THE RF 26 BAND III CONVERTER

Practical Television

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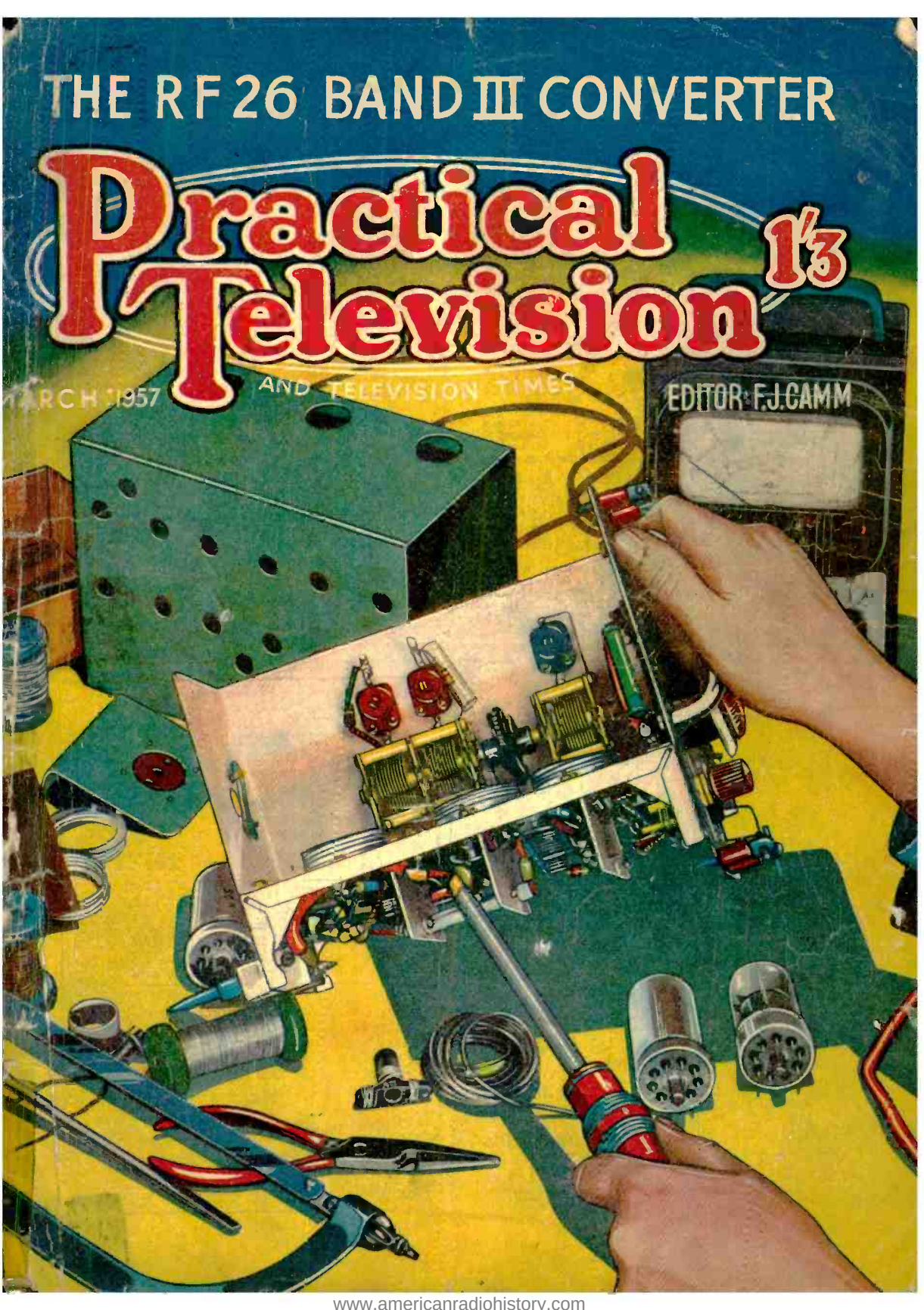
MARCH 1957 AND TELEVISION TIMES

EDITOR: F.J.CAMM



Practical Television

& TELEVISION TIMES

Editor : F. J. CAMM

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The Editor will be pleased to consider articles of a practical nature suitable for publication in "Practical Television." Such articles should be written on one side of the paper only, and should contain the name and address of the sender. Whilst the Editor does not hold himself responsible for manuscripts, every effort will be made to return them if a stamped and addressed envelope is enclosed. All correspondence intended for the Editor should be addressed to : The Editor, "Practical Television," George Newnes, Ltd., Tower House, Southampton Street, Strand, W.C.2.

Owing to the rapid progress in the design of radio apparatus and to our efforts to keep our readers in touch with the latest developments, we give no warranty that apparatus described in our columns is not the subject of letters patent.

TELEVIEWS

COLOUR TV DEMONSTRATED TO M.P.s

ON January 30th and 31st colour television was demonstrated to members of both Houses of Parliament. The colour system used was that which the BBC has been studying and experimenting with for some time. It is similar to that demonstrated last year to delegates of the International Radio Consultative Committee. The BBC is at present making experimental transmissions by this system after programme hours on three evenings each week from their London station, and these can be received as black and white pictures on ordinary receiving sets. Special receivers made for the purpose of receiving colour transmission by the BBC system were installed for the demonstrations at Westminster. We are told that these tests and demonstrations are a contribution to the comprehensive study of the problems involved in colour TV.

It seems extraordinary that members of Parliament were not invited to witness a demonstration outside of the two Houses. The installation must have been very costly. Does it envisage that some time in the distant future we shall be able to witness parliamentary debates ?

However, we are warned that the introduction of colour television as a public service must still be regarded as a possibility of the future.

VIEWING ANALYSIS

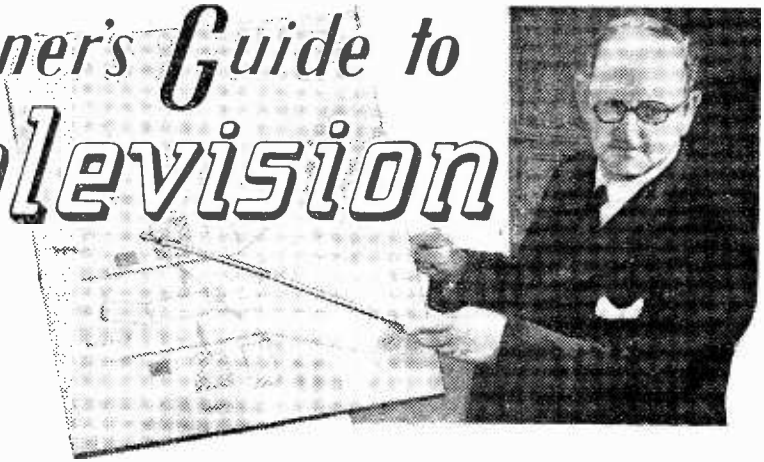
STATISTICS just published show that evening viewing audiences were much bigger in October-December, 1956, than they were a year earlier. For every 100 adults viewing in 1955, 127 were viewing in 1956. Taking the quarter as a whole, the audience for the average BBC TV broadcast included 5,800,000 adults and that of the average I.T.A. broadcast included 1,750,000.

The corresponding BBC figure in October-December, 1955, was 5,650,000 : that for the I.T.A., then confined to one area, was only 250,000.

These increases are, of course, due to the large expansion of the viewing public which rose from an October-December average of 14,450,000 adults in 1955 to 18,150,000 in 1956. By December, 1956, it would seem that half the entire population had television. The number of adults who could receive BBC TV had reached nearly 19,000,000, of which about 7,750,000 could also receive I.T.A. programmes. These figures must be accepted with the assumption that the methods adopted by the BBC to establish them are reasonably accurate. Hitherto, the I.T.V. and other methods of audience research have violently disagreed.—F. J. C.

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

A Beginner's Guide to Television



12.—EARLY SYSTEMS OF SCANNING

By F. J. Camm

I HAVE dealt earlier with the system of scanning as it is today, and it may further help the reader to understand this somewhat complicated system by considering the earlier systems from which it has grown. Dating from the time when the German, Paul Nipkow, invented the scanning disc in 1884, it has been considered impossible to transmit images electrically, without the aid of a scanning device. So far as I know, it is still regarded as impossible to transmit a picture without scanning. As an example, suppose we have the head and shoulders of a subject, or a "still," to transmit either directly from the human being or from a film showing this picture. One or more photoelectric cells in the earlier system were required in order to convert the varying grades of light and shade into equivalent or relative terms of electrical current or voltage. Now if the cell or cells were exposed to this direct, they would merely react to give an *average* light value response, which would be transmitted as a single shade instead of showing varying light values spread over the same area. As this would be of little use, we analyse or break up our subject into elemental areas which are televised in a more or less continuous motion. That is to say, an elemental spot exposes a correspondingly tiny area while the spot is made to move in a straight or slightly curved line to create a strip of light. (This effectively disposes of the fallacious dot theory which tried to prove the process was a discontinuous pulsation of dots.) Immediately this strip is scanned and the correspondingly light values interpreted, another strip takes charge, so that in one complete scan the picture is, in effect, strip-dissected.

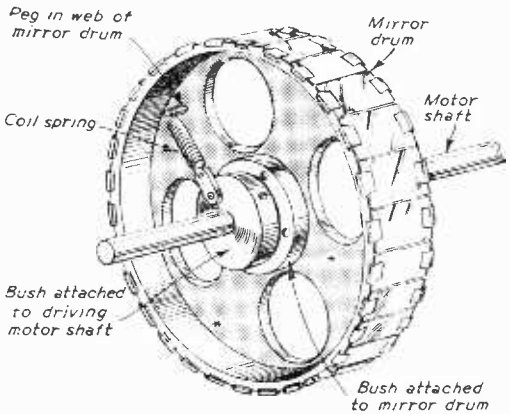


Fig. 51. — A complete mirror drum, showing the method of clipping on the mirrors.

Reassembly

The disembodying process is carried out thousands of times per second without a break, the resultant varying signal being electrical in character and transmitted to the receiving end by wire or by radio. At this end, with the aid of a suitable amplifier and another scanning device, the continuously varying signal is reconverted into light. These light values are reassembled into their relative positions, and the eye is thus able to recognise an interpretation in light of the original subject.

The thinner the strips (lines is the common term used) into which the subject is dissected, the greater will be the detail observed, but then we are up against the inevitable problem of the frequency sideband required for transmission.

Various Devices

Realising that scanning is essential at present to any television system, let us see what devices (mechanical and electrical) have existed for carrying it to a successful conclusion. There have been inventions by the hundred, but most of them are of purely academic interest and can be ignored, while of the others only a few have emerged from the laboratory stage. Of these perhaps the most common are: (1) Apertured disc; (2) Lens disc; (3) Prismatic disc; (4) Apertured drum; (5) Mirror drum; (6) Mirror screw; (7) Cathode ray tube.

