived from the mains, provided by an R.F. unit, or by the line output circuit. A mains supply is dangerous as the current available is very high. An R.F. unit, on the other hand, can be made to provide voltages up to any desired value at the minimum of expense, and in general the supply is not likely to prove fatal, as the touching of the circuit may stop the valve from oscillating and the voltage disappears. Similar remarks apply to the line output arrangement, but changes cannot be made without changing the line output transformer and this is, in turn, linked up with the line scanning coils, etc. Therefore, a separate R.F. unit is the most useful for the experimenter as it may be changed without affecting any other part of the circuit.

Mains Unit

The power supply should preferably contain a separate heater transformer with two or more windings so that a constant load on the H.T. transformer may be maintained. This should be chosen initially to provide the maximum voltage and current output that will ever be needed, and if some arrangement is being tried where the total load is less than that delivered by the unit, one or more bleeders should be added to keep the load constant.

For similar reasons, potentiometers used for such purposes as brilliancy, volume, or timebase controls should be individual components and not part of networks which provide supplies to other sources. This applies particularly to timebase controls which are often found in commercial designs (on the grounds of economy) to be parts of a common potential divider so as to

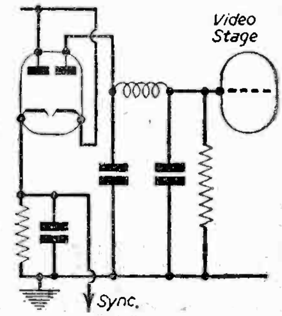


Fig. 3.—An alternative method of taking off the sync pulse and providing better rectification.

reduce the total current flowing through them, and thus enable carbon components to be used instead of those of the wire-wound variety.

Obviously, to provide full flexibility and independency some simple scheme must be provided whereby any desired part of the complete equipment may quickly be removed and replaced by another, involving, say, a different circuit. This is best arranged for by making each part on a separate chassis and fitting multi plugs and sockets—either of the ex-Service Jones type or more compact modern components such as the Belling-Lee, Bulgin, etc. By keeping definite pins for standard connections such as heater, H.T. etc., and by a spot of paint on chassis and plug, it is a simple matter to change separate sections in the minimum of time, and in many cases to replace a part for checking purposes whilst a transmission is available.

R.C.A. Colour Tests

FIELD tests of the R.C.A. compatible, all-electronic colour television system were extended in September, by both radio relay and coaxial cable, from New York to Washington, D.C.

Brig. General David Sarnoff, Chairman of the Board of the Radio Corporation of America, who witnessed the tests in Washington, said they proved that had the colour programme been sent over existing trans-continental radio relay facilities it could have been seen just as well in Los Angeles and San Francisco as it was seen in New York and Washington.

General Sarnoff issued the following statement :

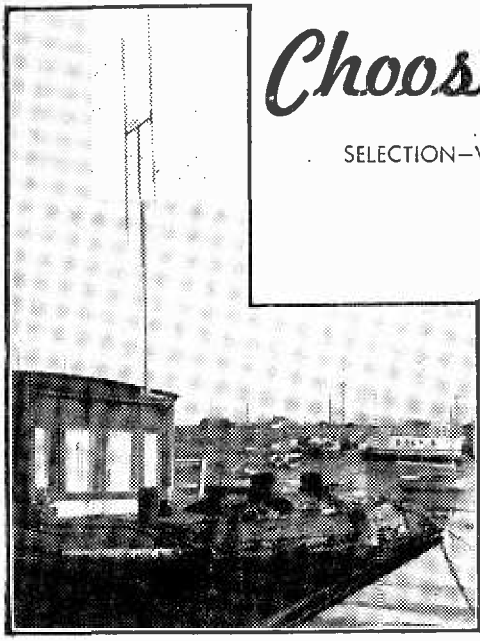
"In the studios of the National Broadcasting Co. in Washington, D.C., I witnessed to-day an extension of the field tests of the R.C.A. compatible colour television system. The colour programme I saw in Washington was also seen at the same time by those present in the Centre Theatre and the R.C.A. Exhibition Hall in New York City.

"The programme was brought from New York to Washington over the coaxial cable and microwave radio relay systems of the American Telephone and Telegraph Co. During the tests we switched frequently from the cable to the relay system for purposes of comparison. The results in each case were excellent and the colour programme I saw in Washington was just as good as it was in New York City where I have been witnessing it almost daily for the past two weeks.

"In addition to the colour programme from the studios in New York City, I also saw in Washington a remote pickup which originated at the Merchant Marine Academy at Kings Point, Long Island, which was an outdoor parade of the cadets carrying various coloured flags and other insignia. That part of the programme was brought from Kings Point, Long Island, over an R.C.A. microwave radio transmitter to the studios of the National Broadcasting Co. in New York. From there, the programme continued to Washington over the coaxial cable and radio relay systems of the A.T. and T.

"In to-day's tests of our compatible colour television system we carried both studio and remote pickup programmes over network facilities. This test proved that had the colour programme been sent over the existing trans-continental radio relay facilities, it could have been seen just as well in Los Angeles and San Francisco, as it was seen in New York and Washington.

"I was so well impressed with what I saw in Washington that I have asked our technical and operating people to arrange for showings to others of what I saw to-day."



Choosing Your Aerial

SELECTION—WITH GENERAL NOTES ON AERIAL DESIGN

By C. T. Clack

THE following notes on aerials are of a generalised nature and are primarily intended to assist in determining the most suitable type required for the various receiving conditions that can exist in and around the service area.

Definitions

Service Area.—The service area is defined as that area surrounding the transmitter in which typical domestic installations will receive a high enough signal strength to produce satisfactory viewing. Terrain differences such as hills, gasometers, water-storage towers and densely built-up areas naturally modify the results and although presenting no serious deterioration up to 30-35 miles distance from the transmitter, can considerably influence results at the edge of the service area, i.e., at 50 miles radius.

Fringe Area.—The fringe area is that area situated at distances of 40-50 miles and more away from the transmitter in which the field strength will be found to vary from place to place due to the presence of hills and other variations in ground height. Intervening hills in the fringe area tend to "shadow" locations behind the hills (Fig. 1) away from the transmitter and it is not unusual to find that a receiver situated well away from a hill (say, five to 10 miles) will produce a good picture, whereas another receiver located behind a hill, yet situated much nearer the transmitter, will produce a very poor picture.

Local Areas.—Almost irrespective of changes in ground level, large buildings, towers, etc., distances up to 15 miles from a transmitter can be considered as high field strength areas and most installations are capable of producing ideal reception conditions.

Extraneous Effects

Flutter.—A rapid variation in picture brightness due to reflections from aircraft flying in the vicinity of the reception area. The speed of flutter changes as the aircraft approaches and recedes from the installation and varies from about 1 per second to 12 times per second. Flutter at higher speeds than about 12 times does not prove objectionable.

Domestic Appliances.—Interference from hair-dryers, vacuum cleaners, electric fans, refrigerator motors, etc., is often recognised by the existence of one or two streaky black and white horizontal bands across the picture; the bands of interference can vary in size from ½in. to 2in. wide and will be in some instances stationary or moving at a regular speed up or down the picture. These appliances can be silenced by fitting an approved suppressor recommended by the manufacturer of the appliance.

Diathermy Equipment.—This can be recognised by one or more broad bands of interference which produce a "lace curtain" pattern across the picture. Modern diathermy equipment is now installed inside electrically screened rooms to avoid unwanted radiation affecting local receivers.

Broadcasting Stations

In some instances harmonic interference from sound broadcasting stations will produce "cross-hatching" on the picture, i.e., a large number of light grey to dark grey sloping lines across the entire screen. This can be experienced in locations adjacent to airfields or up to as much as 10 miles away from large broadcasting stations. Redispositioning of the aerial may eliminate this trouble.

Reflections.—This is characterised by the existence of two or more images and can be severe in high field strength areas where the surrounding buildings are large enough to reflect a strong signal which arrives at the aerial later than the direct signal; consequently, the receiver will show another image displaced a little to the right of the normal picture. This is often much reduced by turning the aerial until the reflection is at minimum, and often completely eliminated by using an indoor aerial.

Interference

In all cases the limit to satisfactory reception is set partly by the level of electrical interference created by industrial equipment, domestic appliances and mainly by ignition pulses from motor cars. In the local areas, up to 15 miles or so away from the transmitter, the signal strength is high enough to compete favourably with this interference, i.e., the receiver sensitivity control (normally referred to as the Contrast Control) is turned well down from maximum and so reduces the susceptibility to interference. As a receiver is moved farther away from the transmitter, the signal strength falls rapidly with distance but local electrical interference can still remain at a high level, consequently marring what would otherwise be a satisfactory picture.

Fortunately, a large proportion of the areas well away from the transmitter will not be so densely populated, hence there will be less industrial and domestic appliances to interfere with reception, but the biggest source of interference will still be due to the ignition pulses radiated from motor cars. This difficulty is often limited only to main road sites, but domestic installations situated away from the main roads in a low field strength area (40 to 60 miles away from the transmitter) will only provide satisfactory viewing if the best advantage is taken in selecting and siting the aerial.

Local Areas (up to 15 miles)

Room Aerials.—These are best used for distances up to 6 miles although they can, under certain conditions, be used up to distances of 15 miles if reception is free from interference.

Where preference is shown for aerials of this type, they can be quickly assembled in a corner of the room adjacent to the receiver and if a contrasty picture is received with no interference then a permanent installation can be completed.

Under some conditions of installation a variation in picture brilliancy will be observed as people move about the room. This is due to the fact that the average height of a person happens to be about the same electrical length of the aerial and consequently reflections occur which may increase or decrease the signal in the aerial as they approach or move away from it. The best position is found by trial and error—moving the aerial to different parts of the room. It must be borne in mind that any aerial situated against a party wall is just as likely to be influenced by movements of people in the next house, hence an inside wall may prove to be the most satisfactory. (This is not likely to apply to detached houses.)

In locations of high field strength where multiple reflections exist due to the presence of large buildings, chimney stacks, gasometers and other industrial erections, the reflections are often much reduced or even completely eliminated by using an inside aerial.

Installation costs are low as the initial expense for an inside aerial is not likely to exceed 30s. or so, and the fixing takes at the most about 20 minutes.

Loft Aerials.—No trouble is likely to be experienced from body reflections as is the case with aerials situated adjacent to the receiver and furthermore, the elevated position brings about an improvement in signal strength together with slightly reduced susceptibility to interference. These aerials may be used at distances up to 20 miles if the site is high or on rising ground and relatively free from hills or highly industrialised locations. At distances of 10 miles or less they may be used almost irrespective of site conditions. Cost is of the order of £2 10s., plus fixing.

Suburban and Country Areas (up to 25 miles)

Aerials of the single dipole type will produce satisfactory results up to 25 miles if the siting is good, i.e., high ground and no screening hills or buildings, otherwise they are best restricted to distances of up to 15 miles or thereabouts. The vertical dipole receives signals from any direction, but the "bent" dipole should be erected so that it points in the direction of the transmitter. An advantage gained by using the "bent" type is that it may be rotated to reduce interference or unwanted reflections coming from a direction other than in the line of reception. In rotating the aerial away from the direction of the transmitter in order to bring about a reduction in interference, a certain amount of signal strength will be lost; this characteristic may be used to advantage up to distances of 10 miles, but beyond this the aerial must point direct at the transmitter, otherwise the signal pick-up may be poor. Cost—approximately £4 10s., plus fitting.

Main Service Area (10 to 50 miles)

The most useful type of aerial is the "H" or "X" as it not only provides an adequate signal within the major portion of the service area, but also possesses a useful degree of rejection to any interference coming from behind the aerial.

As the signal pick-up is often more than adequate, this aerial may be rotated to bring about the best reduction in ignition interference from main roads without losing too much signal strength. All that need be said is that under average domestic viewing conditions there is no particular advantage between either type apart from the fact that the close-spaced assembly is lighter and might be less susceptible to damage.

The "X" type assembly possesses an unusually high back rejection performance and naturally may be used with success in places where heavy main road traffic is situated behind or to one side of the installation. The forward gain is claimed to be slightly higher than that obtainable with the "H" type.

Fringe Area (40 to 75 miles)

Multi-element arrays possess slightly higher gain than those so far mentioned; they also possess a much higher order of directivity together with a slightly reduced bandwidth.

In fringe areas where ignition interference is high relative to the received signal a compromise between main road ignition interference and picture quality can be effected by rotating the aerial to produce the most

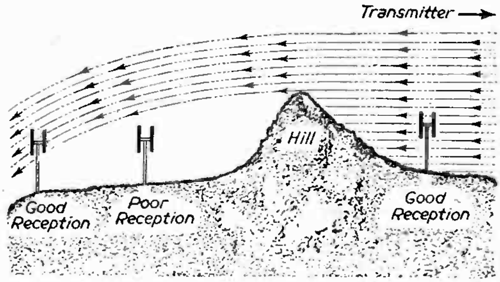


Fig. 1. Diagram illustrating the "shadow" effect of high ground.

satisfactory results. As the forward gain, i.e., in the direction of the transmitter, is higher than with other types of aerials, it can be turned off the beam with a view to directing the back of the aerial towards a source of interference.

These installations are much heavier than other types and consequently the fixing must be mechanically sound. In all cases, fringe area installations should be situated as far away from main road sites and as high as possible in order to secure the best results.

Installation Notes

External television aerial installations are relatively costly, i.e., up to £12 or more, and the average viewer, unaware of the extent of deterioration under continuous exposure to sulphurous atmosphere from chimneys, coupled with large variations in weather conditions from season to season, quite naturally expects an indefinite life from a television aerial.

As a guide it is suggested that an overhaul and repainting at intervals of not more than two years should be sufficient to maintain good efficiency and mechanical soundness.

Fringe Area Reception

CONDITIONS AND ADJUSTMENTS FOR LONG-DISTANCE WORKING

By Bernard Barnard

GENERAL conditions during the past summer have not been particularly good. My own troubles started early in June when the picture was marred by almost continuous "herring-bone" patterns across the screen. Shortly after this, sound reception was affected by a continuous high-pitched whistle with occasional bursts of loud and far too intelligible speech from Radio Moscow! This was accompanied by periods of really bad fading, both sound and picture at times fading to zero. Nothing could be done to rectify the fading and I have not yet overcome the heterodyne whistle and breakthrough.

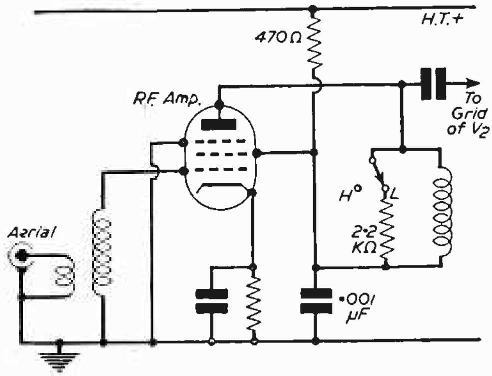


Fig. 1.—How to connect "High/Low" sensitivity switch to series circuit (tuned anode).

I am using a superhet with the usual I.F. of 9.5 Mc/s for sound and the trouble appeared to be due to direct pickup of harmonics from various European stations which fall in and around the 9 Mc/s band of the I.F. amplifier. The most obvious line of attack was to improve the screening on the frequency changer and early I.F. stages or to take the more drastic step of shifting the I.F. in the hope of finding a quiet frequency for both sound and vision.

Screening

The screening I have had in use for nearly two years and has so far been fully adequate so that these troublesome harmonics must be coming through with enormously increased strength. I looked first for the most obvious places for direct I.F. pickup and decided that the grid leads to the F.C. valve and first sound I.F. (both top cap grid valves) were worth immediate attention. These leads were unscreened and protruded about 1½in. above the coil cans, so I decided to replace them with screened wire.

The effect of this was, of course, to add several pF's. capacity across the grid coils of each valve and each coil had to have several turns removed to compensate for this. When these circuits were finally persuaded to tune again to the desired frequencies, the net effect was an improvement inasmuch as the interference was reduced (but not cured) and a setback because the gain of the receiver was reduced by this modification. This loss of gain was, no doubt, due to the effective loss of "Q" in the tuned circuits.

Clearly, this method of attack did not offer much chance of success and the lesson to be learned is that, at the frequencies involved, screening must take the form of complete boxing rather than screening of individual leads. In my case, this would mean major reconstruction and, for the present, I am waiting in the hope of improved conditions.

The I.F.s

Shifting the intermediate frequency involves, of course, changing both sound and vision I.F.s but is not a very difficult job provided a signal generator is available, since a change of .5 Mc/s either way ought to remove interference from any R.T. station. But, after several attempts, although I found several interference-free sound frequencies, each one produced patterns on the picture. It is almost impossible to remove *visual* interference from a wide-band amplifier when that band happens to be a "busy" one. So that idea must be forgotten and it seems that I must be content with things as they are until Sutton Coldfield regains its former "punch" and the harmonics return to normal weakness.