The apertured scanning disc is perhaps the simplest of them all. It consists of a thin flat disc, circular in shape, with a single turn spiral of holes punched at regular intervals near the periphery, and as the disc revolves about its centre, concentric strips, which touch one another, are described by each hole. The disc in this form is suitable for vertical or horizontal scanning, and if we examine the raster it will be found that each hole, as it passes across the area, describes a small arc of a circle, thus dissecting the area into the

same number of strips as there are holes in the disc.

The actual scanning area is a factor of the disc diameter, hole size, number of holes and the shape of the television picture, and simple formulae can be derived to enable anyone to mark out a scanning disc accurately. Usually the holes are square, but

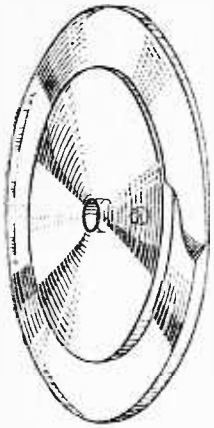


Fig. 52. — A prismatic disc, as used in an American System.

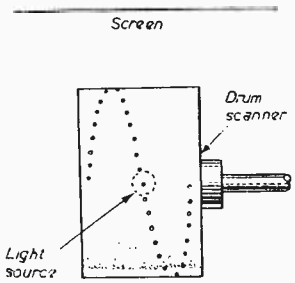


Fig. 53. — This diagram shows how the apertured drum apparatus works.

when a disc is made for a large number of scanning lines, then hexagonal holes are used. When using a disc for scanning a film at the transmitting end, the exploring is carried into effect by having a circle of holes instead of a spiral of holes, and as the disc revolves the film is moved relative to it and the same effect produced as a stationary film or object with spiral exploration.

Other Discs

For certain classes of television disc it was found advantageous to use small lenses mounted in each disc hole. It will be obvious that by this method focusing direct from the disc is possible, and a more intense illumination obtained, the difference between the plain disc and the lens disc being comparable in some respects to the amounts of light admitted by a pinhole camera and one with a lens. Its scanning action is, of course, the same as that for a plain apertured disc.

Another very interesting type of scanning disc was that invented by Jenkins of America. It was called a prismatic disc, and the form it takes is that of a thick glass disc, the outer edge of which has been ground into the shape of a prism, the section varying gradually and continuously round the circumference so that at one point the base of the prism is outward, while diametrically opposite this point the base is inward. If a beam of light is directed through the edge of such a disc it will be bent in a certain direction, the angle at which the beam bends depending upon the angle of the prismatic section at that point. By superimposing a second disc over the first so that their overlapping edges revolve in directions at right angles to each other, a lateral, as well as a vertical, movement can be given to the light beam.

Drum Scanning

While the lens and prismatic disc provide more intense illumination than the plain apertured disc, some form of drum scanning is preferable when it is desired to carry out experiments for projecting the television image on to a screen. One of the simplest arrangements which was found for this purpose was the apertured drum. One example consists of a hollow drum having a spiral of holes pierced through the side. It is possible to place the source of light inside the drum and, by revolving the drum at constant speed, each hole will pass across a definite light area and throw a beam on to a screen placed in any convenient position.

Another method of using the same type of drum lends itself to the employment of a more intense light source at the transmitting end. The light from an arc lamp has its beam condensed by a lens on to a right-angled prism mounted inside the hollow drum. The beam of light is in this way bent at right angles and made to cover a definite rectangular area. As the drum revolves, each aperture passes across this light field and the pencil of light emerging from the drum side can be focused on the subject or object that has to be televised.

If desired, lenses may be inserted in each drum aperture, and in this way the advantages mentioned for a lensed disc are secured.

Belt and Mirror Drums

One development of the apertured drum was the belt scanner. Here we have a thin strip of flexible material with holes punched in it diagonally from end to end. When the ends are joined together a belt is made, and this can be passed over two wheels or pulleys which drive the belt when they are caused to revolve through the medium of a motor coupled to one of them. The source of light is placed between the belt bands and observation made in the usual manner.

One of the most efficient methods which can be used for projecting low-definition television images on to a screen at the receiving end, or alternatively for governing light-spot movement at the transmitting end, is to employ a mirror drum. One such device of this character includes a beam of light from an arc lamp which is focused on to an inclined mirror which in turn reflects it on to the drum. Round the

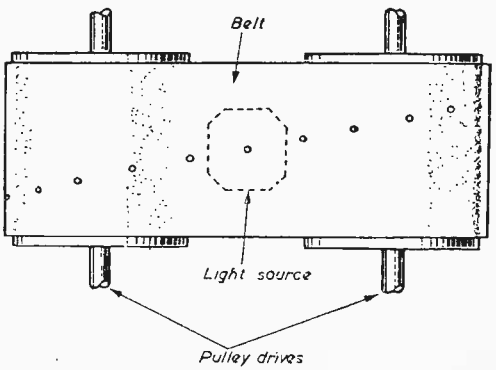


Fig. 54. — Scanning obtained by means of a perforated belt.

edge of this drum is a number of rectangular mirrors made from optically tested glass. Each mirror is canted at a slightly different angle from its immediate neighbour, and in consequence if the drum is revolved the beam of light is reflected from each mirror in turn and made to move upwards until it comes outside the area focused on the drum from the bottom reflecting mirror.

In this way, the drum causes the single light beam to create a number of strips of light, disposed side by side.

Mirror Screws

One objection which is levelled at the ordinary mirror drum is its relatively bulky nature, and in

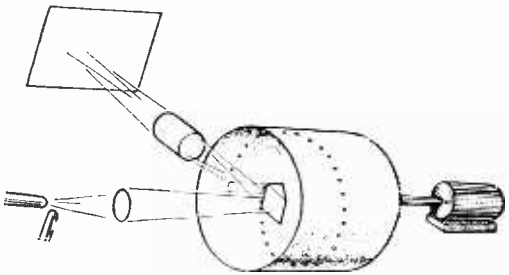


Fig. 55. — Using an external light with a drum scanning apparatus.

consequence an idea was developed on the Continent to replace the mirror drum by what is called the mirror screw. One of the best ways of picturing this device is to recall a spiral staircase. Arms radiate from the centre, and on the end of each one of these arms is a reflecting device such as a mirror or thin piece of stainless steel.

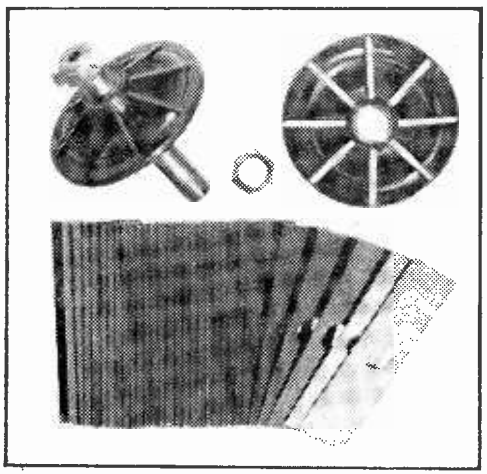


Fig. 57. – The parts of a mirror screw.

As the "screw" revolves the reflecting surface at the end of each arm comes into any beam of light that may be focused on it. The light, in turn, is reflected back on to any convenient screen, and it is easy to see that correctly positioned light strips are traced out as the screw is revolved. The idea is quite ingenious, but the light efficiency is of a comparatively low order.

(To be Continued.)

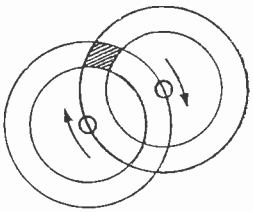


Fig. 56. — How two prismatic discs are arranged to give the necessary scanning effect.

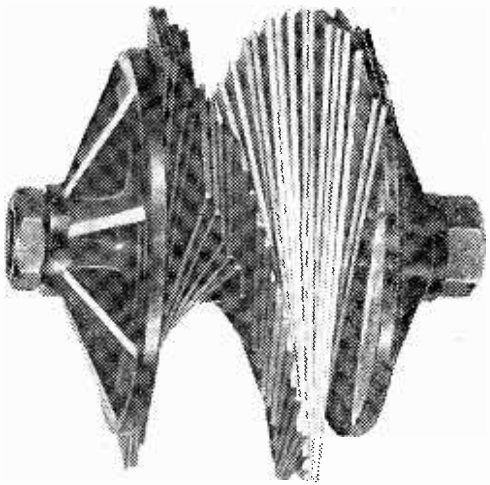


Fig. 58. — A mirror screw assembled.

Triode Valves for Microwave Links

AN advance in the design of valves for microwave television relays and multi-channel telephone links has been made in the form of two new Mullard triodes capable of amplifying and delivering power at the extremely high frequency of 4,000 Mc/s (corresponding to a wavelength of 7 centimetres).

Whilst triodes have already been used at these frequencies they have not, hitherto, been characterised by reliability or substantial life. Nor has it been possible to achieve really useful power or low noise from them.

The new valves are of disc-seal construction and are distinguished by embodying dispenser cathodes. Apart from giving large emission current densities, this permits precision grinding of cathode surfaces and the employment of very small interelectrode clearances. A useful result of this type of construction is that the valves generate very little electrical noise, and can therefore be used to advantage in sensitive receivers.

Of the two new triodes, type EC56 gives a power gain of 13 db at 4,000 Mc/s, with a bandwidth of 100 Mc/s. Type EC57 is a power amplifier with an output of 3 watts, and typical gain and bandwidth figures of 8 db and 50 Mc/s at 4,000 Mc/s.

A Converter Bandswitch

MAKING A CHANGE-OVER SWITCH FOR A CONVERTER

By H. A. Fox

THE bandswitch described in this article was designed for the EF50 converter, described in the September, 1956, issue of PRACTICAL TELEVISION, but it is suitable for any similar converter. Its fixed contacts are arranged so that the leads to it are all short and pick-up is reduced to an absolute minimum.

The EF50 converter was first built by the writer without a bandswitch and gave excellent results. When the switch was added there was no noticeable deterioration in the picture on either band.

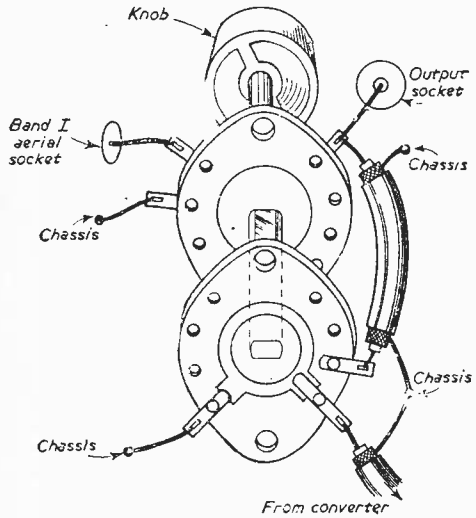
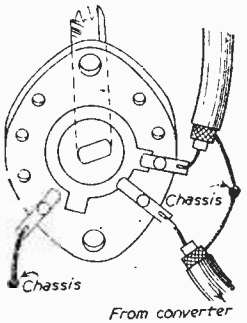


Fig. 1.—Switch in Band I position.