I am situated slightly nearer Holme Moss than Sutton Coldfield but, whereas there is only flat, unbroken country between my aerial and Sutton Coldfield, I am at the foot of a steep hill when looking towards Holme Moss. Only trial can show which will give the stronger and more reliable signal. Holme Moss has recently started transmitting on full power and I understand that several local enthusiasts (pioneers, one might justly call them) have pointed their new and larger aerials northwards and report a signal comparable with that of Sutton Coldfield.

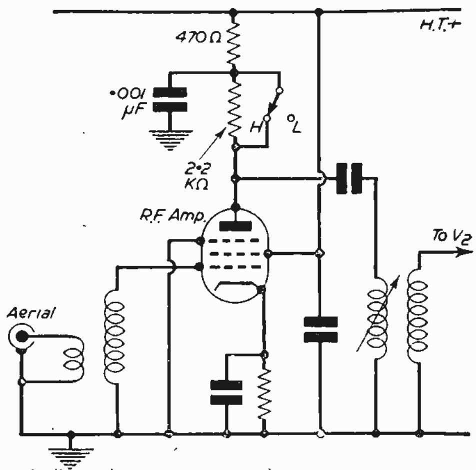


Fig. 2.—Sensitivity switch connections for parallel circuit (tuned grid).

Distant Reception

My business takes me into some of the remote parts of the country and I have been surprised at the way in which some enthusiasts attempt to get a picture at distances of 100 miles and more from a transmitter. In one village, right up in the Lincolnshire Wolds, I noticed a three element aerial perched on top of a lattice mast 80ft. high, which in turn was erected on the very top of a steep cliff. There was no building in the immediate vicinity so I could only conclude that the signal was fed by co-axial cable to the nearest house which is all of a quarter-mile from the mast. The total height of the aerial above average ground level of the district was about 140ft. Now, a dipole rapidly loses its horizontal pickup as it is raised above ground level. For all practical purposes, it is best at about three wavelengths high (about 30ft.) and, at greater heights, it tends to pick up signals coming in at a steep angle only. Taking this into account together with cable losses, I do not think that very much signal energy would have reached that particular receiver.

Aerial Height

In practice, there is only one good reason for exceeding 30 to 40ft. in aerial height and that is where severe traffic interference exists. When it is impossible to get away from the traffic in a horizontal direction, the only alternative is to go in a vertical direction. You will not get a stronger signal, but you will get less interference and, therefore, a greater signal/noise ratio.

Another unusual attempt that I have seen is a house which carries no fewer than three aerials, all pointing in different directions. Two are for Sutton Coldfield and one is for Alexander Palace frequencies and it is anybody's guess as to what happens when the three coaxials meet. My own would be that this enthusiast (for that he certainly is) switches from one to the other in the hope of overcoming fading, roughly on the Diversity Reception principle. When I next pass this house, no doubt a Holme Moss aerial will be added to the collection.

An Experimental Circuit

Bad reception conditions have led me to one circuit development which many fringe viewers will find well worth while. Fading was so bad that it was impossible to enjoy a complete programme most evenings and I was forced to consider adding a further stage of R.F. amplification but, before doing this, I decided to try the effect of removing all damping from the existing stage. This, of course, should greatly increase R.F. gain but in theory must seriously reduce bandwidth and, therefore, picture quality.

The R.F. stage was tuned-anode coupled, the anode coil being shunted by a 2.2 kΩ resistor. I removed the 2.2 kΩ resistor and, as expected, the gain was very greatly increased, the picture holding perfectly with the Contrast Control in the minimum position. On the evening programme, I waited for the usual fading to commence and found that it was now possible to hold the picture on the screen with the Contrast Control, even on the deepest fades. So far as picture quality is concerned, I found that the loss of detail was apparent when the signal was at normal strength, but during the fades there was no difference at all. The reason for this is that picture quality suffers during fading irrespective of bandwidth so that the modification had produced a picture of fair quality in place of no picture at all.

However, *fair* quality is not good enough when the signal is strong and steady, so I decided to fit a low-capacity type switch close up against the R.F. stage anode coil by means of which the damping resistor can be switched in and out of circuit at will. The receiver now has a "Sensitivity" switch with two positions—the one giving normal gain and full bandwidth and the other giving full gain and moderate bandwidth. The device makes all the difference between enjoying the full continuity of a play or suffering those irritating periods when the screen becomes a jumble of flashes and flickering lines.

Modifications

Figs. 1 and 2 show two ways in which the modification can be made according to whether the R.F. stage is parallel or series connected. Two points, however, should be borne in mind. First, the switch must be fitted very close to the R.F. coil and it is therefore un-

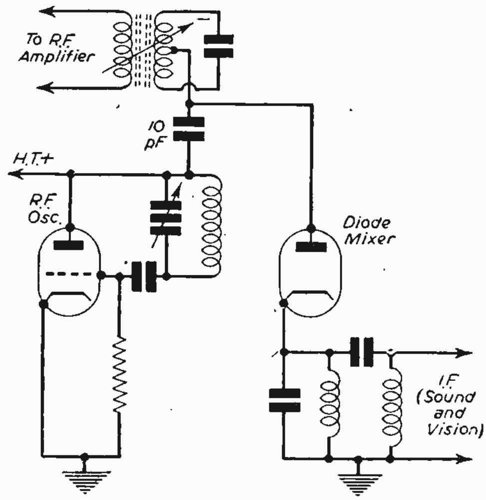


Fig. 3.—Diode Mixer Circuit.

likely that its control can be brought out to the cabinet front. And secondly, the complete removal of all damping may make the stage unstable. In this case, it will be necessary to experiment with a value of resistor in the "High Sensitivity" position which will give the necessary gain without causing self oscillation. It will also be necessary slightly to retune the R.F. stage and it is best to do this to give maximum results in the "High Sensitivity" position.

Straight or Superhet ?

In the fringe areas, controversy concerning the merits and demerits of straight and superhet circuits for television is still a live topic reminiscent of the 1930s when the same issue was fought out concerning broadcast receivers. The latter case was decided, of course, on the question of selectivity which could only be answered by the superhet as more and more broadcast stations opened up.

No such clear-cut decision seems likely where Tv is concerned; commercial manufacturers will continue to prefer the superhet because of the comparative simplicity of changing this circuit from one frequency to another. But the amateur constructor will not find this a compelling reason for choosing a superhet and will be more concerned with more fundamental questions of signal/noise ratio and freedom or otherwise from interference patterns.

(*Concluded on page 332*)

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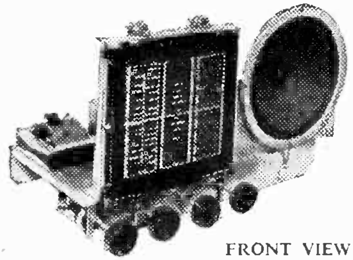

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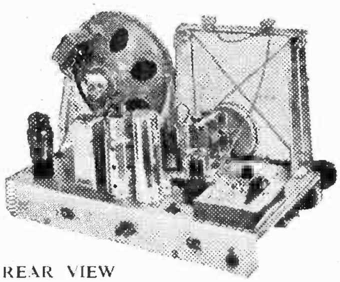

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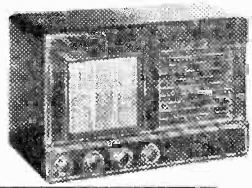

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CHOOSING A RECEIVER

TECHNICAL DETAILS OF COMMERCIAL RECEIVERS AVAILABLE FOR HOLME MOSS

THE following tables detail those commercial receivers which are available for the reception of the Holme Moss station at the time of going to press. Certain makers are preparing receivers for the area, whilst others are adaptable or will be at some later date. The abbreviations used in the table are as follows: Time Base: T—Thyratron, H—Hard valve. Focus: PM—Permanent Magnet, EM—Electron-magnet. EHT: FB—Fly-back, M—Mains (50 c.p.s.) supply. RF—Oscillator type.

Manufacturer	Model No.	Table or Console	AC or DC	Tube size (in.)	No. of Valves	Time base	Focusing	Tube EHT (kV)	EHT Supply	Sound Output (Watts)	Price (Ex. Tax) £ s. d.
Alba	T372	T	AC/DC	12	15	H	PM	8.5	FB	1.5	52 10 0
	T472	C	AC/DC	12	15	H	PM	8.5	FB	1.5	60 18 0
	T483	C	AC/DC	15	16	H	PM	10	FB	4.5	94 10 0
	TR9872	C	AC/DC	12	15	H	PM	8.5	FB	1.5T 4R	94 10 0
	TRG0971	C	AC/DC	15	16	H	PM	10	FB	4.5	145 0 0
Ambassador	TV4/TM	T	AC	12	15+MR	T	EM	10	FB	3	52 7 11
	TV4/C	C	AC	12	15+MR	T	EM	10	FB	3	62 5 4
	TV5/C	C	AC	15	15+MR	T	EM	12	FB	3	94 4 6
Bush	TV22	T	AC/DC	9	15	H	PM	8.5	FB	1	35 10 0
	TV24	T	AC/DC	12	15	H	PM	8.5	FB	1	47 1 11
	TUG24	C	AC/DC	12	15	H	PM	8.5	FB	1	62 6 2
Champion	Adelphi	C	AC	12	14+R	H	PM	7	FB	3	80 0 0
Columbia	C501N	T	AC	12	14	H	PM	7	FB	3	56 5 9
	C502N	C	AC	12	14	H	PM	7	FB	3	64 4 6
Cossor*	916c	T	AC	10	17	H	Part PM plus EM	FB	7	2	42 0 3
	917c	C	AC	10	17	H		FB	7	2	51 8 11
	918	C	AC	10	20	H		FB	7	2½	58 6 1
	919	C	AC	12	17	H		FB	8	2½	58 6 1
	920	C	AC	12	20	H		FB	8	2½	66 17 7
	921	T	AC	12	17	H		FB	8	2½	54 6 10
	924	C	AC	12	20	H		FB	8	2½	Not fixed yet
Ekco	T161	T	AC	12	17	H	PM	8½	FB	1½	47 15 4
	TU169	T	AC/DC	12	18	H	PM	8½	FB	1½	47 15 4
	TC162	C	AC	12	17	H	PM	8½	FB	1½	56 7 1
	TC166 (with full-length doors)	C	AC	12	17	H	PM	8½	FB	1½	71 9 6
	TC165 (with full-length doors)	C	AC	15	20	H	PM	11½	M	1½	93 9 5
	T164	T	AC	15	18	H	PM	13½	FB	1½	To be announced
English Electric	1650	C	AC	16	25	H	PM	12	FB	3	102 10 0
	1651	C	AC	16	27	H	PM	12	FB	3	127 10 0
Etronic	ECS2231	C	AC	Proj.	22	H	EM	25	RF	2	126 0 0
	ECV1527	C	AC	12	15	H	PM	8	FB	2	61 11 9
	ECV1523	C	AC	10	15	H	PM	8	FB	2	48 6 0
	ETV1536	T	AC	12	15	H	PM	8.5	FB	2	54 6 10
	ETV1637	T	AC	12	16	H	PM	8.5	FB	2	54 6 10
Ferguson	988T	T	AC/DC	12	15	H	PM	9	FB	1	47 1 11
	983T	C	AC/DC	12	17	H	PM	9	FB	2.5	57 19 3
	989T	C	AC/DC	16	19	H	PM	14	FB	2.5	76 1 7

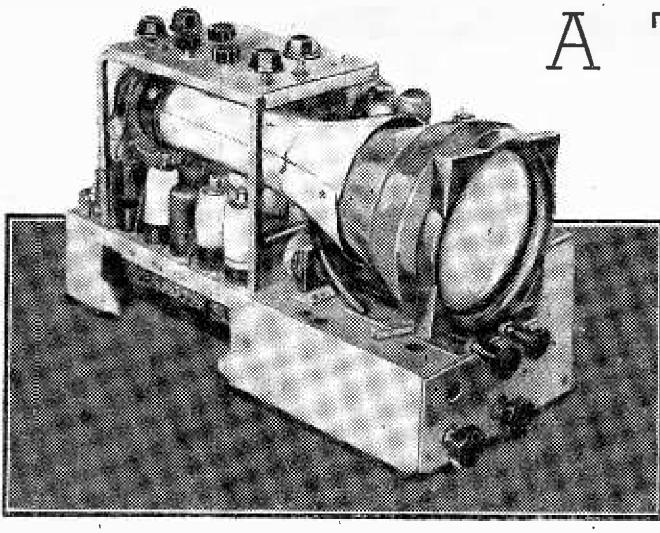
* Models 916c—920 inclusive are expected to be superseded by new models by the time this issue is published; Model 921 may be the first Cossor Model to be seen by those Holme Moss areas which were quite beyond reception of Sutton Coldfield. As all of them are five-channel types, the earlier ones may have found their way into the mutual fringe area and are, of course, quite suitable, although no further supplies are contemplated once present stocks are exhausted.

Manufacturer	Model No.	Table or Console	AC or DC	Tube size (in.)	No. of Valves	Time base	Focusing	Tube EHT (kV)	EHT Supply	Sound Output (Watts)	Price (Ex. Tax) £ s. d.
Ferranti	T1205S	C	AC	12	13	H	PM	7	FB	1	42 17 6
	T1405	T	AC	12	13	H	PM	7	FB	1	34 5 8
	T1505	C	AC	12	13	H	PM	7	FB	1	51 8 8
	T1215	C	AC	12	13	H	PM	8.5	FB	1	45 13 0
	T1415	T	AC	12	13	H	PM	8.5	FB	1	35 19 9
	T1615 (picture size, 14½ in. x 10½in.)	C	AC	2½	21	H	EM	25	RF	2½	93 3 2
G.E.C.											
*A—(SH TV & Radio)	BT3443	T	AC	9	26	H	EM	5.2	M	3	—
	BT3839	C	AC	9	26	H	EM	5.2	M	3	—
	BT9144M	C	AC	14	26	H	EM	7.3	M	3	—
†B—(SH TV) ..	BT1091B	T	AC	9	21	H	PM	6.5	FB	2	—
	BT1093	C	AC	9	21	H	PM	6.5	FB	2	—
	BT4640	C	AC	12	21	H	PM	6.5	FB	2	—
‡C—(TRF TV) ..	BT4541	C	AC/DC	12	15V 2GD 1MR	H	PM	7	FB	1.5	—
	BT2147	T	AC/DC	9	15V 2GD 1MR	H	PM	7	FB	1.5	37 13 7
	BT5144	T	AC/DC	12	15V 2GD 1MR	H	PM	7	FB	1.5	49 19 11
	BT5145	T/F	AC/DC	12	15V 2GD 1MR	H	PM	9	FB	1.5	51 15 1
	BT4542	C/F	AC/DC	12	15V 2GD 1MR	H	PM	9	FB	1.5	62 15 11
"His Master's Voice" ..	3807	T	AC/DC	10	15	H	PM	5	FB	1	—
	3815	T	AC/DC	12	15	H	PM	5	FB	1	—
	3811	C	AC/DC	12	15	H	PM	5	FB	1	—
	3806	C	AC	15	19	H	EM	7	M	5	—
	3851	C	AC	15	19	H	EM	7	M	5	—
	3902	C	AC	15	19	H	EM	7	M	5	—
§Invicta	T112	T	AC/DC	12	15	H	PM	7.5	FB	.4	50 14 4
	T105	T	AC/DC	9	18	H	PM	6.5	FB	2.5	45 3 0
K.B.	FV30	T	AC	12	20	H	EM	10	FB	2	54 6 10
	FV40	C	AC	12	20	H	EM	10	FB	2	71 14 7
	FT50 (Radio and Tel.)	C	AC	12	20	H	EM	10	FB	2	103 10 1
	GV40	T	AC	14	20	H	EM	12	FB	2	58 13 1
	GF40	C	AC	14	20	H	EM	12	FB	2	68 2 2
	GF60	C	AC	17	20	H	EM	14	FB	2	Price to be announced
Marconiphone	VT85A	T	AC	12	14	H	PM	7	FB	3	56 7 2
	VC85A	C	AC	12	14	H	PM	7	FB	3	65 5 10
	VT86DA	T	AC/DC	12	15	H	PM	5	FB	1	54 16 2
	VC86DA	C	AC/DC	12	15	H	PM	5	FB	1	64 8 8
	VRC87DA	C	AC/DC	12	20	H	PM	5	FB	1T 5R	83 17 0
Masteradio	T852	T	AC	12	14	H	PM	7	FB	3	54 18 10
	T851 (with Radio) ..	T	AC	12	14	H	PM	7	FB	3	63 0 0
	T612M	C	AC	12	17	H	EM	7	FB	3	64 14 6
	PT50 (picture size, 16in. x 12in.)	C	AC	2½ Proj.	22	H	EM	25	—	3	142 7 11
McMichael	TM51	T	AC	12	14	H	PM	7	FB	2	54 0 3
	512R (with Radio) ..	T	AC	12	14	H	PM	7	FB	2	75 9 1
Murphy	V200	T	AC	12	17	H	M	FB	FB	—	80 0 0
	V202C	C	AC	12	17	H	M	FB	FB	—	99 10 0
	VU150	T	AC/DC	12	15	H	M	FB	FB	—	72 0 0

* Older receivers in Group A. Conversion kit BT42A available at 7s. 6d. list.
† Older receivers in Group B. Conversion kit BT42B available at 7s. 6d. list.
‡ TRF Receivers in Group C. Current models excepting Model BT4541 available for Holme Moss Frequency. Replacement RF chassis available on interchange basis for receivers already in service on other frequencies.
Older Models BT7092, 7094, 1091A, 1091C, 4640C and 9144 (all London only models) are not suitable for conversion.
§ The Birmingham model T105 is suitable when modified. Makers supply components and circuit diagram.