A standard twin-wafer wave-change switch is obtained and dismantled. Both wafers are then modified by removing all the fixed contacts except the three required, so that each wafer is a single-pole two-way switch. The fixed contacts are easily removed by drilling away the tubular rivet heads.

A screen is then made to fit right across the inside of the chassis and the switch is re-assembled with suitable distance sleeves over the two long bolts, so that the two wafers are back-to-back in the relative positions shown in Fig. 1, the screen being built into the switch midway between the wafers, as shown in Fig. 3. Compare Fig. 3 with Fig. 2 on page 77 of the September issue. For clarity the screen is not shown in Figs. 1 and 2.

Fig. 2.—Wafer farthest from knob, in Band III position.



The wiring up of the switch and screen combined is completed as far as possible before fitting into the converter. To limit the rotation of the switch to the two positions required the writer fitted a bolt in the switch end-plate, which acts as a stop. Alternatively, a lever-type knob could be used instead of a round knob, and two bolts fixed in the end of the converter chassis so that their heads stop the lever at the desired limits.

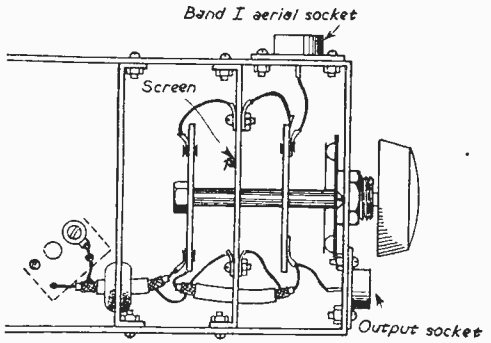


Fig 3.—Switch installed in converter.

New Instrument Cathode-ray Tube

A NEW range of 3½in. instrument tubes, type 4GP, to replace the existing 3½in. E4412 series, is announced by The General Electric Co., Ltd. Four varieties of screen are available with persistences ranging from one millisecond to 20 seconds. A further screen, suitable for radar applications, will be introduced later although the tube can be made to a special order with any of the majority of other standard screens.

The plate sensitivity of the new tube does not vary by more than 2 per cent. for deflections up to 75 per cent. of the useful scan. Improved spot centring ensures that the undeflected spot will fall within a radius of 5 mm. concentric with the tube face. The deflection axes are orthogonal to within 1 deg. Other changes from the E4412 series are single stage post-deflection acceleration, reduced inter-electrode capacitance, a flat-plate glass screen and a 6.3 volt heater.

Readily available from stock, the new tube is list priced at £10 0s. 0d.—G.E.C., Magnet House, Kingsway, W.C.2.

THE P.T DATA SHEETS

No. 4.—McMICHAEL M17T SERIES

THE M17T is a 14-valve 12-channel television receiver, employing a Mullard 17in. all-magnetic cathode-ray tube.

The circuit is a simple, practical and well-proved type, which has been produced in very large quantities. Experience has shown that the receiver is reliable and will give little trouble in the field. All components are conservatively dimensioned and are the best quality.

The receiver employs a 12-channel turret tuner for station selection and has a cascode first stage followed by a triode-pentode frequency converter stage.

The turret is arranged so that BBC and I.T.A. channels are placed adjacent to each other, regardless of the channel numbers, so that channel selection is simplified; it is only necessary to rotate the turret one position to change channels.

Following the frequency conversion is an I.F. amplifying stage common to vision and sound. From this stage the vision and sound I.F. frequencies are separated and amplified independently.

SPECIFICATION OF THE McMICHAEL M17T SERIES

Mains Supply
A.C. or D.C. 200-250 volts (50 cycles A.C.).

Channels
12-channel tuner. Band I and Band III adjacent.

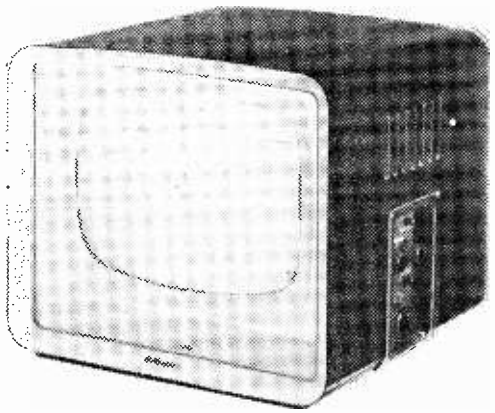
Intermediate Frequencies
Vision 19 Mc/s, Sound 16 Mc/s.

Valves

V1	PCC84	R.F. Amplifier.
V2	PCF80	Frequency Changer.
V3	EF80	Common I.F. Amplifier.
V4	EF80	Vision I.F. Amplifier.
V5	EB91	Vision Demodulator and Noise Limiter.
V6AB	PCF80	Video Amplifier Frame Multivibrator.
V7	ECL80	Sync Separator and Line Oscillator.
V8	PL81	Line Output.
V9	EY51	EHT Rectifier.
V10	PY81	Efficiency Diode.
V11	EBF80	Sound I.F. Amplifier and Detector and A.P.C. Clamp Diode.
V12	PCL83	A.F. Amplifier and Output.
V13	PCL83	Frame Output and Multivibrator.
V14	PY32	Mains Rectifier.

Loudspeaker
7in. by 4in. elliptical.

Aerial Input
75 ohms unbalanced.



McMichael Model M17T.

The vision is then demodulated by a valve diode and fed to the video amplifier, the output of which modulates the cathode-ray tube, MW43-64.

Vision interference suppression uses a valve diode biased with a three-position selector to give different levels of suppression.

The sound signal is demodulated by a valve diode and amplified in a two-stage triode pentode A.F. amplifier with negative feedback applied.

There is a sound-interference limiter incorporated in the A.F. amplifier which uses a cold diode.

Synchronising pulses are separated from the video signal by the pentode section of a triode pentode and from here the line pulses are fed directly to the multivibrator line timebase generator and output stage.

Horizontal width is a three-position selector and horizontal linearity is corrected by a permanent magnet-saturated Ferroxcube inductance. EHT voltage is approximately 13 kV.

The frame-synchronising pulses are separated from the line pulses by integration and a germanium clipper diode.

Vertical scan is generated by a multivibrator circuit and amplified by pentode section.

Deflection is double magnetic, by low-impedance scan coils.

Power is supplied by a valve rectifier and provision is made for D.C. mains.

All the valve heaters are in series and are protected against surges by a negative temperature coefficient resistor (thermistor) in series with the chain.

A control panel is recessed on the right-hand side of the cabinet and contains the channel selector switch, fine tuning, volume on/off brightness, horizontal hold, vertical hold, contrast and sensitivity controls. The contrast control regulates the level at which the automatic picture control operates and the sensitivity control varies the gain of the cascode stage.

(Concluded on Page 390)

A Band I/Band III Aerial Switch

AN ALTERNATIVE TO A CROSS-OVER NETWORK

By L. S. King

WHETHER from preference or from circumstances of signal strength requirements, etc., a large number of separate Band I and Band III aerials are in use, individually oriented for optimum pick-up. Where two down leads can be accommodated on the television receiver by two separate input sockets, one for each aerial, as in the case of a number of converted types of receiver, no problem arises, but where operation is into a simple input-socket type of receiver a further aspect does arise.

One solution is either to use a cross-over network with a common downlead in those cases where the received signal strength is sufficient to support the inherent network losses, or, as a similar approach with a simple feeder, to load each aerial connection with a loading section offering a high impedance to the frequency of the other aerial, although this might not be so easy of accomplishment in actual practice. On the matter of losses, or as a separate issue of reflection troubles that might arise from these devices, it must be remembered in connection with the former that the automatic gain control of the receiver will always endeavour to balance up for losses in the aerial system. But, it may be at the expense of picture quality, and if the A.G.C. is severely on the stretch (and there is no ready means of determining this electrically), internal circuit noise will arise which can be recognised in a stirring or patterning of the background and the picture will be degraded. This tends to occur without one knowing how much better the picture could be, as the means of direct comparison is absent.

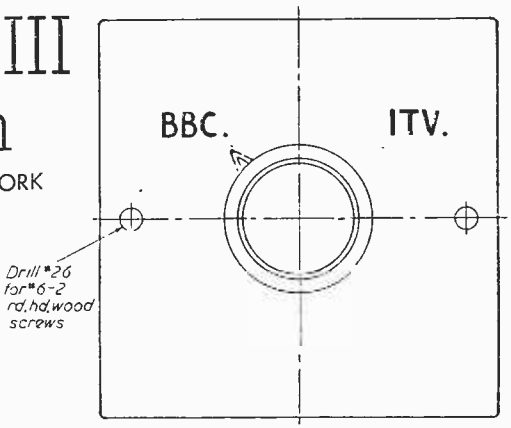


Fig. 2.—The cover plate or panel.

The easy alternative to all this is to put up with plugging and unplugging two separate aerial downleads into the simple inlet sockets, a process which can be reckoned to last about a fortnight or so, before plug troubles develop.

The coaxial plug is not suitable for use as a switching device, but this difficulty can be overcome quite readily by the use of a suitable switch installed on the skirting board near the television set. Manufacturers of television receivers may in time provide for aerial switching in addition to tuner switching, but in the meantime, and for those who already have a simple input-socket type of receiver, the plugging nuisance will persist.