Manufacturer	Model No.	Table or Console	AC or DC	Tube size (in.)	No. of Valves	Time base	Focusing	Tube EHT (kV)	EHT Supply	Sound Output (Watts)	Price (Ex. Tax) £ s. d.
Peto Scott	169	C	AC	Proj. 17	18+ 3EHT	D	EM	27	OSC	4	102 0 8
	127	C	AC	12	16	D	PM	8.5	FB	1.5	71 0 1
	124	C	AC	12	16	D	PM	8.5	FB	4	72 17 7
	126	C	AC	12	16	D	PM	8.5	FB	4	63 9 0
	168	C	AC	16	20	H	PM	14	FB	1.5	94 3 9
Philco	BT1551	T	AC/DC	12	15	H	PM	9.5	FB	1.8	49 5 5
	BC1412	C	AC/DC	12	17	H	PM	9.5	FB	2	60 17 4
	BT1651	C	AC/DC	16	19	H	PM	14	FB	2	94 3 10
Philips	1100U	T	AC/DC	12	14+ CRT	H	PM	9	FB	2.0	49 19 10
	1101U	T	AC/DC	12	19+ CRT	H	EM	9	FB	2.5	56 10 3
	1200U	C	AC/DC	12	19+ CRT	H	EM	9	FB	2.5	69 11 1
	1700A (picture size, 13½ in. x 10½in.)	C	AC	2½	24+ CRT	H	EM	25	RF	2.5	105 1 1
	1800A (picture size, 16 in. x 12in.)	C	AC	2½	24+ CRT	H	EM	25	RF	2.5	82 6 3
Pye	FV1	T	AC/DC	12	17	H	PM	10	FB	Appx. 2	48 19 11
	FV1C	C	AC/DC	12	17	H	PM	10	FB	Appx. 2	58 13 1
	MV30	T	AC/DC	9	14	H	PM	6.5	FB	Appx. 1½	34 5 11
Pilot	TM54	T	AC	12	14	H	PM	—	FB	3	50 13 10
R.G.D.	2351T	C	AC	12	23	T	EM	7	RF	3.5	120 15 0
	1800T	C	AC	12	17	T	PM	6.2	FB	3.5	112 7 0
Regentone	T15H	C	AC	12	14	H	PM	5.5	FB	2.5	64 9 8
	Big 12H	T	AC	12	14	H	PM	5.5	FB	2.5	55 15 10
	Big 12 Console H	C	AC	12	14	H	PM	5.5	FB	2.5	67 7 8
Scophony Baird	P165 (Portable)	T	AC	9	17	HV	PM	7.5	FB	3	44 18 4
	P167 " Twelve " Table	T	AC	12	17	HV	PM	10	FB	3	57 4 10
	T167 "Twelve" Console	C	AC	12	17	HV	PM	10	FB	3	68 16 8
Sobell	T121P	C	AC/DC	12	13	H	PM	7/8	FB	2	52 3 5
	T121W	C	AC/DC	12	13	H	PM	7/8	FB	2	58 13 10
Stella	ST1522V	T	AC/DC	12	18+ CRT	H	EM	7/7.5	FB	Appx. 2	55 15 9
	ST1480V	C	AC/DC	12	18+ CRT	H	EM	7/7.5	FB	Appx. 2	68 16 7
Ultra	12in. Table	T	AC	12	18	Line H	PM	7	FB	3	—
	12in. Table	T	AC	12	19	Line H	PM	7	FB	3	—
	12in. Console, with radio	C	AC	12	18	Line H	PM	9	FB	3	—
	12in. Console, with radio	C	AC	12	19	Line H	PM	9	FB	3	—
	15in. Console, with radio	C	AC	15	18	Fr'e T	PM	12	FB	3	—
	15in. Console, with radio	C	AC	15	19	Fr'e T	PM	12	FB	3	—
Valradio	V2-2 (picture size, 19in. x 14in.)	C	AC/DC†	2½	21	H	EM	25	RF	3.5	148 0 0
	V3-2	*	AC/DC†	2½	21	H	EM	25	RF	4.5	131 0 0 Exc. screen and stand
Vidor‡	CN/4212	C	AC	12	18 inc. tube	F-T L-H	PM	Appx. 7	FB	1	—
	CN/4215	T	AC/DC	12	16 inc. CRT	H	PM	Appx. 7.5	FB	Appx. 1	—
	CN/4213	C	AC/DC	12	16 inc. CRT	H	PM	Appx. 7.5	FB	Appx. 1	—

* Wall Projection Television Receiver, picture size 4ft. x 3ft. † Adaptor for 50, 110 and 200/250 DC operation, £8 extra.
‡ CN/4207/9 Birmingham Models have also been converted to Channel 2 and CN/4212 refers.



The completed receiver.

A Television Re

AN INEXPENSIVE UNIT

By B. L

BASED on the ex-Government Indicator 62 unit, careful shopping will enable this complete televisor, less loudspeaker, to be built for £9 ! Most experimenters have a spare loudspeaker available. This televisor will produce pictures of quite good quality, and at the same time it will provide an inexpensive experimental unit.

Below is given a shopping list with prices current at the time of going to press.

	£	s.	d.	
Sound and Vision receivers, and Time Base :				
Indicator 62 unit	2	7	6	
6V6 valve	0	8	6	
4 potentiometers	0	6	0	
1 volume control with switch..	0	3	6	
Sundry resistors, etc.	0	18	0	
				£4 3 6
E.H.T. Supply :				
E.H.T. transformer	1	5	0	
2X2 valve	0	4	0	
Valveholder	0	1	0	
Smoothing resistor	0	0	6	
Two condensers 2.5 kV. ..	0	5	0	
				£1 15 6
Power Supply :				
Valveholder	0	0	6	
5U4G valve	0	8	0	
Two 1.5 kΩ 5w. resistors ..	0	3	0	
Smoothing choke 3H 200 m/a.	0	6	0	
Two 8+16 μF. 450 v. cond. ..	0	7	6	
Transformer 350-0-350 volts 160 mA., 5 v. 3 a., 6.3 v. 3 a., 6.3 v. 6 a.	1	16	0	
				£3 1 0
Grand Total				£9 0 0

The most costly portion of the equipment is the mains transformer, and the prices quoted are for the cheapest obtainable. It is possible to buy ex-Government transformers which will be suitable for less than the figures given above, but as the power unit is the heart of the televisor it is advisable to buy the best.

The Indicator 62 unit is built on a two-deck chassis and provides most of the components for the vision receiver, sound receiver and time base.. The power unit is built on a separate chassis, as it thereby relieves the main unit of a great deal of weight, and thus makes it easier to handle.

The photograph shows the position of the main items. The sound receiver is in the foreground ; on the opposite side of the chassis is the time base, while the vision receiver occupies the upper deck in the background. The E.H.T. supply is contained in the unit at the back of the vision receiver, being fed from a mains plug fitted on the back of the unit.

Stripping the Unit

When the unit is received it is advisable to check the CR tube, if possible, under normal working conditions on a friend's televisor. If this is not possible, the filament

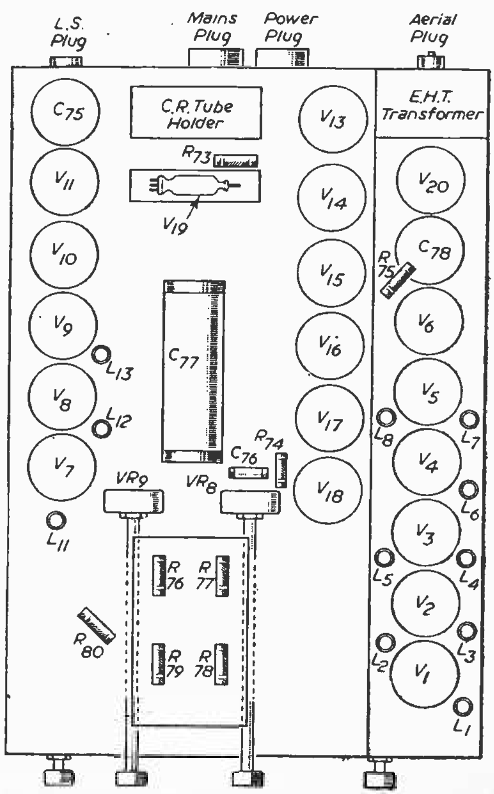


Fig. 1.—Layout of chassis top.

...eceiver for £9

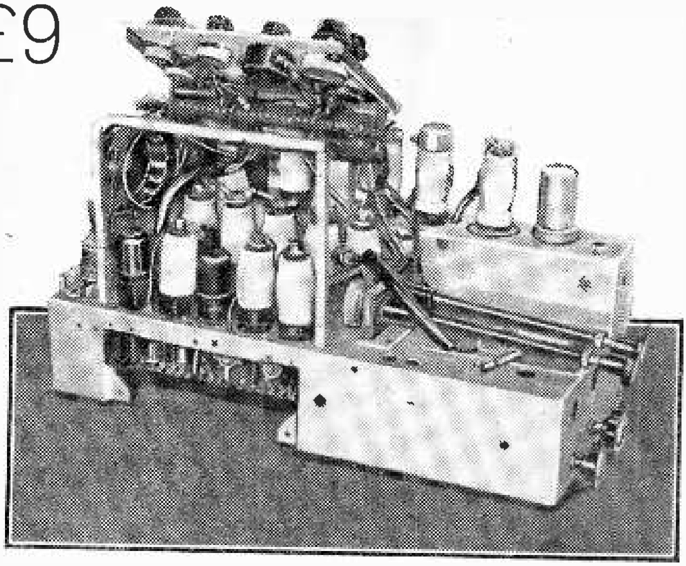
...FOR THE EXPERIMENTER

...Morley

should be tested and the base of the tube examined for looseness. Most of the dealers who sell this unit will change the tube if it is faulty.

The tube can be removed by unscrewing the screw fitted at the bottom of the bracket which supports the tube holder; the bracket can then be drawn back. The potentiometer panel on the top of the chassis can then be swung back on its hinge by undoing its retaining screws, and the tube can then be withdrawn from the chassis.

After removing the valves the whole of the unit should be completely stripped with the exception of the valveholders, the tube holder, the 0.03 μF 2.5 kV. condenser (which becomes C75), the D.C. restoring diode and associated resistor on the top of the chassis (these become V19 and R73), the focus and brilliance controls (which become VR9 and VR8), and the bleeder network (this becomes R76, 77, 78, and 79). Do not remove the leads from the CRT holder.



The receiver with tube removed.

Remove everything else from the chassis including the double-sided paxolin strip underneath the unit and the VR92 valveholder by its side.

The valveholder (see Fig. 1) in V20 position is removed and is replaced with a ceramic-based type for the E.H.T. rectifier valve. The valveholder occupying the next position is removed to make room for C78. The valveholder in V1 position is removed and is replaced with one of the EF50 type. Change the valveholder at V10 position with that at V9. Change the valveholder at V13 position with that at V11. Remove all the potentiometers from the top panel. Remove the front metal (double) panel.

Finally, test all the condensers for leakage. This is important, as a leaky condenser can cause some very puzzling faults, especially in the time base.

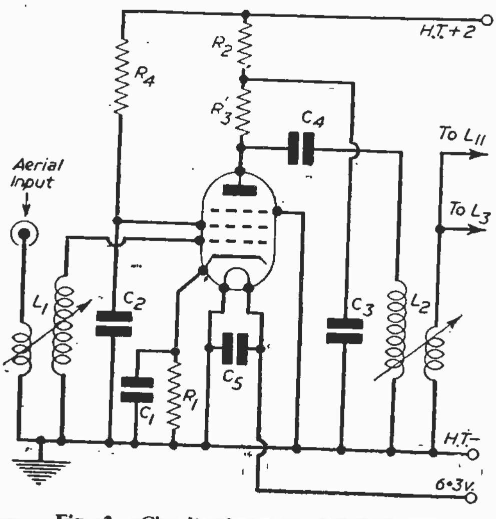


Fig. 2.—Circuit of the first R.F. stage.

The First R.F. Stage

The circuit diagram is given in Fig. 2. It uses an EF50 valve (V1) and provides a good signal for feeding into the sound and vision receivers. L1 and L2 are mounted under the chassis in the position shown in Fig. 1, the metalwork being drilled so that they can be trimmed from the top of the chassis. (This principle applies to all the tuning coils.) Coil-winding data is given in the table.

The various components can be grouped around the valve base, taking care to keep the leads short, and a metal screen 2in. by 2in. should be erected between this stage and the first vision R.F. stage. It will be found convenient to erect this screen after the components have been wired. The aerial connection is made on a Pye socket fitted at the back of the unit and a piece of coaxial cable is run from this socket to L1. The sheath of the cable should be earthed at both ends.

The Vision Receiver (Fig. 3)

This consists of four R.F. stages using VR65 valves, which feed into the VR92 diode detector, whose output is injected into the VR65 video valve. Sound rejection is provided by L5 and L8. All coils are mounted underneath the chassis in a similar manner to L1 and L2. Screened leads to the valve grids (top caps) should not be used, but V3 and V5 valve caps should be screened.

Metal screens, 2in. x 2in., should be mounted between each stage after the components in each stage have been wired. Keep all leads as short as possible and do not mount anode components near grid components.

Anode decoupling components can be mounted on a paxolin strip fitted on the side of the chassis underneath the valveholders. These components are: R5, C8, R8, C10, R13, C18, R17, C22, R18, C25, R23, C31.

LIST OF COMPONENTS

RESISTORS

No.	Value
1	100 Ω
2	2.2 KΩ
3	4.7 KΩ
4	5 KΩ
5	1 KΩ
6	4.7 KΩ
7	10 KΩ
8	100 Ω
9	1 KΩ
10	4.7 KΩ
11	10 kΩ
12	100 KΩ
13	1 KΩ
14	4.7 KΩ
15	10 KΩ
16	100 Ω
17	1 KΩ
18	1 KΩ
19	4.7 KΩ
20	15 KΩ
21	100 Ω
22	K4.7 Ω
23	1 KΩ
24	4.7 KΩ
25	47 Ω
26	30 KΩ
27	1 KΩ
28	4.7 KΩ
29	10 KΩ
30	100 Ω
31	4.7 KΩ
32	10 KΩ
33	100 Ω
34	2 MΩ
35	4.7 KΩ
36	2.2 KΩ
37	10 KΩ
38	20 KΩ
39	150 Ω
40	1 MΩ
41	470 Ω
42	10 KΩ (2, 20 KΩ 1 watt in parallel)
43	3 KΩ
44	1 MΩ
45	47 KΩ
46	10 KΩ
47	100 KΩ
48	10 KΩ
49	56 KΩ
50	120 KΩ
51	47 KΩ
52	4.7 KΩ
53	1 MΩ
54	2.2 MΩ
55	56 KΩ
56	120 KΩ
57	100 KΩ
58	100 KΩ
59	50 KΩ
60	33 KΩ
61	150 KΩ
62	5.6 MΩ
63	47 KΩ
64	2.2 MΩ
65	150 KΩ
66	2.2 MΩ
67	2.2 MΩ
68	2.2 MΩ
69	2.2 MΩ
70	100 KΩ
71	100 KΩ
72	100 KΩ
73	1 MΩ
74	2.2 MΩ
75	510 KΩ
76	180 KΩ
77	470 KΩ
78	470 KΩ
79	470 KΩ
80	390 KΩ
81	1.5 KΩ
82	1.5 KΩ
83	25 KΩ

CONDENSERS

No.	Value
1	500 pF.
2	500 pF.
3	500 pF.
4	500 pF.
5	500 pF.
6	230 pF.
7	230 pF.
8	230 pF.
9	100 pF.
10	230 pF.
11	230 pF.
12	230 pF.
13	230 pF.
14	230 pF.
15	5 pF.
16	5 pF.
17	230 pF.
18	230 pF.
19	230 pF.
20	230 pF.
21	100 pF.
22	230 pF.
23	230 pF.
24	230 pF.
25	0.01 μF.
26	100 pF.
27	230 pF.
28	5 pF.
29	5 pF.
30	15 pF.
31	0.01 μF.
32	0.1 μF.
33	0.1 μF.
34	230 pF.
35	230 pF.
36	500 pF.
37	500 pF.
38	500 pF.
39	500 pF.
40	500 pF.
41	500 pF.
42	500 pF.
43	500 pF.
44	500 pF.
45	35 pF.
46	0.001 μF.
47	0.01 μF.
48	0.01 μF.
49	0.01 μF.
50	0.01 μF.
51	0.002 μF.
52	50 μF.
53	0.05 μF.
54	0.01 μF.
55	0.1 μF.
56	0.005 μF.
57	0.25 μF.
58	0-75 pF.
59	100 pF.
60	0.01 μF.
61	0.01 μF.
62	50 pF.
63	60 pF.
64	100 pF.
65	0.5 μF.
66	8 μF.
67	0.003 μF.
68	0.01 μF.
69	0.01 μF.
70	0.001 μF.
71	0.004 μF.
72	0.01 μF.
73	0.5 μF.
74	0.01 μF.
75	0.03 μF. 2.5 kV.
76	0.1 μF. 500 v.
77	0.1 μF. 2.5 kV.
78	0.1 μF. 2.5 kV.
79, 81	16+8 μF. } 450 v.
80, 82	16+8 μF. } 450 v.
83	500 pF.
T1, T2, T3	0-30 pF. postage-stamp type trimmers.