The Switch

The following briefly describes a suitable switching device for alternative BBC and I.T.A programmes, while further details can be gathered from fig. 1. The arrangement merely consists of a switch in a screened box, but the important aspect is that the switch should be a low-loss ceramic type. With this, no losses whatever can be detected in the picture on either band from its insertion in the circuit. The writer has no reliable figures for losses at 190 Mc/s, but at 3 Mc/s the power factors for statite ceramic and paxolin are 0.002 and 0.05, respectively, which shows a distinct advantage and a ratio of 25 to 1 in favour of ceramic insulation. This advantage increases at higher frequencies, in fact, paxolin may be inhibited, although much will depend on what losses can be afforded. It is believed that the ceramic supply position is itself difficult, and it might be advisable to get any basically suitable form of ceramic wafer-type rotary switch and to modify it

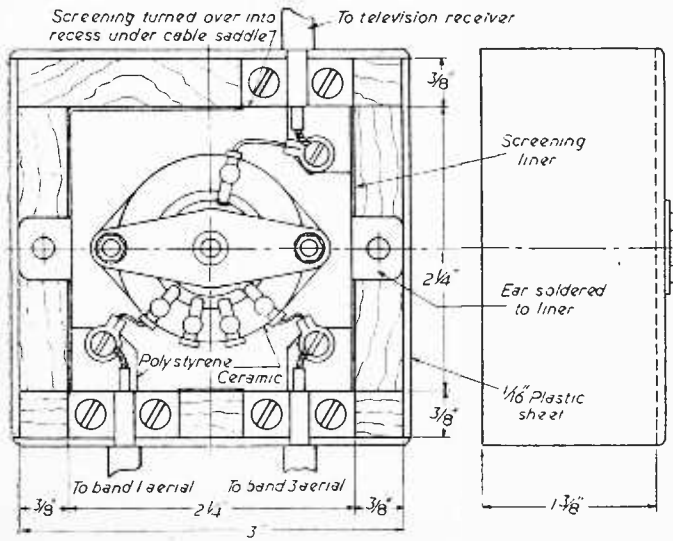


Fig. 1.—General details of the switch.

where necessary by removing any unwanted contacts as superfluous capacitative metal. The writer used an Oak, type HC, single-pole, four-position switch with silver-plated phosphor-bronze contacts, manufactured by N.S.F. Ltd. A relatively small stock is held by G. W. Smith, 3 and 34, Lisle Street, London, W.C.2, and may be by other advertisers.

As the selection of either of two aerials had to be made the "make" contacts were selected as far apart as possible, leaving two unwanted contacts between. On strong signals from the BBC channel, it was found that a weak picture could be obtained on the next unconnected contact by capacitance. But on the next unconnected contact the effect had entirely gone, and so the unwanted contacts were left intact, but they could be removed if found beneficial to do so.

Housing the Switch

With regard to the box to house the switch, no suitable small metal box could be found and it was decided to construct it in wood with a thin sheet brass screening liner. The problem is a designer's one of obtaining conductive entry into a screened box, and the writer has combined a solution with a furniture effect suitable for use in a living-room. Beautifully finished oak 1⅝in. ⅝in. nominal section can be obtained cheaply, and this makes into a suitable open-ended framework with the sides nailed together to form a 2¼in. open square. Suitable recesses should be cut in the edges of the sides to accommodate the entry of the cables and also the cable braid clamping saddles, as can be seen from fig. 1.

The sides can now be covered in a variety of finishes with 1/16in. thick melamine-phenolformaldehyde plastic sheet (Formica or similar), and the writer used one with a walnut wood-grained finish, although other imitations of wood (mahogany, oak, etc.) are obtainable to match the woodwork of the room. Small offcuts are obtainable at about 1s. per square foot and they should be cut well oversize and stuck to the wooden framework with Evo-stik or similar adhesive. Araldite epoxy resin adhesive is also obtainable locally in a new two-tube resin and polymeriser pack by Aero Research, Ltd., Duxford, Cambridge, and this also may be used. When dry, the oversize plastic should be filed back to the framework dimensions with a medium coarse but sharp file, filing towards the framework and not away from it.

The closed top of the box which will carry the switch is another oversize piece of plastic stuck on, but in filing this back care must be taken not to cut into the sides. To avoid this the file should be held in a direction sloping to the plane of the side. An attractive black line will outline the box structure when finished, but remember that the actual finish on the plastic is very thin, and if this is filed away a blemish results. It is best to make an experiment first. During the process the Evo-stik is bound to get on to the plastic surface, but it can be cleaned off with Evo-stik cleaner, Thawpit or carbon-tetrachloride.

After drilling a ⅜in. hole and a suitable retaining hole near to it for the switch, the box should be lined with 0.014in. or similar brass sheet, but leaving the bottom open. Turned-over portions of the screening into the recesses already cut in the wooden framework ensure continuity of the cable braids when clamped down by the cable saddles. Small ears soldered to the side screening and bent over will provide continuity with the metal backplate when the box is screwed to the skirting board with 2in. fixing screws. Cut a large hole in the front screening for the passage of the switch shaft and insulate the switch frame from the screening. There is no object in hanging more metal on the screening than is necessary. The switch is now fitted and the flat backplate of brass sheet completes the screening when the box is screwed to the skirting board.

The drawing shows the inner conductors of the cables, screw terminated on blocks of polystyrene (low-loss material with power factor at 3 Mc/s = 0.0002) for those who would have no soldering facilities on site, but for those who have, it is better to dispense with any possible source of loss and solder the inner conductors direct to the switch tags. Any difficulty in fixing the polystyrene with the possibly small pieces available can be overcome by sticking in the terminal blocks with Evo-stik. This gives a tenacious hold even on the brass screening. Use a sharp file and leave the file marks on the sticking surfaces. Polystyrene drills and taps well, but it tends to clog, so the drill and tap should be frequently cleared of swarf.

The writer uses a knob for switch operation, but readers might like to try out foot operation by a diametral arm instead. This gives assurance at a glance in the restricted light of the room that the switch has been operated to its correct position, a useful point when, as is usual, one programme can be received on the aerial of the other, although less favourably.

I.T.A. Programme Popularity

"SUNDAY Night at the London Palladium" is lengths ahead in the 1956 Programme Popularity Stakes in all I.T.A. areas. Since January 1st, 1956, this A.T.V. programme has hit the Nielsen London "Top Ten" 45 times (16 times top of the class), the Midlands "Top Ten" 23 times (since February 14th, 1956), and the Northern Region "Top Ten" 29 times (since May 3rd, 1956). No other programme has made the Nielsen "Top Ten" so often in any area. The show's average London Nielsen Rating* to December 9th (inclusive) has been 68 per cent. Networked it was viewed on December 9th by an estimated audience of 6,496,000 viewers.

Battling for places in the race are :

	Appearances in Nielsen "Top Ten" To December 9th, 1956, inclusive
London	
Dragnet	35
Take Your Pick ...	31
Jack Hylton Presents	31
Midlands	*Since February 14th, 1956*
Take Your Pick ...	20
Robin Hood ...	20
Dragnet	19
Cross Current ...	19
Manchester/Northern Region	*Since May 4th, 1956*
Play of the Week ...	17
The 64,000 Question	15
Spot the Tune ...	15
Dragnet	15

* Percentage, viewing each programme for not less than five minutes, of all households within the Nielsen London Area capable (from week to week) of receiving Croydon.

SHARED CHANNEL Interference

SOME HINTS ON DEALING WITH A NEW PROBLEM By B. L. Morley

BECAUSE of the limited number of channels available for television, transmitters have been forced to share the same channel in order to obtain as near full coverage of the country as can be managed.

The BBC have tackled the problem by making the five Band I channels available to them, primarily for covering the more densely populated areas by means of high-powered transmitters.

The very first transmitter was naturally based on London and was originally at Alexandra Palace. This covered the London area and much of south-east England where the population density is high. The next step was to erect a transmitter for the Midlands at Birmingham (Sutton Coldfield) to cater for the high density population in this area.

The Birmingham transmitter, at the time of its erection, was the most powerful transmitter of television signals in the world.

Holme Moss was the next transmitter to be erected and it was possible to get this transmitter working fairly early because it made use of the London-Birmingham link.

Scotland was the next leg and the inception of the transmitter at Kirk o' Shotts brought TV to Scotland.

The erection of these transmitters left only one channel available in Band I, and the final high-powered transmitter was erected at Wenvoe, near Cardiff, to serve South Wales and as much of south-west England as was possible.

It should be noted that the frequency spectrum covered in Band I allowed five transmitters to be erected, each one using a separate channel. This was due to the fact that the British system of 405 lines made five channels possible. If the 625-line system had been used only three channels would have been available, and the French 819-line system would have meant that two channels only would have swallowed up the whole of the Band I spectrum.

Although the bringing into service of the Wenvoe transmitter gave a good coverage of the television service, there were many black spots where signals were either too weak to be of use or were non-existent. Having used the five existing channels it was decided to share the same channels out again so as to fill up the gaps left by the more powerful stations.

There were two important factors to consider in sharing channels; they were that, first, in Band I it was found that the signals covered a much larger area than was originally anticipated and, secondly, sporadic atmospheric conditions could cause signals to be obtained at long distances from their source.

Band I signals have a much smaller fall in signal power over distance than was at first anticipated. For the first 30 miles or so the loss of signal strength kept up to the calculated expectation of 1-2 db per mile, but instead of being maintained at this figure over the normal range of the transmitter, the signal strength is thereafter found to decrease at about ½ db per mile. The reasons for this are not yet fully understood.

In arranging for channel sharing, therefore, arrangements had to be made to separate the two sharers by as great a geographical distance as possible. We have evidence of this with London and Belfast sharing Channel I, Isle of Wight and Scotland sharing Channel III, and so on.

Additionally, in an effort to prevent a mutual interference caused by sporadic atmospheric conditions, it was decided to make the smaller-powered transmitters horizontally polarised, the theory being that a vertical aerial will only respond to a vertically polarised signal and vice versa.

This latter is true except in the region of a high-powered transmitter where a horizontal aerial can respond to the vertically polarised signal. However, this is of no practical importance as, when near enough to a transmitter for this to happen, then the local signal completely swamps any interference.

One further point had to be taken care of when sharing channels was considered, and this was the possibility of the signals actually mutually interfering with each other in areas where the signal strengths of each are about equal.

The simplest way of overcoming this problem is to arrange that the second transmitter radiates on a carrier which differs by a few kilocycles from its brother in the same channel.

Band III Sharing

When Band III was made available to the I.T.A.

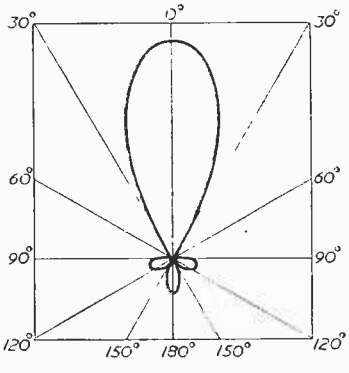


Fig. 1.—Polar diagram of Yagi array.

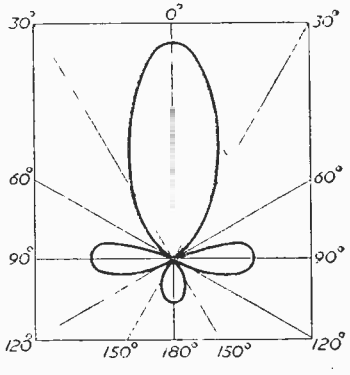


Fig. 2.—Lobes of a Yagi incorrectly matched.

conditions were not quite so easy as with the BBC on Band I. On the one hand there was no practical experience of vertical polarisation propagation on these higher frequencies, and, further, most of the channels available were in use, there being initially only two channels vacant, with the promise of a third. These three channels were numbered 8, 9 and 10.

Channel 9 was the first to be used in the new Band and the pattern of events began to follow closely those used by the BBC. First London using Channel 9 then Birmingham using Channel 8, and moving further north the Winters Hill transmitter was opened on Channel 9 which is the same as used by London.

After this period the transmitter at Emley Moor was opened, the main reason for this transmitter being that the Pennine Chain (the backbone of England as they told us in the classroom) acted as an effective barrier to the Winters Hill transmitter, and this station could not alone cover the required area.

When Emley Moor project was mooted, Channel 10 became available and this was used for the new transmitter.

When the Scottish transmitter at Blackhill is completed on Channel 10, and the Welsh and West of England transmitter also on Channel 10, the wheel will again have turned full circle, so to speak, and the I.T.A. scheme will have followed a similar pattern to that of the BBC in covering the main population areas with high-powered transmitters.

The difference, of course, is that the completion of the BBC's scheme required five transmitters, working each in its own channel, whereas I.T.A.'s scheme required six transmitters working on three channels.

Vertical versus Horizontal Polarisation

The advantages and disadvantages of both systems have been explored and the concensus of opinion is in favour of vertical polarisation, particularly in regard to Band III, as vertically polarised waves suffer less from ground reflection.

Because of this we have the position of two high-powered Band III transmitters working on the same channel with the same polarisation. Some of the defects of such a system can be modified in a similar manner to that on Band I, i.e., by making a slight difference of a few kilocycles in the carriers of the two transmitters.

However, conditions have arisen where signals from two transmitters are presented to the receiver—with disastrous results!

The position is aggravated by the turbulent upheavals in the ionosphere caused by sunspot activity, which cause the signals to be presented at very good strength at places where it was thought impossible to receive them.

As an example of this, at the author's location, which is practically at sea-level just outside Bristol, when conditions are good an excellent signal is received from Winters Hill, which is ruined by that from Croydon!

Effects of Interference

The effects produced when two signals interfere with each other are those produced on the screen and those produced on the sound.

On the sound channel it is difficult to perceive that the transmissions are coming from two sources *when each station is transmitting the same programme.* When they are not (such is often the case with I.T.A.) then two voices are heard, one perhaps in a dramatic play or talk, while the other is extolling the excellence of some product!

It is obvious that this dual voice business happens more frequently with the I.T.A. than with the BBC, as most of the time the BBC radiates the same programme from all transmitters.

The position is worsened by the fact that most of the trouble occurs in Band III, where each advertising period is different for each station. (I am speaking now of the short advertising periods between programmes.)

Effect on the Picture

In the picture the effect most generally observed is what appears to be a total loss of interlace, there being a gap of several lines between each section. It is caused by a heterodyne whistle which is produced by the two transmissions beating together and can be heard distinctly if the tuner is rotated so that the vision signal is heard on the sound.

While both stations are radiating the same programme things are bearable, provided one stands well away from the picture, but when the programmes differ then the ghost of one picture is neatly superimposed on the other and in many cases, where the two signals are fairly equal in strength, havoc is played with the synchronisation.

Solving the Problem

The solution to the problem is not easy. The obvious thing is to employ a directive aerial system, and this can be effective where the geographical location of the respective transmitters permit.

The difficulty here is to obtain a suitable high-gain array, with highly directional properties, which does not respond to signals from other angles. Theoretically a highly directive array is ideal, and the more directive it is made by the addition of directors the narrower is the acceptance angle and therefore the less its response to signals from transmitters located in different geographical positions.

In Fig. 1 we show the polar diagram of a typical Yagi array, and the response in practice of the aerial would closely approach that of the diagram provided the conditions were ideal and that no outside sources, such as roofs and near-by objects, caused distortion, and also that the matching to the feeder was perfect.

Practically, these conditions are rarely obtained and side-lobes, as shown in Fig. 2, are apt to develop. The lobes can develop in any direction and are not necessarily at right-angles, but can develop at practically any angle to the main lobe. (It should be explained that the specially shaped curve termed the polar diagram illustrates the pick-up area of the aerial.)

The production of side-lobes in a directional array explains the reason for pick-up of interference from the side or even behind a directive array, even after it has been carefully aligned on the transmitter by means of a compass.

Another point to note is that the popular broadside arrays, where two Yagis are mounted side by side, is less effective from the directivity point of view than the same number of elements used in a forward array. A Yagi which is highly directive is shown in Fig. 3.

Against this must be set the fact that a "double"

array is often unresponsive to signals arriving at 90 deg. A broadside (double) array comprising 10 elements has just about the same gain as a forward array using the same number of elements.

Unfortunately, no hard and fast rules can be laid down about it as so much depends upon local conditions. The golden rule is that where this class of interference is obtained, then improve the aerial system, and if one form of aerial does not provide the answer, then try another. The slot aerial may prove of value here.

Acceptance Angle

The acceptance angle of most standard arrays is much greater than many people believe, and it is possible to pick up a signal when the direction of the aerial is different from that of the transmitter. As an example, at the author's location an H aerial directed at Birmingham picks up a very good signal from the Isle of Wight, which lies practically behind it.

The answer is, of course, that when an aerial is used for a frequency other than that for which it is cut, the polar diagram is altered, and herein lies a clue to another method of improving the aerial. This is to experiment with the lengths of the aerial by altering them so as to vary the polar diagram and so enable it to discriminate against the interfering signal.

It goes almost without saying that aerials with "twig" attachments (Band I aerials converted to dual band by the addition of small elements) can have some weird and wonderful polar diagrams when they are fully explored. If troubled by dual channel interference then use a separate aerial system if a dual-band aerial is now in use.

Matching

It has been observed that incorrect matching can cause side-lobes to appear in the radiation pattern of the aerial. Matching is quite difficult, especially with high gain arrays. In all cases the matching should be as recommended; in the case of a commercial aerial as recommended by the manufacturer, and in the case of a designed aerial, such as published from time to time in these pages, the recommendations of the designer.

But in spite of this both the manufacturer and the designer cannot cater for all possibilities of local conditions and so, where access to the aerial is fairly easy, matching stubs can be tried.

A matching stub is a quarter-wave section of feeder cable of the same type used for the down-lead, which is connected in parallel with the down-lead and is short-circuited at its distant end. The length of the stub should be varied above and below its optimum value, the results on the television receiver being noted at the same time.

It is difficult to be up on a roof and watch the televisor at the same time! But a very good guide to what is being done can be obtained by tuning the sound of the receiver to the vision channel and extend the output by a long lead and pair of phones to the roof. The beat heterodyne whistle will be heard and the object would be to reduce the heterodyne to zero while still retaining the strength of the vision signal.

While adjusting the stub it will be found that at certain lengths the vision signal will be almost wiped out.

Screening

If at all possible, screening can be resorted to. Where conditions permit, the aerial could be mounted at the side of the house or at the front or back in an effort to get the roof and walls between the aerial and the interfering signal.

This method is particularly useful on Band III, where tiles cause a greater attenuation than they do on Band I.

Another point in connection with screening is that in the case of a Band III a wire mesh screen can be erected at a distance of one wavelength from the aerial. If it is more than one wavelength away, then reflections are liable to occur. It should be erected on the side from which the interfering signal comes.

To improve the front-to-back ratio, rods of the same length as the reflector and spaced the same *radial* distance from the dipole can be placed in a parabola behind the dipole in place of the wire mesh.

Remedy at the Receiver

There is very little that can be done at the receiver end, unfortunately, as if both signals reach the tuning stages then they will naturally be amplified together.

One of the first things is to check the matching and as a start check the connections of the aerial socket and the coaxial plug.

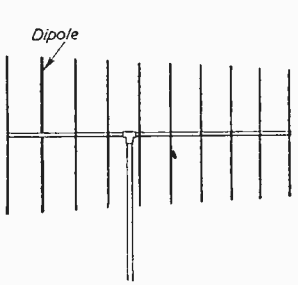


Fig. 3.—A highly directive Yagi.

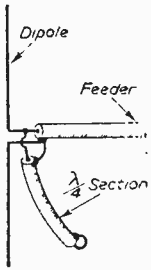


Fig. 4. — A matching stub.

Always use the type of feeder recommended by the maker of the set. It is asking for trouble to use a coaxial feeder if balanced twin is specified, and vice versa, and also if 300-ohm cable is recommended, use 300-ohm cable and make certain that the aerial dipole is adapted to cater for a 300-ohm feeder line.

There is one other line of action and that is to fit a high-Q rejector in the form of a stub. First, the stub can be used to "tune out" any inaccuracies in the matching and, secondly, it may be possible to take advantage of those few kilocycles off tune so that the amplitude of the interference is reduced. It should be remembered that what is done at the aerial socket is figuratively and literally reflected at the aerial.

Using a stub to attenuate the interfering signal is rather a risky business, as they are so close together it is not possible to do anything to one without affecting the other, and even if the interfering signal can be attenuated sufficiently, then there will be a serious degradation of the quality of the picture.

The stub should be used mainly for evening up the matching.

The stub should be a length of feeder cable a little

more than a quarter of a wavelength long (about 2ft. for Band III and about 6ft. for Channel 1 to 4ft. for Channel 5).

It should be connected in parallel with the aerial socket of the televisor in a manner similar to that shown in Fig. 4 for the stub at the aerial end. The end of the stub should be short-circuited and then cut 1in. at a time, leaving it short-circuited each time, and noting the effect on the picture.

A note should be kept of the number of cuts made so that if one passes the optimum position then a fresh length of cable can be cut which is the correct length for best results.

When the correct length has been found then the short-circuited end should be permanently soldered and the length of cable tucked away inside the cabinet. Do not let it come into contact with anything inside the cabinet, and under no circumstances must it make contact with the chassis in these days where it is common practice for the chassis to be alive.

Adjacent Channel Interference

In addition to dual channel interference, we have, in the case of Band III, the problem of adjacent channel interference, and this is increasing where the number of the transmitters increases.

The R.F. circuits of televisors on Band III are not very selective and can have an accepted bandwidth of 8-15 Mc's. This means that the first stages of the receiver will receive, say, Channel 8 signals when tuned to Channel 9, particularly in areas where the signal strengths are about equal. The result is, of course, utter confusion on the screen, or, where one signal is weaker than the other, effects similar to those explained for dual channel interference will be experienced.

All the data given in previous paragraphs can be applied and particular note should be taken of the aerial system so that it is cut for the desired channel. Most Band III aerials will receive the adjacent channels with little loss, but every effort should be made to cut accurately.

The second line of defence is the use of high-Q rejectors, and while a simple rejector circuit of standard form could be tried, the quarter-wave stub method is by far the best.