All resistors ½ watt unless otherwise stated above or in the text. Component tolerances + or −15 per cent. Components should be combined in series or parallel to make the utmost use of those in the 62 unit.

POTENTIOMETERS

VR1—5 KΩ, Contrast.
VR2—¼ MΩ, Volume.
VR3—½ MΩ, Line Hold.
VR4—25 KΩ, Height.
VR5—2 MΩ, Frame Hold.
VR6—100 KΩ, Shift.
VR7—100 KΩ, Shift.
VR8—100 KΩ, Brilliance.
VR9—500 KΩ, Focus.

VALVES : CIVILIAN EQUIVALENTS

VR65—Mazda SP61.
VR92—Mullard EA50.
VR54—Osram D63.

TRANSFORMERS

E.H.T.—200-230 volts input ; Output, 2,500 volts 3 mA. 4 volts, 1 amp. C.T. 4 volts, 1 amp. C.T.
H.T.—200-230 volts input ; Outputs, 350-0-350 volts 160 mA. 5 volts 3 amps, 6.3 volts 3 amps, 6.3 volts 6 amps.

COIL WINDING DATA

L1, L2 } Primary 1 turn. Secondary 4½ turns.

L3, L6 } 4 turns.

L4, L7 } 4½ turns.

L9 5 turns.

L11, L12, L13 } Primary 2 turns. Secondary 4 turns.

All above coil forms are 3/8in. diameter.

Secondary spacings approximately 2mm. between turns.

Wire gauge, 18 s.w.g.

L5, L6 } 9 turns 22 s.w.g. ¼in. forms.

Note.—The above data refers to Sutton Coldfield. For Holme Moss or London add 1½ to 2 turns in each case, except on the primaries. Add ½ turn on the primaries. The rejector coils will not be required on the London frequency.

L10, 50 turns 40 s.w.g. enamelled wire wound between cheeks ½in. diameter spaced 1/64in. apart mounted on a 1 MΩ resistor.

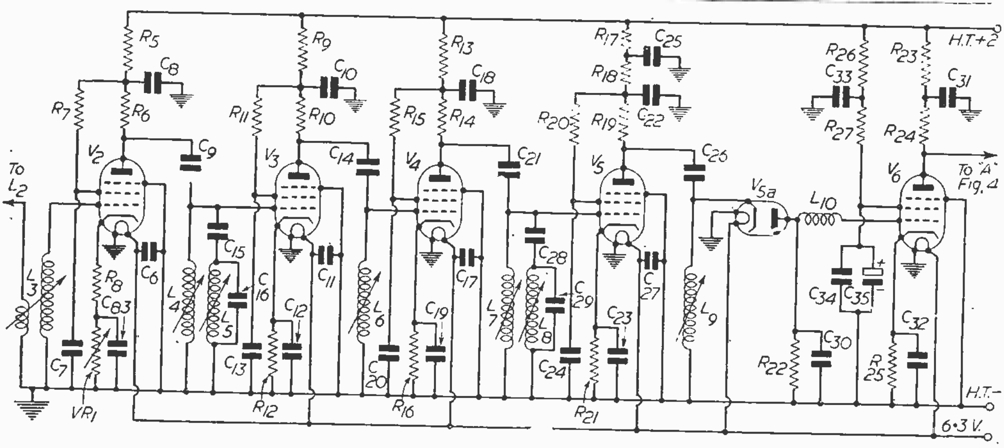


Fig. 3.—Circuit of the vision section.

VR1 forms the contrast control and is fixed on the front panel.

V6 and its associated components, L9, R22, C30 and L10, are wired directly on the tag strip, no valveholder being used.

The Time-base (Fig. 4)

All valves are VR65s with the exception of the D.C. restorer diode (V12) which is a VR92. (Note there are *two* D.C. restorers in this unit, one in the time-base and one in the CRT circuit.) V13 is the phase splitter, the signal for the CRT grid being taken from the cathode resistor, R43. V14, the sync. separator, follows and feeds the sync. pulses to frame and line time-bases.

The line time-base receives its sync. pulse from the condenser C58, which is made variable so as to obtain the best amplitude of sync. pulse, for triggering the line oscillator.

Both line and frame time-bases use the Miller Integrator combined with Transitron oscillator, as sawtooth generators. V15 is the line oscillator, its frequency being varied by VR3 which forms the "line hold" control. Output of sufficient amplitude is obtained by paraphase amplification which employs V16. The output to the deflector plates is taken from the anodes of these two valves via C60 and C61 which are 450-volt working.

The frame oscillator (V17) is similar in nature to V15, the only difference being in component values. VR5 is the "frame hold" control and V18 forms the other half of the paraphase amplifier. The frame deflector plates are fed from C68 and C74 which are both 450-volt working.

Components marked with an asterisk in Fig. 4 are mounted on the double-sided tag strip taken from underneath the chassis. It will be found convenient to wire up this strip before fixing it back in the chassis, leaving about 6in. long leads where interconnection between strip components and chassis components are to be connected together.

On the other side of the strip should be mounted the components for the sound receiver which are indicated in Fig. 5. *(To be continued)*

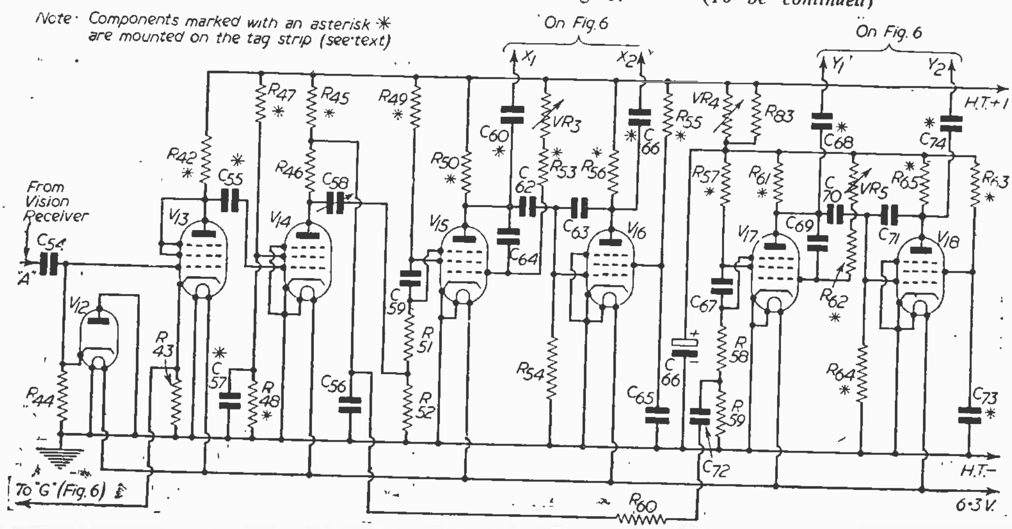
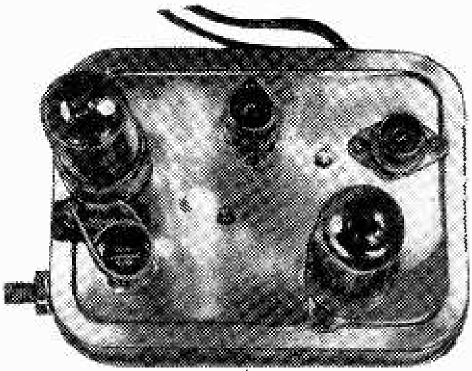


Fig. 4.—Circuit of the time-base section.

Birmingham-Holme Moss Converter

THE LIMITATIONS OF THIS TYPE OF UNIT DESCRIBED, AND A PRACTICAL DESIGN

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



A LITTLE after the Sutton Coldfield (channel 4) television station went on the "air," the author described the construction of a converter suitable for adapting Alexandra Palace (channel 1) receivers for operation on channel 4 (see London/Birmingham Converter, P.T., Feb. 1951). A method was depicted of performing the above adaptation, without the need for receiver modification. So far, reports have indicated that this unit has proved very successful, even though the vestigial sideband vision signal from channel 4, in theory, offers limitations of vision quality (see "Correspondence," P.T., March and April, 1951).

Now, on the opening of the Holme Moss station (channel 2), many requests have been received for modification details applicable to this converter, rendering by its inclusion a channel 4 receiver adaptable to channel 2.

The author has carried out experiments in this direction, and the following notes indicate the limitations of Birmingham/Holme Moss conversion as experienced by him.

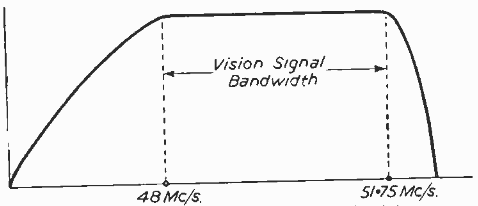
Local Oscillator Radiation

The previously described converter employs a local oscillator operating on the frequency difference between channel 1 and channel 4 (16.75 Mc/s). On the face of it, therefore, it would appear that by altering the coils L1 and L2 to tune channel 2, and arranging the local oscillator to work on 10 Mc/s (the frequency difference between channel 2 and channel 4), the desired conversion would be achieved. From the theoretical aspect this is, indeed, the case, since a frequency of 10 Mc/s heterodyning with an incoming signal of 48.25 Mc/s will produce the following frequencies: 10 Mc/s plus 48.25 Mc/s, and 10 Mc/s minus 48.25 Mc/s. By selecting the former frequency (58.25 Mc/s), channel 2 sound is converted to the frequency of channel 4 sound. The same reasoning applies to vision, and further, because both channel 2 and channel 4 transmitters employ the vestigial sideband principle, the quality limitations offered by the London/Birmingham converter are avoided.

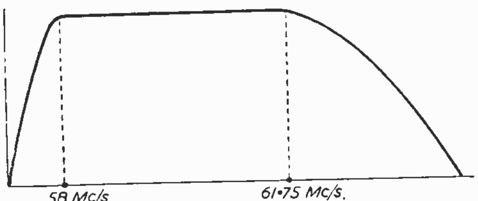
Unfortunately, in practice, harmonic radiation from the 10 Mc/s local oscillator causes this system to be impracticable when conversion of these frequencies is desired. This will be appreciated by considering the mid-band vision frequencies of channel 2 and channel 4 in relation to the fifth and sixth harmonic of the local oscillator. Such harmonic radiation is accepted by both the converter input, and the receiver input direct, and manifests itself in the form of a powerful interference pattern on the screen of the receiver.

Furthermore, a large number of commercial superhet receivers use 10 Mc/s or near for their intermediate frequency. Therefore, radiation from the local oscil-

(*Continued on page* 319)



(a) Frequency characteristic of Channel 2 Vision Transmission



(b) Frequency characteristic of the converted Channel 2 Transmission as applied to a Channel 4 Receiver

Fig. 1.—Important frequency response curves.

LIST OF COMPONENTS

R1—6.2 KΩ ½ watt.
R2—150 ohms.
R3—10 KΩ.
R4—1 KΩ.
R5, R6—27 KΩ.
R7, R8—22 KΩ.
(N.B.—All resistors are rated at ¼ watt unless otherwise stated.)
C1, C2, C3, C4, C13, C15—1,000 pF. Hunts Midget Moldseal Type W99.
C5, C14, C9, C10—5 pF midget tubular ceramic.
C6—100 pF midget tubular ceramic.
C7, C12—25 pF midget tubular ceramic.
C8, C11—40 pF midget tubular ceramic.
2 Belling-Lee Co-axial sockets Type L604/5.
2 B8A Valve Bases.
3 Aladdin Coil Formers, ⅜in. diameter, complete with cores.
V1—6F1 Mazda.
V2—6L19 Mazda.
GEX 33—G.E.C. Germanium Crystal Diode.
Four 3-way Tag Strips, centre tag earth.

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MILLIAMPS D.C.: 0—.15—1.5—15—150—1,500.
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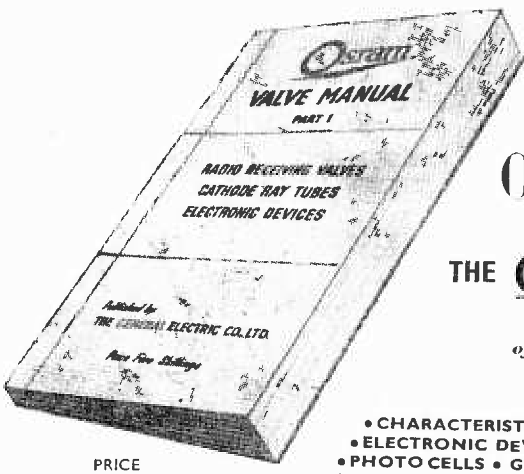

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3½in. ...	11/6	5in. ...	12/6
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10in. ...	25/- (as available).		

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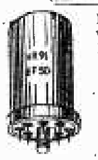

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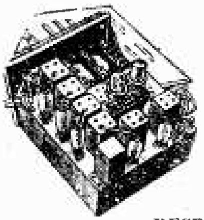
Made by very famous manufacturer, new and unused, 9/6 each. P.M. Type (quick adjustable), 17/6 each.



10-VALVE 1½-METRE SUPERHET

Ideal for conversion into a Midlands or London region Televisor. These contain 6 valves type SP61 (two) and one each RL7, RL16 and EA50. Six I.F. Transformers of 12 mc/s, 4 mc/s band width, and hundreds of other useful components. Price 59/6, plus carriage and packing 5/-. These receivers are unused and in original wrappings.

RECEIVER 3457

These cost over £100 each to build; they contain 15 valves type EF50 and one each of VR56, VR55, VR92, and two of types VR116 and VR54. These contain a host of valuable pot. meters, motors, relays, gearbox and components of all descriptions, and in addition they contain the famous "Pye" 45 mc/s television strip. Brand new in transit boxes. Price £5 19s. 6d.

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This indicator known as A.S.B. uses the same circuit and the same equivalent parts as our famous Type 6. For instance, it uses tube type 5BP1, which is the American equivalent of the VCR97; it uses valves type 6AC7, which are the American equivalents of the EF50; and, of course, it is packed full of very useful components. This unit can be made into an excellent 'scope and the *Wireless World* data available, price 9d., will be an excellent guide. Price for the Indicator Unit is £4 10s. 0d., carriage 10/- extra.

BRITISH INDICATOR UNIT TYPE 6

Contains the famous VCR97 and EF50 valves, brand new and in original packing. Price 79/6, plus carriage and packing case 10/-.

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UNIT TYPE RDF1

As suggested by October issue as suitable for home-built Televisor, but with the complete set of 14 valves instead of 11, e.g., 5 of SP61, 2 of P61, 3 of EA50, and 1 each of CV63, EB34, EC53, 5Z4. Price 49/6 plus 5/- postage.

194 STRIP

Also described in the October issue, contains 8 valves and really does give superior results. Price 45/- plus 2/6 postage.

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Size 13in. × 10½in. 4/-

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CATHODE RAY TUBES

Note.—All these tubes have green fluorescence.

5CP1.—5in. electrostatic, American manufacture, medium persistence suitable for TV or 'scope, in original cartons, 19/6, carriage and insurance 2/6.

VCR517.—6in. electrostatic, medium persistence, suitable for TV or 'scope work: unused, ex new equipment, 22/6, carriage and insurance 5/-.

VCR97.—We have had a new delivery of this new famous electrostatic 6in. TV tube. These are not the cut-off type, they give a full picture, 42/6, carriage and insurance 5/-.

VCR516.—9in. magnetic tube, long persistence which makes it rather unsuitable for TV. Price £2 10s., postage and insurance 10/-.

CV961.—7in. electrostatic, short persistence, suitable for TV., 47/6, carriage and insurance 2/6.

ELECTRONIC PRECISION EQUIPMENT

152-153 FLEET STREET, E.C.4, and at WINDMILL HILL, RUISLIP MANOR, MDDX.

GERMANIUM CRYSTAL DIODES. Complete with circuit, 4/6; CV102 Crystal, 3/6; W6, WX6, 1/6.

R.3515 I.F. STRIP. A complete I.F. Unit comprising 6 SP61 I.F. Stages, tuned to 13.5 Mc/s, 1 EA50 diode detector and 1 EF36 or EF39 output or video stage. A few modifications only are required to adapt this unit, which will give pictures of extremely good quality. Price, complete with valves and foolproof modification instructions is 45/-, plus 5/- carriage and packing. Limited quantity only.