It is likely that the stub will cause attenuation of the main signal, though accurately cut, but the main object is to obtain as great a ratio as possible between the desired signal and the unwanted one, even though it be at the expense of a little gain.

Notes on the Marconi Tele-recording Equipment

TELE-RECORDING forms an important part of modern television programme techniques, for by this means a programme can be transferred to film for use on a subsequent occasion. Basically, this is achieved by feeding the video signals and synchronising pulses to a cathode-ray tube capable of producing an intensely bright, short-persistance picture. This picture is optically focused on to a "frame" of negative film stock and thereby photographed, the film then being moved on one "frame" for the taking of the next picture, and so on. The reel of the film is then developed and processed in the normal way for future use.

Although theoretically straightforward, the practical realisation of such an equipment poses many problems. For instance, in order to record full picture information, the film must be stationary in the gate for the period of the two scanning fields which make up one complete television frame or picture; this means that the only time left in which it can be moved on for the next exposure is in the brief blanking period between television frames.

As this blanking period varies between 1.4 and 1.8 milliseconds, two opposing requirements have somehow to be reconciled. First, the film must (ideally) be pulled down into position in this exceedingly fast time, as any overlap into the period when the television picture is being built up by the normal scanning process will mean that some of the scanning lines (and, therefore, picture-content) are not registered on the film. In practice, the loss of a few lines is not of great importance; nevertheless, the nearer the pull-down time approaches these limits the better will be the quality of the filmed picture.

Secondly, it is naturally of prime importance that the film itself must not suffer physical injury in the process of being pulled down.

Pull-down times in use on conventional interrupted cameras have been so long as to make the arrangement quite unworkable, and hitherto the usual practice has been to record only alternate television frames, the others being blanked out and the intervals used as "breathing spaces" in which the film is pulled down.

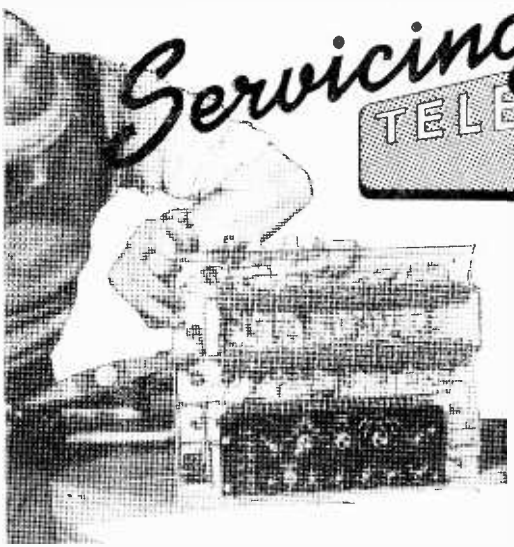
The Marconi Tele-recording Equipment Type BD.679 incorporates an entirely new and exclusive fast pull-down mechanism which operates in the normal time of 2 milliseconds, but which can be adjusted to give a pull-down actually within the blanking period. A very light gate-pressure is employed, while positive registration of the film is achieved against a sapphire-tipped claw. The fast pull-down mechanism itself is totally enclosed in an oil bath and can be quickly removed as a sub-unit. A very simple optical system is incorporated which ensures that there is negligible loss of contrast in the recording due to scatter. (See page 382.)

The camera itself is supplied with magazines of 2,250ft. capacity (or 2,000ft. magnetic stripe), identical for feed and take-up. "Minutes left" indicators are provided, together with "Lost loop" and "Take-up failure" cut-outs. The gate is designed to deal with long recording sessions without attention, and splices can be passed without difficulty. A footage indicator is incorporated in the camera.

The recording monitor, the function of which is to generate (from the externally supplied video signals) an intense high-quality picture for focusing on to the film, is mounted on a swivel head, and may be swung through 90 deg. to facilitate removal of the recorder cathode-ray tube. Due to the flexible design of this unit, any magnetically-focused tube of a diameter between 5in. and 10in. can be used.

A flywheel sync panel can be supplied as an optional extra for the regeneration of line and field pulses when the recording is made from a remote location. Other optional extras are a grey scale generator, a waveform monitor and a 14in. picture monitor.

Servicing TELEVISION RECEIVERS



No. 28.—THE VIDOR CN4216

By L. Lawry-Johns

THIS receiver was developed from the CN4213 and CN4215 which differ from the subject of this article only in minor respects, such as the disposition of the pre-set controls. The receiver is a five-channel superhet table model with a 12in. tube. The pre-set controls are concealed beneath a flap on the front of the cabinet. The width and horizontal linearity controls are mounted at the rear on the tube bracket.

Other pre-set controls are shown in the diagrams, and it should be noted that the sensitivity plug and socket are not fitted on the earlier receivers.

The receiver employs two separate chassis connected by plugs and sockets. The R.F. chassis may be completely withdrawn by removing the various plugs (including the speaker leads), and is separate from the pre-set control panel once the connecting plug is removed.

To remove the timebase and power supply chassis the two screws securing the pre-set panel should be withdrawn and the panel will then be removed with the chassis.

The circuit is fairly conventional, V1 being an R.F. pentode with the contrast control in its cathode circuit. V2 is the mixer oscillator. L4 being the oscillator coil. It should be noted the L1 is factory set at vision I.F. frequency and should not be adjusted unless a signal generator is available. L2 is the aerial tuning coil, L3 the R.F. coil.

L2, L3 and L4 are the only coils likely to require adjustment, and no others should be touched. Sound-on-vision and vision-on-sound effects can usually be removed by a slight movement of L4. Generally speaking, this should be set for maximum sound.

V3 is the common I.F. amplifier and the sensitivity plug and socket connect its cathode circuit to the contrast control.

V4 is the vision I.F. amplifier, a sound rejector L6B being connected in its control grid circuit. The output of V4 is passed via tuning coils to the vision detector which is a crystal diode. The demodulated signal is passed to the V5 video amplifier via series chokes. The cathode circuit of this valve is connected to chassis through a 270-ohm resistor shunted with a 100 μF electrolytic capacitor. This capacitor has a profound effect upon the picture strength and the picture synchronization.

Heavy negative feedback will result if this component becomes open circuit, and the sync pulses in particular will be almost completely lost; thus what picture is visible will not be able to be locked vertically or horizontally. The anode circuit is loaded by a choke and a 4.7 KΩ resistor. The C.R.T. cathode, interference limiter cathode (V6A) and sync pulse limiter (V6B) being fed from the anode. The 4.7 KΩ resistor is not taken to the H.T. line. It is taken to the boosted H.T. line via an 18 K resistor decoupled to the H.T. line with a 2 μF capacitor. The positive side of this capacitor is joined to the H.T. line.

Thus a loss of efficiency in the line timebase will

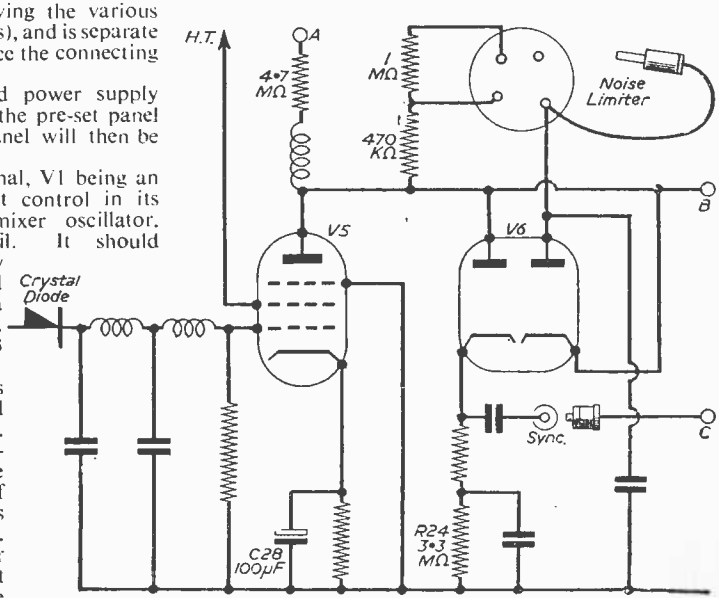


Fig. 2.—Video output, noise limiter and sync clipper.

not only cause low E.H.T., etc., but also a drop of H.T. to the video amplifier. The cumulative effect is to produce symptoms closely resembling those of a weak tube, as well as loss of focus and variation of picture size, focus, etc.

If the 2 μF capacitor becomes open circuit, loss of sync and a negative picture will result. Thus it will be seen that this part of the circuit can, if defective, cause some misleading symptoms and the line timebase has a profound effect upon the video response. It will be seen from the diagram that the sync separator, pentode section of V11 (ECL80), is fed from the cathode of V6B which operates as a sync clipper. V6A is the interference limiter whose anode potential and thus its conducting point is determined by the position of the vision noise limiter control plug.

Timebases

The triode section of V11 operates as the frame-blocking oscillator, the frequency of which is determined by the vertical hold control. If the control is at the end of its travel without securing a proper lock, check the 470 KΩ series resistor which may increase in value. The output of the oscillator is fed to the pentode section of V12 (ECL80). In the event of insufficient height, check V12, its cathode bypass 100 μF electrolytic and its 2.2 MΩ grid-leak.

If this valve is at fault the horizontal scan may be affected, since the triode section functions as part of the line timebase oscillator. V14 is the line output, part oscillator, PL81. In the event of poor width, bad EHT regulation, and as previously mentioned, lack of definition and contrast, suspect the 1.5 MΩ load resistor of the triode section of V12.

The efficiency diode is a PY80, the anode of which is joined to the H.T. line and the cathode to the line output transformer at tapping 4. The heater of this valve is fed via a pair of bifilar windings on the transformer from the series heater chain. The windings are included to prevent insulation failure between the heater and the cathode.

The EY51 EHT rectifier V15 anode is fed from the overwind on the transformer, whilst the heater is supplied from a separate winding. Two 68 megohm resistors of a special type form an EHT bleeder chain from the heater to chassis.

The Sound Channel

V8 is the sound I.F. amplifier, working at a frequency of 19.5 Mc/s. The output from the anode of this valve is fed to V9A, which is the detector; the output from the cathode of this is applied via the volume control to the cathode of the second section of V9, which operates as the sound noise limiter. The operation of this depends upon the H.T. applied to its anode and the signal applied to its cathode. The anode H.T. is applied through a 10 megohm resistor. When this resistor "goes high," distortion of sound results, which becomes worse as the contrast is advanced, and slightly less pronounced as it is retarded.

From V9B audio signals are fed to the triode section of V10 (ECL80) which serves as an A.F. amplifier. The 220 K load resistor of this section is also liable to increase in value, causing weak and distorted sound. Here, however, the distortion continues whatever the volume level. On this particular receiver, when the noise limiter resistor goes high, the volume control has an effect similar to that of the contrast control, unlike the majority of receivers where the volume control comes later in the circuit, and does not affect the distortion.

The output of the triode section is capacity-coupled to the control grid of the pentode of V10 in a conventional circuit.

The Power Supply

This consists of a PY82 half-wave rectifier with choke capacity smoothing, the capacitors being C64, C65 in a single 60 - 100 μF can. All valve heaters are in a single chain, the tube heater being "next to chassis" as is usual practice. It is in the

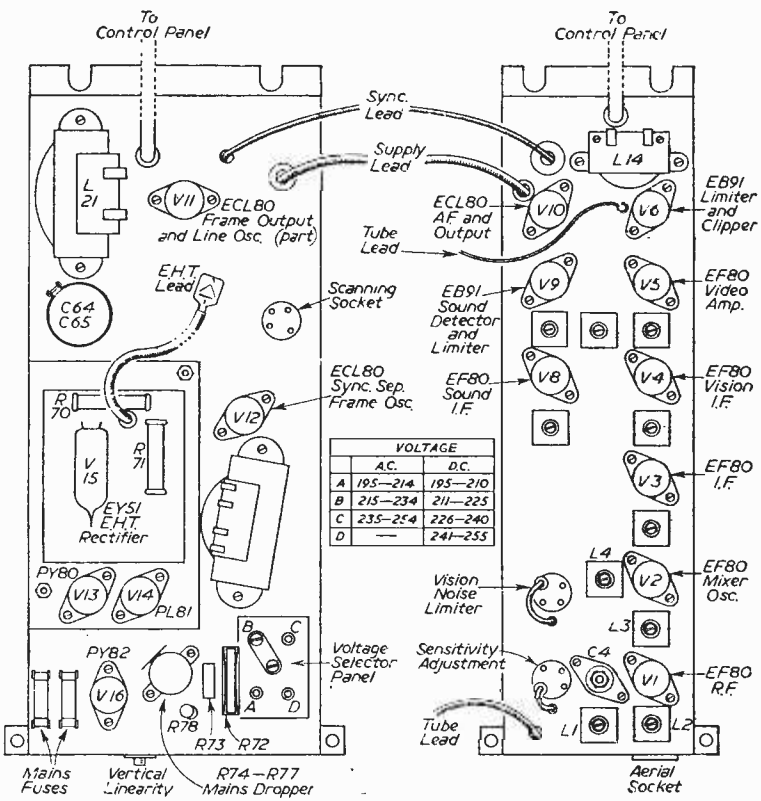


Fig. 1.—Top view of the chassis.

mains dropping resistor R74 section (lower 180-ohm section) that the most frequent cause of trouble in this receiver seems to occur. The symptoms are that the receiver heater chain goes dead with no valves alight. Upon checking the fuses, these will be found intact, and if the lower section of the dropping resistance is examined, a discoloured patch will be seen. As the dropper is green in colour, this is easily seen. The cure, of course, is either to replace the dropper complete, or to strap a 180-ohm 20-watt resistor across the defective section. This is easily done and there need be no worry as to what caused the failure. It "just happens."

Common Faults

The above-mentioned failure of the mains dropper is by far the most common cause of a No Picture, No Sound condition. Another common failure is in the on/off switch which is of the double pole type on the back of the brightness control.

One side of this switch fails, causing the receiver to be inoperative.

The symptom of Sound—No Picture, with the screen remaining blank when the brilliance is advanced, should direct attention to the line timebase. The first check is to listen for the characteristic whistle. If it is absent, check V12 before removing the screen from the line output section. Then check valves PL81 and PY80. If still at fault, and the PY81 is obviously overheating, check R55 (1.5 MΩ) which as previously mentioned is the load resistor of V12 triode section.

If the PL81 is not overheating, check its screen dropping resistor (R61) 6.8 KΩ.

If the PL81 is overheating, i.e., the anode is glowing red, this valve must be checked first before proceeding further, as a screen-to-control grid short is a common occurrence, although not so much in this receiver as in some others.

If the line timebase is working, although the whistle may be a trifle ragged, check the EY51 heater. If it is unlit, remove the anode lead from the tube. If now the EY51 lights up, suspect either a fault in the EY51 itself or an inter-electrode short in the tube.

If the EY51 remains "out" with the tube lead on or off, check the single wire end for spark, with the tube clip off. If a spark can be drawn, it may be assumed that the EY51 is defective. The reason for removing the tube clip is in case the EY51 is shorted internally. If it is, the A.C. at the anode (single wire end) will be applied to the tube and will be virtually shorted through the capacity of the inner and outer conductive coatings of the tube.

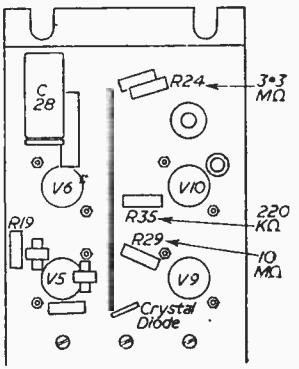


Fig. 4.—The front-end (underside) of the R.F. chassis.

Insufficient Height, Frame Distortion, Cramping, etc.

Check V12, its 2.2 MΩ grid leak, and its 100 μF cathode by-pass capacitor.

No Sync

If the picture cannot be locked vertically or horizontally, check V11, V6 and the 3.3 MΩ resistor R24 which in series with a 15 KΩ joins the cathode of the clipper section of V6 to chassis. This assumes that the actual contrast of the unlocked picture remains at a normal black and white. If the picture

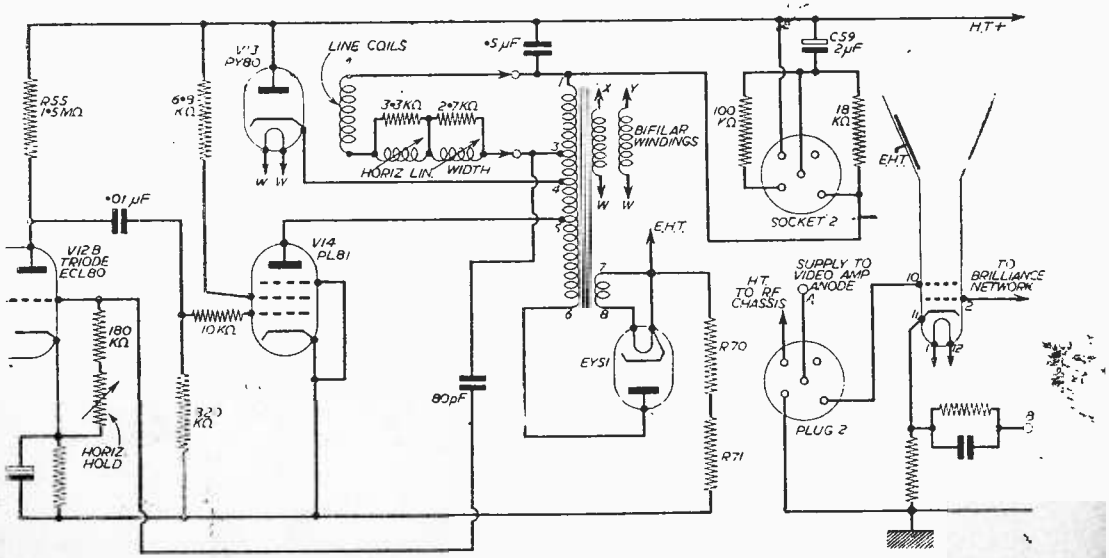


Fig. 5.—Circuit of the line timebase.

is weak, check V5, its 100 μF cathode by-pass capacitor and the crystal diode vision detector.

If the fault is not revealed, check V4 and its voltages and then temporarily wire the 4.7 KΩ V5 anode load resistor to the normal H.T. line instead of through the 18 K to the boosted H.T. line. If this results in an immediate improvement check R68 (18 K) R69 (100 K) and C59 (2 μF). If this does not clear the fault, and the brilliance of the raster is affected, check R55 as previously mentioned, and then the interference limiter circuit. Also check the ion trap magnet setting.

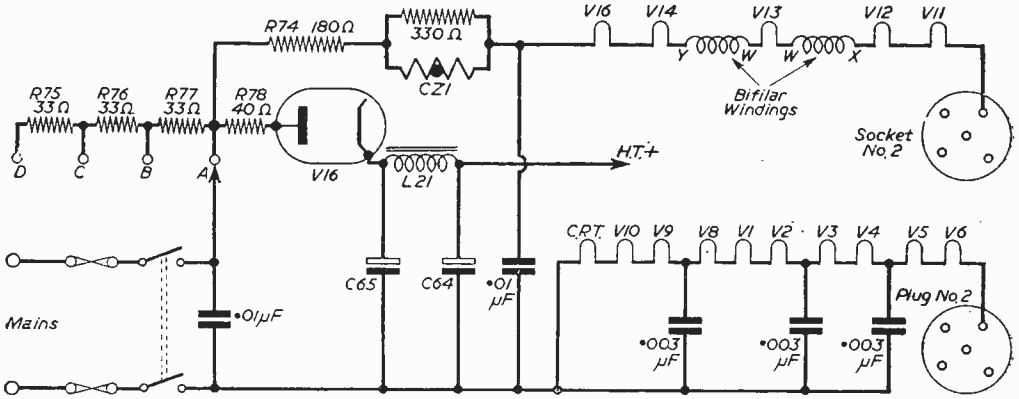


Fig. 6.—Details of the power supply.

No Picture, No Sound, Brilliance Working Normally

Check V1, V2 and V3 and valve base voltages. If still defective, check contrast and sensitivity circuits. If one or more of the valve base anode and screen voltages is absent, check the feed resistor and associated decoupling capacitor. If the circuit seems normal, connect a temporary length of wire to the aerial socket to check upon the aerial, feeder cable and plug connections, etc.

Uncontrollable Brilliance

Suspect heater/cathode short in tube (fit 6.3 volt isolating transformer) or defect in brilliance network.

When fitting an isolating transformer, the following hints should be observed. The transformer should have a mains input primary winding which should be connected, one lead to the centre screw of the voltage selector panel and one lead to chassis. The secondary should be connected to tags 1 and 12 of the tube base socket, the existing wires being removed and joined together with a 20 ohm 3 watt resistor.

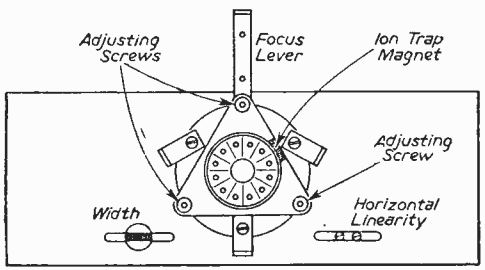


Fig. 3.—Details of the tube mounting bracket.