5CP1 C.R. TUBES. Brand New and Boxed. 25/- carriage paid.

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3547 RECEIVERS. Absolutely brand new, in sealed manufacturers' packing cases. Incorporating 15 valves type EF50, 2 of SP61, EF36, EBC33, 3 of EB34. Complete 45 Mc/s I.F. Strip, motor dial and drive, pots, etc., etc. £6 only, plus 10/- packing and carriage.

I.F. TRANSFORMERS. Manufacturers' surplus. Iron-cored, 465 kc/s. Size 4in. x 1½in. x 1½in. Per pair 8/6.

VIBRATOR POWER UNITS, 2 volt. As for Canadian 58 set. Completely smoothed, output 1.5v. L.T. and 90v. and 180v. H.T. at 35 m.a. Complete in grey metal box. Size 8 x 3¾ x 4½. 50/- only.

METAL RECTIFIERS. S.T.C. 300 volts 75 m.a., 6/-. G.E.C., 6 volts 1 amp. 4/-. Westinghouse, 12 volts 2 amp., 12/6. 12 v. 3½ amps., 17/6. Pencil Type E.H.T., 600v. 1 m.a., 4/7; 1,000v. 1 m.a., 6/-.

BATTERY VALVES, 2 VOLT. P2, Super Power, 4/-; HL2, Detector, 2/6; 215SG, 4-Pin Screen Grid, 6/-. PEN 220A, Pentode, 6/-; VP2 Var. Mu H.F. Pentode, 7-Pin, 8/6; VP23, Var. Mu PEN 25, 8/6; QP25, Q.P.P. Output, Mazda Octal, 12/6; ATP4, Trans./R. Output, Mazda Octal, 7/6; TDD2A, Double Diode Triode, 8/6.

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RECEIVER TYPE 25. The receiver portion of the T/R 1196. Covers 4.3-6.7 Mc/s and makes an ideal basis for an all-wave receiver, as per *Practical Wireless*, August, 1949, issue. Complete with valves type EF36 (2), EF39 (2), EK32 and EBC33. Supplied complete with necessary conversion data for home use. 35/-. New condition.

No. 38 "WALKIE-TALKIE" TRANS/RECEIVERS. Complete with Throat Mike, 'Phones, Aerial Rods and Junc. Box. Freq. Range: 7.4 to 9 Mc/s. As new and guaranteed. £4/19/6. Carr. 2/6.

RECEIVER R.1355 as specified for "Inexpensive Television." Complete with 8 valves VR65, and 1 ea. 5U4G, VU120, VR92, and a copy of "Inexpensive TV." ONLY 55/- (carriage, etc., 7/6).

Send stamp for 28-page Component List. Please include postage under £1

A SIGNAL TRACER at minimum cost. An easy-to-build unit that can be used for R.F., I.F. and Audio signal tracing, without any switching or tuning. Highly sensitive, easy to build, responds to signals picked up from an ordinary receiving aerial. The circuit is that of a high-gain, 3-stage resistance-coupled audio frequency amplifier, with a 5in. speaker in the output of the Power Amplifier stage. We shall be pleased to supply a complete kit for the construction of the above, right down to the last nut and bolt for the low price of £3/18/6. Concise instructions and circuits are supplied. If preferred, circuit and instructions only can be supplied for 1/6 post free. All items may be purchased separately. This is a highly efficient instrument, and a MUST for every radio man. Completely assembled and tested, ready for use, £5/5/0.

EX-GOVT. VALVES. The following are brand new: EF50 Red Sylvanian, original boxes (U.S.A.), 10/-; EF50, English Types, original boxes, 8/6; EF50, ex-Units, guaranteed, 6/-.
The following at 8/6 each: EF50, EF54, EF55, CV66, EF8, EF36, EF39, EK32, EL32, EBC33, 6K7GT, 6J7GT, 6L7GT, 6SK7GT, 6SJ7GT, 6B8GT, 6N7GT, 6J5GT, 6C5GT, 6AC7GT, 6SA7GT, 6SH7GT, 6D6, 6C6, 6N7GT, 12SA7GT, 12SK7GT, 12SJ7GT, 12SQ7GT, 12C.8, 12SR7GT, 12SH7GT, 12A6GT, 14A7GT, 12Q7GT, 7A7GT, 7C7GT, 7H7GT, 7S7GT, 7B6GT, 41MP, 955, 9002, 9003, 1299A, VR150/30, 28D7, 9D2, 4D1, 15D2, VU111, VU133, VU120A, OZ4, 6X5, VU120, 5Z4, 5Z4G, U50, U22. The following at 11/6 each: 35L6GT, 50L6GT, KT61, 6F7, AC6PEN, MU14, 6AM6, 6V6GT, 5U4G, 6Q7, 6A8G, U52, 6AG5, PEN46, 6SL7GT, EF91. The following at 12/6 each: 12K8GT, 6K8G, 6SN7GT, 6J6, 807, KT33C, 25A5G, 43, 6L6 (1622 Metal). Also EA50 (VR92), 3/6; D1, 3/6; EB34, 3/6; VR65 (SP61), 5/-; RL18, 5/-; 954, 5/-; 6H6, 5/-; S130, 7/6.

ALL DRY BATTERY VALVES. 3V4, 1C5, 1N5GT, 1H6, 1T4, 1S5, 1R5, 1LN5GT, 1S4, 3S4, all at 10/- each. Also HIVAC XH at 7/6.

(*Continued from page* 316)

lator, in this direction also, presents a potential danger. Filter circuits, tuned to 10 Mc/s, were included in the experimental circuit, but the remaining interfering signal was of such a magnitude as to render this mode of conversion very unsatisfactory.

The only other way by which external conversion may be effected is by making the local oscillator frequency higher than the incoming signal frequency.

Consider first the conversion of the sound by such a method. The sum of the sound frequencies of channel 2 and channel 4 equals 106.5 Mc/s. Obviously, then, the incoming channel 2 sound signal heterodyning with a local oscillator of 106.5 Mc/s will produce, amongst other frequencies, the sound frequency of channel 4. This method functions very satisfactory in practice, and, also, since harmonic radiation from the local oscillator is above 200 Mc/s it does not interfere in any obvious way with the signal frequencies. A snag arises, however, when the vision channel is considered. A local oscillator frequency of 106.5 Mc/s will need to heterodyne with a frequency of 44.25 Mc/s to produce the vision carrier frequency of channel 4. This means that the sound signal of channel 2 will be converted to that of channel 4, but instead of the vision signal also being converted, as with the lower local oscillator frequency, the input to the converter is open to signals which may fall around the 44.25 Mc/s mark. As is well known, this frequency falls within the radiated bandwidth of the vision signal of channel 1. Interference may, therefore, be expected from this source depending on location and prevailing signal conditions.

Two High-frequency Local Oscillators

In order to convert both vision and sound signals simultaneously, a second local oscillator is necessary. If the frequency of this second oscillator is computed from the vision carrier frequencies, a frequency of 113.5 Mc/s will be found to suit, but further analysis focused on the converted radiated vision bandwidth shows that this frequency will completely suppress the low-frequency end of the converted vision signal. Therefore, to achieve conversion over the whole of the radiated vision bandwidth, a local oscillator frequency of 110.75 Mc/s is needed.

Such an oscillator, however, will reverse the converted frequency characteristic of the vision signal. For instance, the high-frequency end of the vision signal from Holme Moss will produce, at the output of the converter, the low-frequency end of Sutton Coldfield's vision frequency, and the converse follows at the low-frequency end of the vision signal. The two curves of Fig. 1(a) and (b) illustrate this point. A certain amount of phase and amplitude distortion will ensue, due to this, but, in practice, a compromise oscillator setting minimises its effect.

A Birmingham/Holme Moss Converter

The design criterion for this mode of conversion is mainly frequency stability of the two local oscillators—especially the one employed for sound conversion. Another factor, which should also receive due attention, is the effect of unwanted signals present at the converter output, due to the combination of signals mixed therein. One which may cause trouble, where the receiver is a superhet, may be due to a harmonic of the frequency difference of the two local oscillators, gaining admittance to the I.F. channel of the receiver. An unwanted signal of 52.5 Mc/s would also be accepted by the converter, since it would heterodyne with the vision oscillator and produce the sound frequency of channel 4. The only other drawback offered by this system is its comparatively high production cost.

To produce freedom from spurious signals an R.F. amplifier is desirable in front of the converter proper. The signal output from this, of course, feeds the mixer, together with the two oscillator frequencies. Nevertheless, cost may be kept to a minimum by employing the new G.E.C. "crystal diode" as a mixer, and one of the current type double triodes solves the oscillator problem. It can, therefore, be seen that the number of valves, including an R.F. amplifier, need not exceed two.

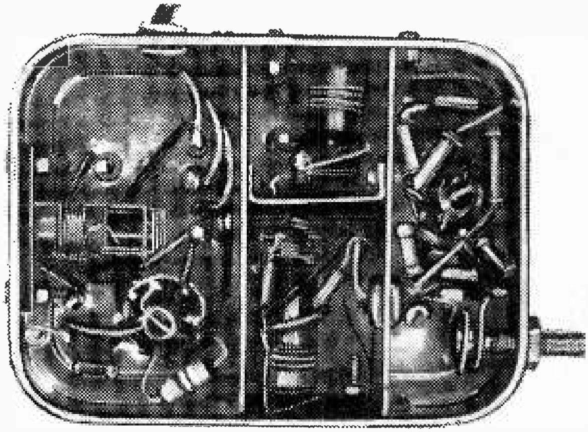


Fig. 2.—Underside view of the converter unit.

A Birmingham/Home Moss converter designed around this pattern has been developed by the author. The mechanical aspect of the unit is similar to that of the London/Birmingham converter, and details of construction are clearly shown by the accompanying photographs.

It will be seen that the unit is divided into four sections. The larger section houses the R.F. amplifier, coil L1, etc., and is marked (a) on the circuit diagram. The not-so-large, opposite section accommodates the two oscillators, and here it should be noted that the coil for the vision oscillator is mounted on the top of the chassis, close to the oscillator valve. A cut-down 2-pin plug is used to support the coil and is held in position by the valveholder retaining screw. It should be ascertained that sufficient clearance is given to the coil-connecting leads as they pass through the chassis. These leads should consist of 18 S.W.G. A good idea is to pass the end of the actual coil through the centre of the plug, and connection may then be made direct to the coil. The sound oscillator coil is mounted underneath the chassis close to the valveholder and is secured to the two outside tags of a three-way tag strip, which is held in position on the chassis by the centre tag. Both oscillator coils are, of course, self supporting, and, assuming ½in. in diameter, they are wound with two turns of tinned 18 S.W.G. wire. Brass cores are used to form the tuning control of each oscillator, and may be large-headed 0 B.A. brass screws. On the appropriate section a hole is drilled in the chassis to clear an 0 B.A. screw, and directly above an 0 B.A. nut is soldered, to provide simple adjustment of the oscillators. The threaded end of the screw is available for adjusting the sound oscillator, and, if desired, it may be cut to take the blade of a screwdriver. The oscillator section is marked (b) in the circuit diagram. One of the two smaller sections houses the mixer section, comprising the coil L2, the crystal diode, and associated components (section (c), circuit diagram). The remaining section is used to screen coil L3 (section (d); circuit diagram). Belling and Lee coaxial input sockets are fitted to the top of the chassis over section (a) and (d) for aerial input and signal output respectively. The capacitor C6, feeding the output from the mixer to the coil L3, is pushed into a rubber grommet between sections (c) and (d). The same procedure applies to the oscillator feed capacitor C14, between sections (b) and (c). Further details relevant to construction may be acquired from the previously mentioned article.

The Circuit

The R.F. amplifier follows conventional design, and its output is transmitted, together with the two local oscillator frequencies, to the crystal mixer. R3 and C5 form the mixer load, across which appears the heterodyne frequencies. L3 selects the converted sound and vision signal only. A tapping on L3 enables connection to be made to the receiver in the usual way.

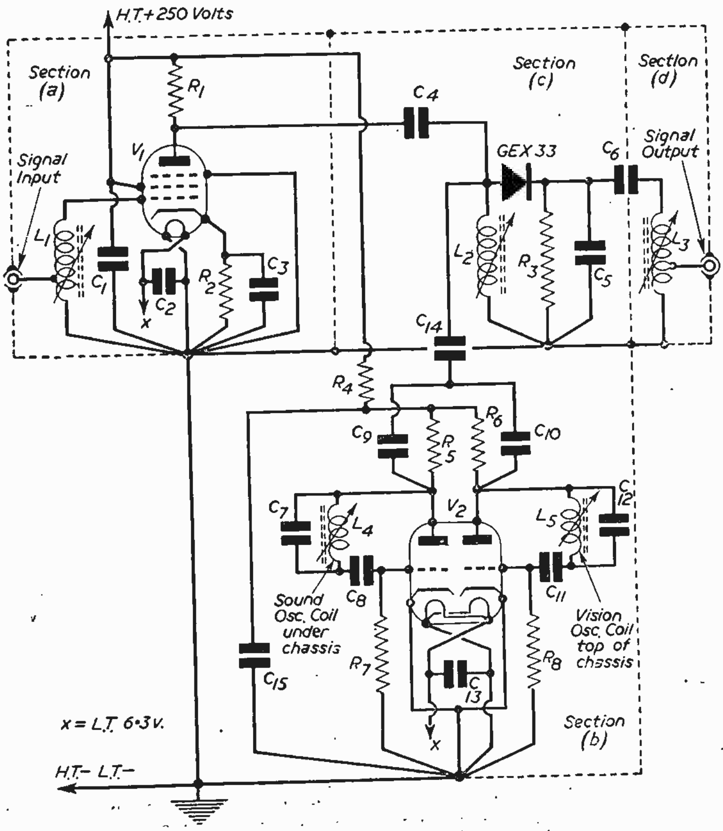


Fig. 3.—Theoretical circuit of the converter.

The Coils

The three coils L1, L2 and L3 are wound on Aladdin formers of ⅜in. diameter and use standard cores. All windings start ¼in. from the base of the former.

L1 : 7.25 turns close wound, tapped at 1.5 turns at the earthy end.

Wire : 30 S.W.G. d.c.c.

L2 : 6.5 turns close wound. Wire as above.

L3 : 5.5. turns close wound, tapped at 1.5 turns at the earthy end. Wire as above.

L4, L5 : See text.

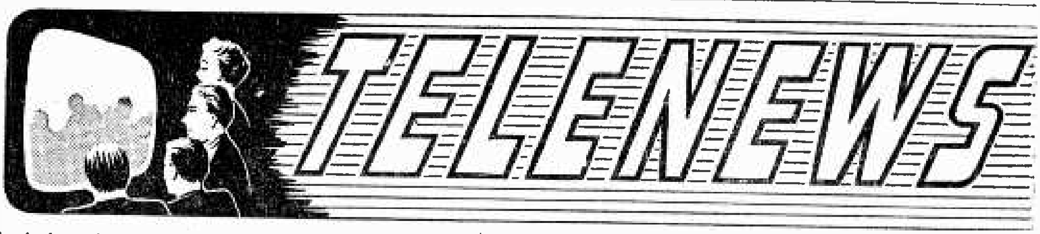
Setting Up

Adjustment of this unit is slightly more complicated than the London/Birmingham converter, but with patience it should present no undue difficulty.

The cores of L1, L2 and L3 are first set to their mid-positions. L5 is then tuned until the vision signal is received. L4 is next adjusted for maximum sound. Care should be taken when performing this adjustment because it is very easy to pass the tuning point. It may be found that while adjusting L4, the vision tuning is affected. If this occurs L5 should be readjusted before continuing with the tuning of L4. This process should be continued until both vision and sound are received at their maximum. L3 is then tuned for maximum vision, after which, L1 and L2 are adjusted for a compromise between sound and vision. Finally, a re-check of the local oscillator tuning is recommended.

It should be appreciated that the spacing between the windings on the oscillator coils will appreciably affect their frequencies. Therefore, if the desired tuning range of the oscillator coils does not come within the limits of the brass cores, altering the distance between the turns will correct this. The oscillator frequency will increase with the spacing between the turns. Another point worthy of note is that while an iron-dust core reduces the frequency of a tuned circuit, a brass core increases the tuned frequency.

As previously mentioned, this converter suffers characteristic limitations, and the design presented indicates a phase in the experiments of the author, but nevertheless, very good results from Holme Moss have been received with the prototype at a distance in excess of 130 miles from the transmitter, using a London aerial facing in the opposite direction ! It is hoped, therefore, that these notes will prove of assistance to the very many requiring information on this subject.



Anti-glare Spectacles

MR. E. WILLIAM CHINN, a Brighton optician, has designed a special pair of anti-glare spectacles for the prevention of eyestrain while viewing.

They are to appear on the market soon.

New Outside Unit

IT was recently announced in Birmingham, by Mr. H. J. Dunkerley, BBC Midland Regional Controller, that the television outside broadcast unit, which will be jointly shared by the Midland and the Northern (Holme Moss) regions, will cost between £55,000 and £60,000.

Mr. Dunkerley said that there would be seven programmes each month from the North and Midlands, and that although both regions would use London's outside broadcast equipment at first, they would eventually have a unit of their own with a permanent staff to service and operate it. The capital cost is expected to be around £75,000.

More Licences in North-west

IT is reported from the north-west that television licences are being issued at the rate of several hundred a day. In Manchester alone, the total value of licences sold (at £2 each) is now well over the £15,000 mark.

Demand from Channel Islands

THE formation was announced last month of a committee of Channel Islands radio traders, set up for the pressing of a television service across the channel.

They claim that a micro-wave transmitter could be built on the mainland, near Lyme Regis, enabling programmes to be relayed from the transmitter at Wenvoe, South Wales, which is due to be opened in the spring of next year.

Advantage of Television

AT a recent luncheon of the Radio Industries Club, of Merseyside, Mr. H. A. Curtis, secretary and director of the Radio and Television Retailers Association, Ltd., reviewed the effect of television on the country. He said that one of its greatest assets was its bringing together of the family.

Broadcasts from Empire State Building

THE National Broadcasting Company's aerial, for its station WNBT, is now in operation on top of the 1,250ft. tall Empire State Building, after eleven months of work often delayed by bad weather conditions. At times progress was halted through strong, gale-like winds which blew at the top of the tower, while down below at street level the weather was often sunny and the temperature mild.

The mast itself measures 215 feet.

America Leads

A SURVEY issued in New York shows that the United States leads the world by a considerable margin in television with 108 stations and 14,000,000 receivers. Britain is second with three stations and roughly a million receivers.

Canada, although without any stations, has 1,500,000 sets in use. These are owned by viewers living near to the American border where American programmes can be received. By next year, however, Canadians will have two stations of their own at Toronto and Montreal, and in view of this the sale of receivers there is growing.

Latin America, the survey shows, is building more stations than any other area in the world; nine are already in operation and another 20 in preparation.

"Good Wireless and Television Reception"

HOLDERS of sound and television broadcast receiving licences who complain to the Post Office of interference to their reception of programmes will in future be given a pamphlet which tells them how they can make simple tests to ascertain whether the trouble is due to a faulty receiver or inefficient aerial and earth systems. Interference due to such causes should not be referred to the Post Office Interference Investigation Service, but should be dealt with by the owner of the receiver or his radio dealer.

If, however, the tests indicate that the interference is due to causes outside the control of the owner of the set, there is a form at the end of the pamphlet for enlisting the services of Post Office engineers to track down the source of the trouble.

A Post Office spokesman said that this new method of dealing with complaints of radio interference has been adopted because in a large proportion of the cases investigated by the Post Office bad reception was due to faulty receivers and/or inefficient aerial and earth systems. It is hoped that use of the new pamphlet will effect an appreciable reduction in the heavy calls made on the Interference Investigation Service.

Dr. R. C. G. Williams

DR. R. C. G. WILLIAMS, chief engineer of Philips Electrical, Ltd., who is vice-president of the Commercial Committee of the Comite International de Television, attended the meeting of this committee in Paris during the French Television Exhibition.

The C.I.T. was formed at the end of 1947, with the object of discussing and exchanging views internationally in the broad field of television technique and development. It holds various committees and functions in several European capitals.

Just issued is Vol. 1, No. 1, of their bulletin which, in future, will be issued to interested academic, Civil Service and university bodies all over the world.

Training at Southend

THE first course for Scottish TV engineers assembled at the EKCO Television School, on October 15th, and courses will continue to be run until all Scottish Ekcovision dealers have staff qualified to undertake installation and servicing of Ekcovision receivers.

It is felt that the advantages of holding courses in Scotland are outweighed by the benefit to students of attending an established school with fully experienced instructors and also where a "live" signal and actual experience of television viewing conditions can be obtained. Ekco will be paying the return rail fare of all Scottish students from either Glasgow or Edinburgh to Southend.

Everyone who qualifies will be given the diploma at present granted to successful students at the Ekco school.

Big Bills for Hospitals

FOLLOWING an appeal from the G.P.O. to hospital authorities concerning the adjustments of machinery which may cause interference to television, Tyneside hospitals may soon find that some quite considerable expense has been incurred.

Although no figures are yet to hand, it is expected that the final amount will run into several hundreds of pounds.

First To Be Televised?

WHEN a memorial plaque was unveiled last month over 22, Frith Street, Soho, W., where John Logie Baird first televised a human being, an interesting situation developed.

This first televised human subject had been Baird's own office boy, but the argument which has developed is as to who exactly was Baird's office junior at the time.

Bill Taynton had been generally accepted as the original and was having tea with officials after the unveiling when a rival appeared. He was Joe Hamelford, a piermaster, who claimed that he had been Baird's subject and that Taynton had taken over the job afterwards.

Both men have given accurate descriptions of Baird, his methods and his peculiar mannerisms.

Broadcast Receiving Licences

STATEMENT showing the approximate numbers issued during the year ended September 30th, 1951.

Region	*Number*
London Postal ..	2,343,000
Home Counties ..	1,649,000
Midland	1,746,000
North Eastern ..	1,918,000
North Western ..	1,613,000
South Western ..	1,071,000
Welsh and Border Counties	730,000
Total England and Wales	11.070.000
Scotland	1,111,000
Northern Ireland ..	210,000
Grand Total.. ..	12,391,000

The above total includes 958,500 television licences.

Servicing Calls

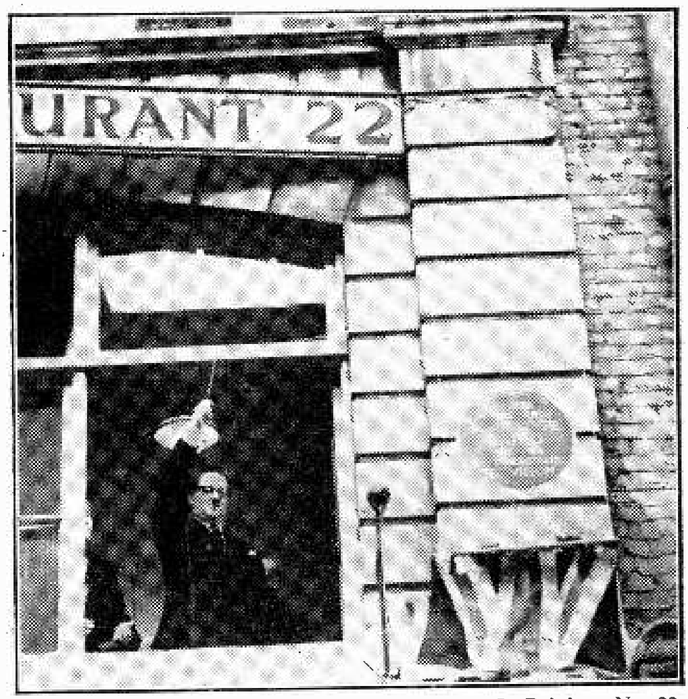
MANY northern radio dealers have reported a great rush of complaints from new viewers concerning their sets, and maintenance staffs are being kept busy with orders for servicing and adjusting sets.

It appears, however, that in many cases adjustments to be made are those that can be done easily by the viewers themselves, such as the alteration of height and width controls. Unnecessary calls are also caused by viewers who attempt to adjust controls before their receivers have been given enough time to warm up.

Television in Holland

SINCE March, 1948, experimental television programmes have been transmitted from a Philips' factory in Holland covering an area of about 30 miles. The Netherlands Government has now granted a licence to an organisation representing four of Holland's largest broadcasting companies and the country's television services were officially inaugurated last month by Dr. Cals, Under-Secretary of State for Education, Arts and Sciences, when he addressed the small number of Dutch viewers in the first programme.

The programme included also a contribution from the new Danish studios and the congratulations and good wishes of Sir William Haley.



Sir Robert Renwick unveils a memorial plaque to J. L. Baird on No. 22, Frith Street. It was in these premises that his first experiments were carried out—in the room above that in which this unveiling ceremony took place. The Plaque carries the following inscription: "London County Council. In 1926 in this house, John Logie Baird, 1888-1946, first demonstrated television."

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B. H. MORRIS & CO. (RADIO) LTD.

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OPEN TILL 6 P.M. SATURDAYS Phones : AMBASSADOR 4033 & PADDINGTON 3271/2

TERMS OF BUSINESS :—CASH WITH ORDER OR C.O.D. OVER £1. Please add 1/6 for post orders under 40/- 1/- under 20/-. Over 40/- carriage free unless otherwise stated.

BALANCED ARMATURE LOW RESISTANCE HEADPHONES, Type 1, 5/11 set.

BALANCED ARMATURE LOW RESISTANCE HEADPHONES, Type 2, 7/11 set.

HIGH RESISTANCE HEADPHONES, 12/6 set.

LIGHTWEIGHT HIGH RESISTANCE HEADPHONES, 14/6 set.

MOVING REED HEADPHONES, Type 5, 8/11 set.

TANNOY HAND MICROPHONES, with switch in handle, 4/11. Post and insurance, 2/-.

BRAND NEW R1155 RECEIVERS, in original cases, complete with 10 valves, £12/10/-. 7/6 Packing and carriage.

BRAND NEW R1355 RECEIVERS, in original cases, as specified for the "Inexpensive Televisor," complete with 11 valves, £2/15/-. 7/6 Packing and carriage.

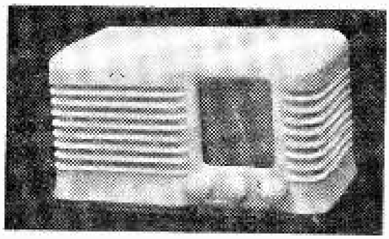
TUNING CONDENSERS, 4-Gang, .0005 mfd. Ceramic insulation, ¼in. spindle, 5/-. 3-Gang, .0005 mfd., ¼in. spindle, 7/6.

G.E.C. GERMANIUM CRYSTAL DIODES, wire ends, midget size. The ideal Crystal Detector, 4/6.

THREE-PIECE AERIAL

Ex U.S.A. copper-plated steel, highly flexible with non-stick screw joints, tapering ½in. to ¼in. Brand new, in container, 6/9, packing and carriage, 1/6. Insulated Base, 2/6.

Build a professional-looking Radio at less than half today's price



We can supply all the parts to help you.
Bakelite Cabinet (Brown or Ivory), 17/6. Packing and insurance, 2/6.
Punched Chassis, 3 valve plus rectifier T.R.F., 3/9
Engraved Glass Dial, 180-550 and 800-2,2200 m., 1/- with station names, new wavebands.

T.R.F. COILS 180-550, 800-2,200 metres, pair	6/6
Drum (2½in. diam.)	1/-
Driving Head	1/-
Double Pointer	4d.
Spring	3d.
Nylon Cord (yard)	6d.
Dial Front Plate	2/6

SEND 1/6 FOR EASY-TO-FOLLOW, POINT-TO-POINT DIAGRAMS AND CIRCUIT DIAGRAM, which show you how YOU can build the Receiver illustrated at HALF TO-DAY'S PRICE.

THE COMPLETE KIT to construct a 3-valve plus rectifier TRF Receiver for use on 200/250 v. A.C. mains can be supplied at £6 9s. 6d., plus 2/6 packing and carriage.

Each Kit is complete in every detail, nothing has to be made or improvised. Easy-to-follow, point-to-point diagrams are supplied, making construction very simple. The Dial is illuminated and the Receiver, housed in a Bakelite Cabinet size 12in. x 5in. x 6in., presents an attractive appearance. The valve line-up is 717A — H.F. Pentode, VR116 — Detector, ATP1—Output, and Metal Rectifier.

Waveband coverage is for the medium and long bands. Choice of Walnut or Ivory coloured Cabinet.

EX U.S.A. U.H.F. AERIAL, with Untuned Detector Stage consisting of VR92 Valve. Brand new 5/-.

CRYSTAL MICROPHONE

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IMPORTANT ANNOUNCEMENT: Premier Radio Co. no longer have a branch at Fleet Street, London, E.C.4. Premier products can be obtained at our only address, 207, Edgware Road, W.2. We cannot accept responsibility for, or guarantee any kit or component sold as a Premier product by firms other than ourselves.

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T.V. TUBE MASKS.—12in. New Ratio, brand new, 15/- each, post free.

ELAC FOCUS UNITS for Triode and Tetrode Tubes, P.M. type, List 303. Our price 20/- each, post free.

XTAL DIODES, 3/9 each. Germanium Diodes, 5/6 each.

COAXIAL CABLE, ¼in. Polythene Insulated, 1/3 yd. Post and packing 1/6.

EX-W.D. EF50's, 6/6 each. New and boxed, 10/- each.

807's, new, 10/- each, or 35/- for 4.

W.W. POTS.—5K, 10K, 20K and 25K., 2/6 each.

CATHODE RAY TUBES, Type 5CPI. Brand new in cartons, 17/6 each. Packing and Postage 1/6. VCR97 in crates, 30/-. Post and packing 1/6.

VCR97 HOLDERS, 2/6 each. EF50 holders, 9d. each.

CARBON POTS.—50 k., 100 k., 1 meg. and 2 meg., 1/6 each.

CONDENSERS.—.1 mfd. 8,000 v. test, 3/- each. Post 9d.

All "**VIEWMASTER**" parts available from stock. Viewmaster Constructor envelopes for A.P., S.C. and H.M. in stock at 5/- each. Postage 6d.

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TELEVISION PICK-UPS AND REFLECTIONS

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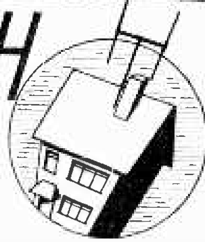


By Iconos

THE General Election has come and gone, and prior to Polling day, many of the candidates were plied with questions affecting the BBC, Television, big screen television, and broadcasting generally. Radio questions were, admittedly, minor ones in the estimation of the general public, but nevertheless, in some constituencies they played an important part amongst the hundreds of questions fired at the harassed candidates, some of whom are now our "governors." Mixed in with the questions fired at the platforms, on the subject of welfare were those concerned with education and entertainment in general—and television in particular. I feel that readers would be interested in some of the views expressed, especially as they appear to have no particular party bias, probably because the official policies of the Conservative and Labour Parties were expressed at a later date.

CANDIDATES' VIEWS

AS was to be expected, C. I. Orr-Ewing (Conservative, Hendon North) was the most forthright upon this subject, expressing almost revolutionary views, which called for the re-consideration of the entire present system of broadcasting and television, with a view to the establishment of alternative services competitive to the BBC. Mr. Orr-Ewing (not to be confused with the candidate of the same name at Weston-super-Mare) has many times expressed himself on this subject long before the election, and has even gone so far as lecturing learned societies on the technical and organisational problems involved. His unique knowledge and opinion, not always endorsed by other colleagues in the same party entitle him to be regarded as "The Viewers' M.P." A Labour candidate at South Fylde, L. H. Burgess, seems to agree with some of the views expressed by Mr. Orr-Ewing, since he approves of the establishment of an independent system of high definition, specially suitable for big screen television in theatres, cinemas and elsewhere, adding that it is highly important that the British companies that developed big screen television should be encouraged to maintain their world lead and research. But he felt that an independent system of this kind should not be allowed exclusive rights for the televising of national or sporting events, to the disadvantage of the BBC and home viewers. On the other hand, in the neighbouring constituency of Blackpool North, S. V. Hyde-Price (Labour) was definitely against the opening of a system independent of the BBC. L. Hallinan (Con., Cardiff West) expressed opinions which coincided pretty well with those of L. H. Burgess, already mentioned, but stressed that any changes must necessarily bear in mind the responsibilities of the BBC to the viewing public. Fred Longden (Labour, Small Heath, Birmingham) said, "I am against TV becoming an advertising racket on the appalling Yankee model." Lionel Heald, K.C. (Con., Chertsey) thought that a case could be made for giving a try-out to one night a week of sponsored programmes on both television and sound radio, using BBC facilities. "I wouldn't go further than that at the moment," he told me personally in an interview, "but a six months' trial would at least give the viewing and listening public a chance of making up their minds on the subject, and would probably give the BBC a little financial relief and competitive spur." This cautious reply seemed to me to be the most practical one of the lot !

OFFICIAL STATEMENTS

FOLLOWING the questioning of large numbers of candidates on radio matters by various interested individuals and trade associations, the Labour and Conservative parties issued official statements in reply to a definite question from the trade journal "Kinematograph Weekly":

Would your Party support the Film Industry's argument that it should be allowed to operate large screen television in Kinemas, by means of its own transmitters, providing that the BBC is not deprived of television rights to such events as Royal occasions, the Boat Race and similar items of public interest?

Both parties gave somewhat vague replies to this clear-cut query and obviously preferred not to commit themselves. The Labour Party said: "This is a matter which should receive very careful consideration before an answer can be given," but added that if the trade itself would submit a practical scheme it would be judged on its merits in consultation with all the industries concerned. The Conservative Party stated that it would favourably consider a fair working scheme for the public showing of television, consistent with the responsibilities of the British Broadcasting Corporation.

As we go to press, the news of the Conservative electoral victory comes to hand. A re-examination of the views expressed by both sides encourages me to believe that the chances of the establishment of a competitive television system, whether solely for "big screen" use or otherwise, are more likely to be fulfilled. But so far as "big screen" reproduction in cinemas is concerned, there is likely to be considerable opposition from the independent and smaller theatres, who feel that the big Odeon and A.B.C. circuits might have an unfair advantage. However, the prior calls of rearmament are likely to delay for a long time the practical establishment of the necessary TV transmitters, however soon the talking and agreement-drafting stages might be reached.

The "Viewmaster"

THE Edison Swan Electric Co., Ltd., have ceased to handle Plessey Components suitable for use with the "Viewmaster." Similar types will shortly be available from the Whiteley Electrical Radio Co., Ltd.

The Edison Swan Electric Co. Ltd., will, however, continue their interest in the "Viewmaster" so far as Morganite components and Ediswan Mazda valves and cathode ray tubes are concerned.

The Television Election Broadcasts

A REVIEW OF THE USE OF TELEVISION IN THE RECENT ELECTIONS

By "X"

IN the United States the television companies, by some magic unknown to us, are frequently able to put their leading politicans in front of their cameras. Not until the recent election were we enabled to enjoy similar facilities when, on three successive nights, politicians representing the three major parties made fifteen-minute appeals to the electorate.

The political opinions of viewers will inevitably colour their views upon which of the speakers made the greatest impact and so served best the causes advocated. In the following article an attempt is made to be impartial, to divorce the matter of the appeals from their manner, and to judge which proved the most effective advocacy and why.

The first speaker was Lord Samuel on behalf of the Liberal Party. A few weeks ago he took part in "Speaking Personally" when he appeared by himself without the aid of an interviewer. For his political appearance he followed the same practice. He sat facing a single camera throughout and spoke to it all the time except when he was referring to his notes (a practice that led to an untimely ending). He had none of the personal appeal of an Algernon Blackwood, who similarly addresses the camera direct. Instead we saw an obviously wise and gentle old man who had mastered the fact that his audience consisted of a few people gathered round a television receiver. He was intimate and persuasive, and disdained visual aids of any kind. For the greater part of his talk his dignity and authority carried him along with great sincerity and then his manner changed. He was less happy and confident and it became apparent from his manner that he realised that he was fighting a battle that was lost before it was begun. Given a more hopeful chance it was evident that Lord Samuel's advocacy could sway many votes from viewers who prefer reason to oratory.

The second speaker was Mr. Eden, who came supported by a neutral questioner in Leslie Mitchell. The layout of the set was deliberately contrived so that cameras during the first section of the interview showed alternately Mr. Eden and Leslie Mitchell, and then Mr. Eden alone shot from a position close to Mitchell's left ear. In this manner viewers were afforded a close shot of Mr. Eden's face as the thoughts passed over it and as he delivered his answers. By this means he was not required to look directly into the camera until invited at the end by Leslie Mitchell to deliver his peroration. The effectiveness of this was truly remarkable. What had gone before was excellent, particularly as it was obvious that the questions to be asked by Mitchell had not been arranged so rigidly as to destroy all spontaneity in the answers. All this was on a high level, but the peroration, delivered by the speaker directly to the camera, had an electrifying effect.

Few members of the general public have opportunities to see and hear leading politicians in the flesh. One result of these particular broadcasts will be that henceforth, when their speeches are read in Hansard or the national press, they will be interpreted by the recollection of how they looked and spoke and behaved in front of the television cameras. In the case of Mr. Eden, for one viewer at least, he will be a gentleman, a sincere and honest man, and a person as incapable of being a fire-eater as he is of producing a Churchillian phrase that will echo down the centuries.

If the controvertial graph can be referred to here, there is one explanation of its debated rate of climb that should be obvious to anybody who has made a study of the special requirements of television. This is that it was designed to fit the shape of the television screen so that it would show most clearly.

The production of the Labour programme by Sir Hartley Shawcross and Mr. Christopher Mayhew on the third night was well contrived. It conveyed the impression of intensive rehearsal with Mayhew bringing out of the bag every television trick he had mastered in his previous programmes. Both speakers spoke directly to the camera and adroitly shared the viewer between them.

Christopher Mayhew's performance suffered because he was over anxious. He was like the head boy of a school, determined to justify the good opinion he knew the master held of him. There was an odour of midnight oil having been burnt whilst he feverishly prepared himself to make the most of his big moment. He was completely sincere and yet not as effective as he could have been. Searching for a reason for this, it is possible that his matter unduly coloured his manner; he made bold statements not as if they were his usual habit of speech, but with the deliberate intention to be daring.

It was to be expected that Sir Hartley Shawcross, one of the greatest lawyers of our time, would be an eloquent advocate of his cause. So it proved to be. He was not as successful as Lord Samuel in visualising the small audience around each set, but nevertheless acquitted himself well. Watching him, the thought prompted itself that perhaps over-rehearsal had robbed him of the fine edge of seeming spontaneity.

It has already been said that individual political opinions will cause viewers to be partisan in judging the performances of these politicians who contended for their votes. Sympathy should be extended to those who submitted themselves to the scrutiny of the cameras. But this having been said, what value can be attached to these television appeals? Is any speaker likely to affect the votes of any but those who have no firm political convictions? The answer is "yes." If a man should arise who can speak the unspoken thoughts of the decent many, and say them with clarity, simplicity and an utter conviction that can withstand the critical stare of the television camera, such a man will move the voting mountains. No such man took part in the television broadcasts.

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).

CONVERTING THE RDF1 UNIT

SIR,—I have received a lot of enquiries about the purchase of this unit for conversion as described in the article.

The full description of the unit is "ZC13312 Identification Unit RDF1." Precision Equipment, 42, Windmill Hill, Ruislip Manor, Middx, did have a good supply of these units which they sold at 22s. 6d. The units are also available from U.E.I. Corpn., The Radio Corner, 138, Gray's Inn Road, London, W.C.1. The price here is 49s. 6d., but more valves are included than in the unit which was obtained from Precision Equipment. The last-named firm are still advertising the unit in PRACTICAL TELEVISION under the title "Identification Unit ZC13312." —B. MORLEY (Bristol).

THE NOISE FACTOR

SIR,—In his reply to my letter, Mr. Thomasson asks me to explain why, in my equation for the noise factor, the input resistance R_i of the valve is not included in R_D, the dynamic resistance of the aerial coupling circuit. The answer is that by using the fictitious valve equivalent noise resistance R_{eq} we have already taken account of the noise produced by R_i so it would hardly be justifiable to lump R_i with R_D and make it give its noise contribution twice !

The valve equivalent noise resistance is a convenient mathematical device which simplifies noise factor calculations and it represents all the noise generated in the valve, including that due to the input resistance. Consequently putting R_{eq} equal to zero is equivalent to treating the input resistance as noiseless and, whatever its value, it will not then affect the signal/noise ratio. However, it will still affect the condition for impedance matching since we must match to the impedance of R_D and R_i in parallel, i.e., $R_T = \frac{R_i R_D}{R_i + R_D}$, and because R_D is noisy and R_i noiseless the noise factor for the matched impedance condition becomes $F = 1 + \frac{R_i}{R_i + R_D}$ and not 2 as in Mr. Thomasson's example. The condition for this latter equation to reduce to 2 is, of course, that R_D is negligibly small compared to R_i, since then we are matching the aerial to the noisy resistance R_D.

I regret that an arithmetical error caused me to give the figure of 13 db. as the reduction in amplification of an EC52 grounded-grid triode used in the minimum noise factor condition compared to operation in the matched-impedance state. This figure should have been 4.2 db. (using the approximate value of R_i given in the original article) and a more exact calculation taking the output load of the stage as 2,500 ohms makes this reduction 3.4 db. It then appears that an overall noise factor of about 1.8 should be attainable.—L. E. LAND (Lossiemouth).

7BP7 DETAILS

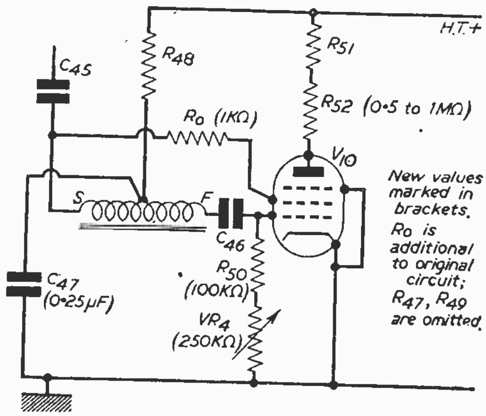
SIR,—In reply to the reader in the November issue (Mr. F. E. Profaze) who wished to know some details of the 7BP7, here is some information :

7BP7 = 7BP1 (except for screen colour and persistence).
6.3 V 0.6 amp. heater.
7,000 V on final anode (A_2).
250 V on focus anode (A_1).
—45 V grid bias.
Green/yellow fluorescence.
Long persistence.
Electrostatic focus.
Magnetic deflection.
Octal base pins 1 to 8 :
—, H, A^2, —, G, —, K, H. Top cap A^2.
Therefore, this tube is unsuitable for television.

Commercial coils might be used if the neck diameter of the tube is the usual size. Incidentally, the 7BP5 has similar characteristics, but has a short persistence and a blue fluorescence and is suitable for television.—A. W. WOOD (Aspley).

THE COMBINED TELEVISOR

SIR,—There appears to be difficulty in obtaining the line oscillator transformer used in the Combined Televisor described in the July-September issues of PRACTICAL TELEVISION as Messrs. Premier Radio Co.



Modified circuit of the line oscillator stage in the Combined Televisor.

have discontinued manufacture. A suitable alternative involving the minimum of modification to the circuit is the Haynes Type TQ116 and the circuit above shows the change necessary to incorporate this.

The mains transformer, too, is in short supply, but an alternative here should present little difficulty to the intending constructor. A 375-0-375 volt secondary will be suitable and R_{99} can be altered accordingly to give the correct voltages as outlined in the appropriate table in the article.—S. A. KNIGHT (Chelmsford).

NOISE

SIR,—I note in your feature "Your Problems Solved" that R. C. M. (near Bridgend) seeks guidance concerning the relative merits of pre-amplifier circuits so far as reduction of "grain" or "noise" is concerned. Whilst agreeing with the importance of securing a good aerial installation so that the signal/noise ratio is as high as can be obtained, it is also possible to obtain a very marked improvement with the use of a suitable "low noise" circuit. In this connection may I mention we have employed neutralised triode circuit arrangements for the past three years, and are continuously improving the "noise factor" of pre-amplifiers intended for long-distance television reception. More recently we have secured a further improvement with the use of a calculated mismatch in aerial impedance matching to these units. —SPENCER WEST (Gt. Yarmouth).

DOUBLE " V " AERIAL

SIR,—We note in your issue of November, 1951 (Vol. 2, No. 18), a short article by a Mr. D. Pater (Southampton) with regard to a double " V " aerial.

The aerial described is in principle an exact copy of our well-known " Antex " aerial, as described in our leaflet reference E/50. This revolutionary design of aerial was evolved in our research laboratories several years ago and is protected by Reg. Des. 859,630, Pat. No. 630,795 and Prov. Pat. 12,178/49. It has, as your correspondent rightly states, many advantages over the more standard form of television aerial, and tens of thousands have been sold by us to viewers all over the country.

We do not object to amateurs constructing a copy of our " Antex " aerial for experimental purposes. We are not prepared, however, to give permission for the design to be used for manufacture of the aerials for sale, either in small quantities or large. In view of our large continuous expenditure on aerial research which has led to this design, we feel that it is only fair to adopt this attitude.

We should be glad, therefore, if you would call your readers' attention to the fact that the " Antex " aerial is fully protected by patents and that we shall not hesitate to take action to uphold our rights against any person supplying them commercially.

As a matter of interest we might mention that the " Antex " aerial was chosen to supply all television at the South Bank Exhibition of the " Festival of Britain," two of them being mounted on the Shot Tower.—N. M. BEST (Managing Director, Antiference, Ltd.).

" PRACTICAL TELEVISION " RECEIVER

SIR,—I have been operating my " Practical Television " receiver for about a month now and am obtaining first-class results on both sound and vision from Holme Moss.

I would mention that I am using a 12in. C.R. tube and although I am situated nearly 80 miles from Holme Moss, and practically at sea level, I am receiving excellent vision and sound with no pre-amplification. The sound was just a little below comfortable listening strength, however, and I added a stage of A.F. amplification before the output stage, and have now more than enough volume. I am, therefore, highly delighted with results, and would like to thank you and your staff for designing such a fine receiver for the amateur constructor.—W. KETTLEY (Middlesbrough).

REFILLING SCREEN ENLARGERS

SIR.—Regarding your advice given to a reader's query on this subject in the August issue of PRACTICAL TELEVISION.

I carried out the method of refilling my VCR97 magnifier with medicinal liquid paraffin. It proved most successful. The magnification is slightly greater than the original oil filling and the focal length is unaltered.

There is a little additional advice I would like to give and is what I learnt from the job of carrying out the operation. Use only a soapless detergent for removing traces of the original oil as ordinary soapy water leaves the plastic cloudy. Give a number of rinses of detergent and warm water until satisfaction is obtained, and leave to dry in a warm atmosphere. This is a long process and took about two days.

Finally, obtain liquid paraffin of one particular brand. Two 14oz. bottles are required. Mine were each of a different make, and although to the " B.P." standards, one is of a greater density than the other.

However, when the oil finally settled down in the magnifier, only a faint dividing line is discernible when held up to the light.

Trusting this information may be of interest to those desiring to revive their magnifiers.—E. ANDREWS (Headington).

FRINGE AREA RECEPTION

(Concluded from page 306)

Noise

On the question of noise the frequency changer gets far less consideration than it deserves. It can be the source of serious noise if it is badly designed, especially if the R.F. signal is weak. Most of this kind of trouble arises from the use of a pentode as a mixer and in endeavouring to make this valve amplify and mix at the same time. Triode hexodes, too, are not satisfactory for the amount of noise that they generate varies enormously with different specimens.

Frequency Changer Circuit

Those constructors who want to use a frequency changer that really is quiet in operation will find it worth while to use the circuit in Fig. 3. This uses a diode for mixing, which means that no gain can be expected from the stage, but it does have the advantage that it produces the minimum possible noise and, in addition, it cannot be overloaded which is by no means the case with pentode mixers. This type of mixer has been used in various radar apparatus using either a thermionic or crystal diode and, since the mixer stage gain is never very great, the loss in amplification is not likely to be a serious matter.

" Snow "

The question of noise in general—which means the question of " snow " superimposed all over the picture —nearly always resolves itself into a question of finding a " peaky " tuned circuit somewhere in the amplifying chain. Without a signal generator, this is a difficult and tiresome business requiring a great deal of trial-and-error work. With a signal generator, however, it is a simple job to sweep over the 3 Mc/s band and to note that the output is constant at all frequencies. If there is a peak anywhere this will cause " snow " and this may be the only visible symptom of the fault. It is quite possible to have a perfectly acceptable picture—even on Test Card C—with one tuned circuit peaked enough to cause serious noise response on the screen.

A particular case of " snow " which came to my notice recently was due to a sound rejector circuit which had not been tuned to the sound I.F. (9.5 Mc/s, in this case). It was one of three in the vision amplifier and it had been found that the two preceding rejectors were sufficient for the job. The third had therefore been left, rather carelessly, tuned " anyhow." It was, in fact, tuned to rather less than 11 Mc/s and, as a result, this frequency had been almost completely eliminated from the vision band. Further, the rejector was connected across the associated vision tuned circuit and its incorrect setting affected the tuning of that circuit. The combined effect was a very poor picture in quality, indefinite frame hold and serious " snow." And all this resulted from failing to adjust correctly an " unwanted " sound rejector !

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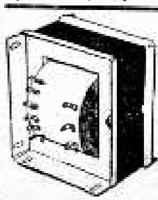
ELECTRICAL TEST METERS, all makes single or multi-range repaired and standardised. THE ELECTRICAL INSTRUMENT REPAIR SERVICE, 329, Kilburn Lane, London, W.9. (Tel.: Lad. 4168.)

C.R. TUBE, 9in. MW/14c, new, boxed, **£9**. GERRY, TV and Radio Specialist, 22, Birkbeck Rd., Sidcup.



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T/V COMPONENTS for Practical Television, Viewmaster Electronic Engineering, etc.; 8 x 8 mfd. 350v, cardboard case or alum. case, **3/9**; 2mm. and 4mm. Sleeving, **3/-** doz. yds. ⅜in. Polystyrene Formers, **1/0½**. JARVIS, 12, Chatsworth Rd., Manchester, 21.

GUARANTEED VALVES: 12K8, 6K8G, 6Q7GT, **10/-**; 6N7, 5U4G, **9/6**; 807, 6SN7, 6SL7, 524, 6B8G, 6SS7, **9/-**; 1A5GT, 12SK7, 6SH7, U14, 6X5GT, 6K6, 7C5, 2X2, **8/-**; 6K7G, 6J7, 1LN5, 3D6, 12SC7, RK3H, **7/-**; 6L7, 12J5GT, **6/-**; 6J5, 6H6, 7193, **4/6**; HL2, **3/6**. Postage 6d. C.O.D. or c.w.o. Many other types in stock. Send us your valve requirements. ELECTRO-SERVICES & CO., 28, Ethelburga St., S.W.11. (BAT. 2964.)

PRACTICAL TELEVISION RECEIVER.—Set of coils, Holme Moss, London or Birmingham, **16/6**; Aladdin Formers, **10d.**; Tag Ring, **2½d.**; Chassis, **70/-**; Mains Trans., **68/6**. S.A.E. list. R. F. SHILTON, 19, Clarendon Road, Salisbury, Wilts.

IDEAL FOR XMAS GIFTS.—"Personal Portables." Get your copy of the second edition now; 5 complete circuits and data, **2/8** from BRADBOOKS, Sennen, Penzance, Cornwall. And "A Portable Televisor" is better still, of course, **3/2** post paid.

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TELEVISION SERVICE ENGINEERS or good Radio Service Engineers for training in Television required by large company for the Bristol area. Applicants must be prepared to work in the London area for the period of training and return to the Bristol area with the opening of the new transmitter. Give details of experience, age and salary required to Box No. 115, c/o PRACTICAL TELEVISION.

EDUCATIONAL

TELEVISION.—The Gothic Television School, devoted exclusively to training in Television, prepares students to Brit.I.R.E. and R.T.E.B. examination standards. Correspondence course prospectus from the Secretary, GOTHIC TELEVISION SCHOOL, 13, North Avenue, London, W.13.

TRADE TOPICS

Television Aerials—Price Increases

MESSRS. AERIALITE regret to announce that they have been reluctantly compelled to increase prices of television aerials effective as from Monday, October 1st, 1951.—**Aerialite Ltd., Castle Works, Stalybridge, Cheshire.**

Valradio Projector Receiver

A PROJECTION TV receiver giving a picture size of 4ft. x 3ft. (1.22 metres x 92 cms. approximately) on to cine type wall screen, is announced by Valradio. The complete receiver is made up of four units consisting of sound and vision receiver, time bases, power unit and optical unit, which are all interconnected by simple plugs and sockets, no unsoldering being required to remove any unit. The loud speakers are separate and are intended to operate near the screen.

The receiver requires 100 micro-volts input for full picture modulation.

The receiver is operated 8ft. (2.5 metres) from the screen. By placing the receiver at a greater distance a larger picture will be obtained with a proportional reduction of brilliance.

Minimum viewing distance 7ft. (2 metres), normal viewing distance 10 to 100ft. (3 to 30 metres). The receiver can be viewed in semi-darkness but total darkness is to be preferred. The standard receiver is designed for forward projection but can be supplied for ceiling projection for use in hospitals, etc.

The receiver is enclosed in a ventilated metal case measuring 18in. x 18in. x 18in. (45.5 cms. x 45.5 cms. x 45.5 cms. approximately).

Provisional price, with optical unit and one loud-speaker, £191 9s, including P.T.—**Valradio Ltd., New Chapel Road, High Street, Feltham, Middlesex.**

Ediswan Television Tube

A NEW 12in. television cathode ray tube has recently been introduced by The Edison Swan Electric Co., Ltd., type CRM.121B.

This type is similar in all respects to their standard 12in. tube, type CRM.121A, except that it is capable of working at anode voltages up to 10,000 v. compared to the maximum of 7,500 v. for the CRM.121A. (Both these figures are design centre ratings, the corresponding absolute ratings being 12,000 v. and 9,000 v. respectively.)

At any anode voltage up to 7,500 v. the performance of the two types of tube is identical and they may be used interchangeably. Thus a CRM.121A can be used as a replacement for a CRM.121B in sets with anode voltages up to this value. At anode voltages between 7,500 v. and 10,000 v. only the CRM121B may be used. In addition to these tubes the Edison Swan Electric Co., Ltd., market a 12in. aluminised cathode ray tube, type CRM123, with a maximum design centre rating of 10,000 v. (absolute rating 12,000 v.). It is recommended that this tube should not be operated at anode voltages below 7,500 v.—**The Edison Swan Electric Co., Ltd. 155 Charing Cross Road, W.C.2.**

New Mullard Filmstrips

THREE new titles have recently been added to the well-known series of Mullard educational film-strips. Each item comprises a 35 mm. filmstrip carrying between 30 and 40 illustrations, and a printed booklet of lecture notes which can be either read verbatim or used as the basis of lectures or lessons to meet the requirements of different audiences.

The new filmstrips are as follows: No. 9. History, Development and Principles of the C.R. Tube.—**Mullard, Ltd., Century House, Shaftesbury Avenue, W.C.2.**

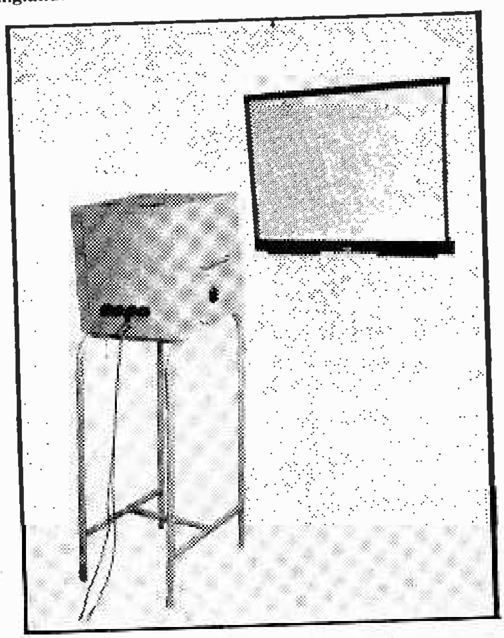
New Type Aerial

E.M.I. SALES & SERVICE, LTD., have perfected, after long and extensive research, the E.M.I. 20ft. Tilted Wire Television Aerial.

The new aerial provides the perfect answer to the problem of an efficient television aerial installation at a very moderate cost, yet has the following advantages:

1. Is better than the standard dipole aerial.
2. Considerably reduces interference, including that from diathermy and other electrical installations.
3. Has exceptional directional qualities.
4. Rejects images from high buildings, gasholders, etc.
5. Reduces aeroplane "flutter."
6. Gives better definition on vision due to increased sideband acceptance.
7. Is suitable for all television receivers.
8. Can be easily installed in a small space—two point fixing only—in attics, under roofs or in the garden.
9. When installed in a loft overcomes all objections against television aerials from local councils or landlords.
10. Has no exposed metal to corrode.
11. Is unaffected by high winds.

Here, in fact, is the television aerial which gives better results, costs less, can be installed by anyone, and is completely unobtrusive. Developed after extensive research by E.M.I., the pioneers of electronic television, it marks a great step forward in the improvement and simplification of television reception. Price 48s.—**E.M.I. Sales and Service, Ltd., Hayes, Middlesex, England.**



The Valradio Projector Receiver and screen

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. If a postal reply is required a stamped and addressed envelope must be enclosed.

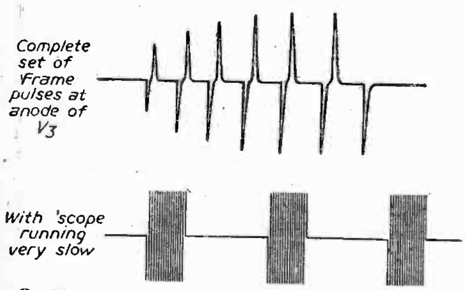
COLLAPSING FRAME

"Just lately a fault has developed in my commercial receiver which takes the form of a sudden reduction of frame depth. This seems to collapse downwards and as soon as a single line is left it opens up again from the bottom. This goes on for quite a few seconds and is not cured by switching off. Is it due to failure of the frame amplifier valve or a faulty condenser across the bias resistor in this stage?"—G. H. Sales (Oxford).

We think it more likely that the fault is in the frame oscillator stage. The valve is apparently running in such a condition that oscillation ceases for some reason and as soon as the current has risen as a result of the cessation of oscillation, the condition is reached where it bursts into oscillation again. This is most likely due to a faulty anode load component in the oscillator stage, or one of the components associated with the frequency control will be found faulty. If the oscillator valves in the frame and line stages are identical you could try changing them round to check that the valve itself is not faulty.

INTERLACE FILTER

"I was very interested in the filter described in your August issue, and have been experimenting with various filters for some time now. I have a 'scope and associated



Oscillograms in connection with Interlace Filter.

equipment, but have so far been unable to obtain maximum results with this particular filter. I note that the output from V3 in my case is not quite the same as shown in your illustration and wonder if you can give me any further clues as to what might be wrong, or how to get it working properly. It seems to have possibilities but is just not quite right."—H. G. Watts (Edgware).

The most critical part of the circuit is the EF36 and its associated grid connections. As mentioned in the article the condenser and leak should be mounted on the actual top-cap clip and screening should be carried out where indicated. Incidentally, the accompanying illustration gives perhaps a more accurate representation of what should be seen on the 'scope and should be substituted for that shown in Fig. 4 in the article in question.

LINING-UP VIDEO STAGES

"I recently obtained a 'scrap' vision chassis just to play about with, and managed to get it working but with very poor response. After some experiments I decided that it would not be possible to state whether the circuits were intended for double sideband, or upper or lower single sideband. Is there any way of telling this from inspection? If not, what is the best to adopt?"—F. M. Neat (Guildford).

The types of coil might give a clue—for instance, if each coil assembly is a double-wound transformer it would be most likely that it was for double sideband. Single coils are generally used for single sideband, and the value of the shunt resistor might also give some clue as to the likely bandwidth for which the circuit was designed. If single coils are fitted we suggest you trim to tune the upper sideband, endeavouring to get the coils to peak at points between 44 and 49 Mc/s, with at least one rejector tuned to sound. The highest values of shunt consistent with adequate amplification should be used to retain the maximum bandwidth.

SMOOTHING WITH ECONOMY

"I have nearly completed my own design for a receiver but am up against one small point. I intend to wind an auto transformer on the mains side, but am worried about smoothing. Do you recommend that I use one large smoothing choke and take off all my H.T. positive leads from this, with simple resistors and decoupling condensers at various points, or a small choke to carry the total current and then other chokes and smoothing condensers for the various H.T. positive leads? What are the advantages, if any?"—R. T. Trimble (Westcliff-on-Sea).

A single choke to carry the total current will be large and expensive. For the same money it may be possible to get as many as three smaller chokes which whilst designed to carry smaller current may have much higher inductance values. Consequently, better smoothing may be obtained in individual parts, such as the vision stages, the time bases, etc., whilst the problem of decoupling will also be simplified. Against this will be the problem of suitably placing the chokes to avoid hum due to interaction.

BLACK LEVEL

"I am worried about an effect in my set which I have noted on other people's receivers, although perhaps not quite so badly as on my own. It takes the effect of varying darkness on different camera shots. Sometimes I have to adjust the brightness two or three times during the evening and then a camera comes on in which the picture is much too white and I have to turn it down. I enclose the circuit of my receiver and should be glad if you would check whether there is anything wrong with it or whether it is the BBC which is at fault."—J. L. Emerson (Brighton).

The BBC go to considerable trouble to adjust their black level so that a properly adjusted receiver does not need adjustment on different camera shots. There is some difference due to different makes of camera, etc., but after going into this question very thoroughly we have found that, in our opinion, much of the trouble is due to the design of the tube coupling. Some circuits have the video anode taken direct to the tube, and this pure D.C. coupling appears to give best results. Where, however, a potentiometer arrangement is used, the value of the condenser which is often shunted across part of the potentiometer will affect results as this is a form of A.C. coupling, and a large capacity electrolytic condenser with a low value of resistor seems to give inferior results to a low capacity with high value resistor. It is difficult to make quantitative tests as the pictures are changing from time to time, but we feel that a pure D.C. coupling is definitely to be preferred, provided arrangements can be made to avoid exceeding the heater-cathode potential on the tube.

CHANGING A TUBE

"I recently replaced my old 9in. tube by a 12in. (type numbers given), but although I cover the area quite all right I am disappointed in the brightness of the picture. My old tube gave a picture which was reasonably good in normal room lighting and we never put the lights out. The new tube is so dull that it can't be seen unless the lights are put out, and I am wondering if I have got to alter anything in the set as the tube is bigger. The set is home-made to a published design and gives perfect results otherwise."—R. I. Allen (Blandford).

The type numbers which you give reveal the fact that the new tube is of the aluminised type, whilst the old tube is of the ordinary type. The maximum EHT voltage for the old tube was 7 kv., but the new tube is rated at 12 kV.—normal working 9 kV. This, then, is your trouble, as your receiver probably delivered slightly less than 7 kV. for the old tube and this is much too low for the new one. You will have to increase the EHT to obtain the benefits of the aluminised tube, but this increase may result in the line time base having to be modified as it may not be powerful enough to provide the full scan when the EHT is increased. You should have obtained a normal (not aluminised) tube of the 12in. type as a replacement.

ION TRAP MAGNET

"I have only had my set about a month but have come across a trouble which I should like you to help me on. The picture is very dull now compared with when it was new and I do not like to call in the dealer although the set is still under guarantee, as I believe I am responsible for what has happened. Last week I was anxious to see inside and I took the back off the set. It was very dusty inside and I thought it would not do any harm to get rid of some of it, so I got a duster and carefully wiped away as much as possible, but was careful not to move anything. I blew out as much loose dust as possible, put the back on again and when I next switched on the picture was very dark. As it only happened after cleaning, do you think I have done anything to cause the trouble?"—B. E. C. Unshanton (N.W.4).

We think it highly probable that you have caused the trouble and it is most likely due to the fact that the tube is fitted with an ion trap magnet. These are mounted on the rear of the tube and are not always clamped up tightly. In dusting you have no doubt moved this and it will have to be reset. Your dealer will soon be able to do this, although it is not difficult and there is a risk of damaging the tube if you carry out the adjustment in a certain manner.

E.H.T. LEAK

"I have just experienced a fault which I think is due to a faulty E.H.T. transformer and should like confirmation of this. The effect is that soon after the picture has appeared and settled down, a series of white spots appears just as though a car were approaching. The spots do not, however, keep in two lines as ordinary ignition interference does on my set, but take at least six lines and do not float up and down but remain fixed. I removed the aerial and found the spots persisted, and on switching off and removing the back of the cabinet I can smell a faint ozone smell.—K. W. d'Estle (Northampton).

It certainly would appear that corona discharge might be responsible, in view of the ozone smell, but there is just a possibility that it might be due to a punctured electrolytic smoothing condenser on the ordinary H.T. side. This will cause spots on the screen, and in some makes will give rise to a smell something like that obtained by a corona discharge. The best plan is to switch the set on in a darkened room and try and see if there is any familiar glow in or near the E.H.T. unit, and also check the H.T. output by inserting a meter permanently in the normal H.T. line. A leaky electrolytic might be expected to give a reduced H.T. voltage output.

DOUBLE-V AERIAL FOR HOLME MOSS

"I was interested in the article on the double-V aerial in your November issue and should like to try this for Holme Moss. Could you give me the measurements of the dipole and reflector for this frequency, please?"—T. R. Stansted (Leeds).

It is necessary to repeat again that the type of aerial referred to consists of a dipole and a director—not a reflector. A reflector is slightly longer than the dipole, whereas the director is slightly shorter, and in addition the director is placed between the transmitter and the dipole, whereas the reflector is placed behind the dipole. For Holme Moss a dipole should be 9ft. 4½in. overall, and as stated in the article on the "X" aerial, the dimensions of the elements for this type of aerial are slightly less than for a standard assembly.

BRIGHTNESS CONTROL FAULT

"My —— receiver has been in use just over a year now, but I am experiencing a fault which is annoying. When the picture comes up I adjust the brilliance and the picture flutters very quickly accompanied by a lot of white spots. If I let go of the brilliance control the fluttering and spotting stops and the picture settles down, but a heavy car or bus going by (I am on a main road) gives a similar effect on the screen, and I now find I can get the same result by banging the cabinet.—V. R. Elgar (New Barnet).

Although a loose wire could cause the trouble, a valve which is not right home in its socket could give rise to similar trouble as also could a number of other faults. However, from experience with the particular make of receiver you mention, we think the trouble will be found in the brilliance control which, in this case, is a carbon component of the enclosed type. After a period of use a powder deposit is found which short-circuits part of the track and the loose powder jumps about under vibration, causing the spots and varying picture brightness.

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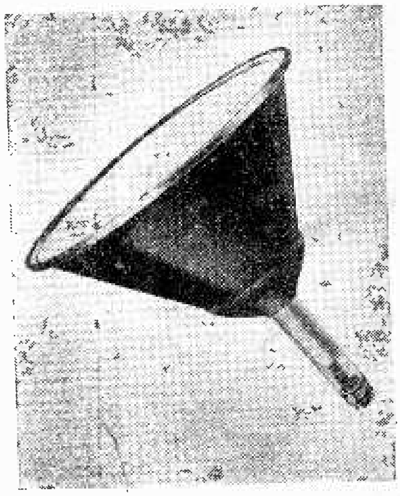

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