Conversion

This receiver gives good results with a normal type of converter such as the Plessey multi tuner (Aerialite M.C., E.M.I., Regentone, Defiant, etc.), the Spencer West type 50 or the Channel for example.

For the more involved conversion at I.F., the Valradio TP16S (with oscillator working high) is suitable.

Political Broadcast

THE political broadcast which was made on January 10th opened at 7.05 p.m. to more than 3,000,000 viewers in homes with a choice of Band I or Band III programmes in all I.T.A. areas. This figure represents some 45 per cent. of all homes of this kind. The tune-in was relatively higher in the Midlands than elsewhere.

During the first quarter of an hour in all areas the total audience averaged about 3½ million of whom 2½ million were viewing on the Independent channel, according to the Nielsen Company.

During the second quarter of an hour the average number of sets was 1,535,000 representing an audience of more than 4½ million of whom over 3½ million were viewing on the Independent channel.

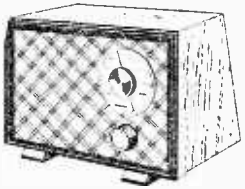
In the Midlands the average overall tune-in during the second half was again higher than elsewhere—66 per cent. to 57 per cent. in the other areas.

The composition of the audience varied from area to area and channel by channel. In all areas the "under sixteen" element was proportionately larger in the I.T.A.'s audience than in the BBC's throughout the programme, and decidedly greater in the Midlands and North (I.T.A. one-third—BBC one-quarter) than in London (I.T.A. one-quarter—BBC one-fifth). In the London area the feminine element was over 40 per cent. to both channels, but below 40 per cent. to the I.T.A. in the Midlands and North, while well above 40 per cent. to the BBC.

The division of tuning between the two channels reflects largely the appeal of the rival succeeding programmes—I.T.A.'s "Spot the Tune" and BBC's "The Petula Clark Show." Both channels gained audience all through the political broadcast but the I.T.A. proportionately more than the BBC.

THE SKYSEARCHER

An all mains set for 19/6



This is a 2-valve plus-metal rectifier set useful as an educational set for beginners, also makes a fine second set for the bedroom, workshop, etc. All parts, less cabinet, chassis and speaker, **19/6**. Post & ins. 2/6. Data free with parts or available separately 1/6. **3-valve battery version also available at the same price.**

Don't Be Caught Like This

CAR STARTER CHARGER KIT

All parts to build 6- and 12-volt charger which can be connected to a "flat" battery and will enable the car to be started instantly. Kit comprising the following

Mains transformer	22/6
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MINIATURE COMPONENTS

for transistor sets, deaf aids, etc

Made by Fortiphone and other famous firms.

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Earphone 250 ohm Type L ...	18/-
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Tinsel flex and Plug for earphone	5/-
Slide switch ref. SW5 ...	4/-
Pots with switch ½ meg. ...	2/-
Very small resistors, many values	6d.
Very small condensers, prices from	6d.
Tinsel leads without plugs ...	6d.
Deaf aid cases with clip for pocket	2/6
Plastic box with lid 4½"x3"x1,	2/6

TRANSISTORS

Red spot replaces Mullard OC71, etc., 10/-. Blue spot suitable R.F. up to 1/6 Mc/s, 15/- each. Mullard OC71, 20/-, OC72 30/-.

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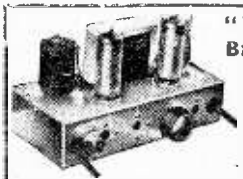
Three-colour 3-waveband scale covering standard, Long, Medium and Short wavebands, scale pan, chassis, punched for standard 5-valve superhet, pulley driving head, springs, etc., to suit. Scale size 14½" x 3½" Chassis size 15" x 15" x 2" deep. Price 15/- plus 1/6 post.



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To-day's best value in Band III converters suitable for your T.V. or money refunded. Complete ready to operate. 49/6 non mains or 79/6 mains, post and insurance, 3/6.

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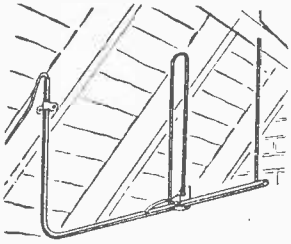

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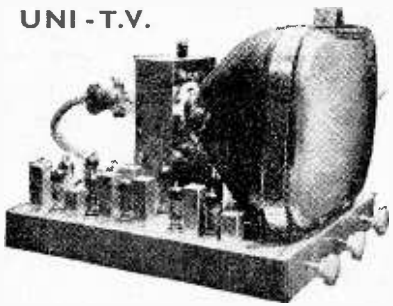
MAKING AN ELECTRIC BLANKET

UNI-T.V.



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THE CLEVELAND F.M. TUNER

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This tuner is based upon the very successful circuit published by Data Publications. We have made up models at all branches and will gladly demonstrate. Stability is extremely good and making and aligning most simple. Cost of all parts including valves, prepared metal chassis, wound coils and stove enamelled scale, slow-motion drive, pointer, tuning knob, in fact everything needed is **£6.12.6**. Data is included free with the parts or is available separately, price 2/-.

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Construct a powerful three-valve mains amplifier. Ideal for dances, parties, etc. Complete less chassis, cabinet and speaker (available if required). Data 1/6 (free with parts).

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Waterproof P.V.C. covered, so blanket washable. 16½ ohms per foot—1/6 per yard. 14 yards, ideal for average blanket, £1 post free.

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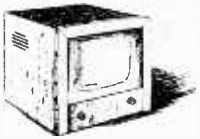

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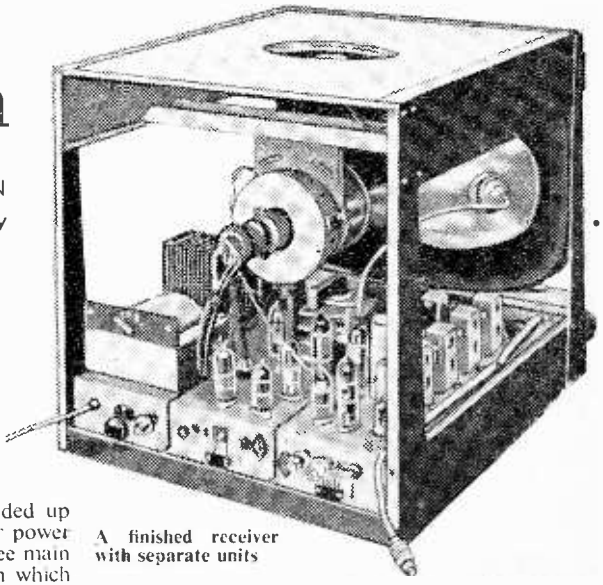
Unit Construction

THE ADVANTAGES OF SEPARATE SECTIONS IN A MODERN TELEVISION RECEIVER

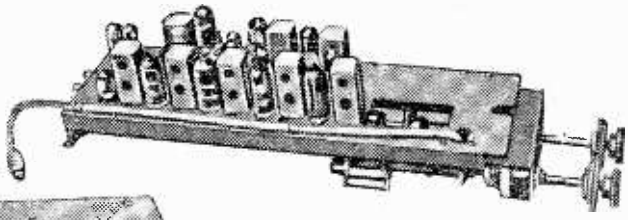
By W. J. Delaney

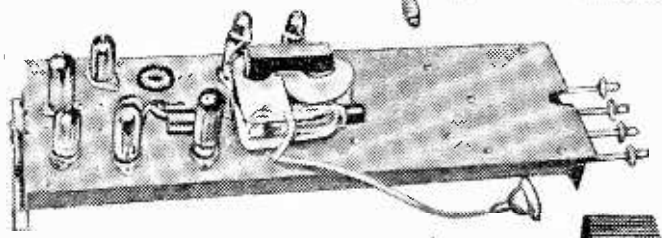
A SHORT time ago a correspondent criticised the failure of manufacturers to put on the market units for the construction of a television receiver. He mentioned the fact that such units were available on the French market and some of these are shown in this article, together with a complete receiver made from the units connected together. There is certainly a marked advantage in having a modern receiver in unit form, and this will be more important when colour arrives. Taking a normal present-day receiver it is clearly divided up into sections, which, apart from the mains or power supply portion, may be classed as two or three main units. There is the vision and sound section which may be regarded as one unit, as the early sections of a receiver pick up both sound and vision and this embraces all the tuning arrangements. Next comes the timebases which again may be split into two sections to enable experimen'ts to be carried out. Finally there is the mains or power supply.

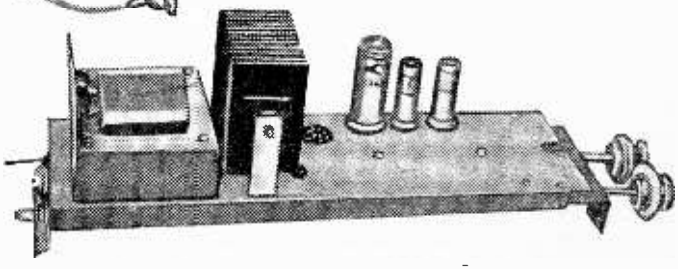


A finished receiver with separate units

An arrangement of units on the above lines offers the home constructor great scope for trying out new ideas, and in fact would be an advantage in a commercial receiver as it would greatly facilitate servicing. For instance, if a case of timebase failure were reported, the entire timebase could be removed and a new one inserted (at the customer's house) and the receiver put in working condition in less than half an hour. The faulty unit could then be taken away, serviced and either kept as a replacement or taken back and replaced in the receiver. Costs would also be considerably cut by such a scheme, and the servicing of the faulty units could take place as convenient instead of having to rush to avoid a customer being without a receiver for long periods due to pressure of work.







Figs. 1, 2, & 3.—A vision/sound, timebase and power unit chassis for the unit construction of a receiver as shown above.

Home Construction

However, we are more concerned with the home constructor, and it is interesting to see how such a scheme would affect him. The power pack should be considered first, and this should be designed to include the heater and normal H.T. supplies, preferably with isolated mains section for safety, and provided with a suitable plug and socket output scheme to take these supplies. The heater current can reach quite a large amperage and therefore some care should be taken in the selection of a suitable plug and socket. As a safety measure it might, in fact, be preferable to use a standard mains-type two-pin plug and socket of the 10 amp. variety, but in this

case some care should be taken to avoid the risk of a "live" mains lead being inserted by mistake. The main smoothing should be included on this chassis, although individual droppers and smoothing could be inserted on the remaining chassis.

Next is the timebase chassis, and if both timebases are to be included in a single unit it would be preferable to divide the chassis in the centre, keeping the line and frame sections quite separate. Interaction between line and frame can mar the picture, and furthermore the EHT on the line section must be kept well clear of all earthed objects to avoid corona effects. The usual type of EHT fly-back transformer, however, is so designed that it almost certainly has to be mounted in a suitable manner and this point will therefore take care of itself.

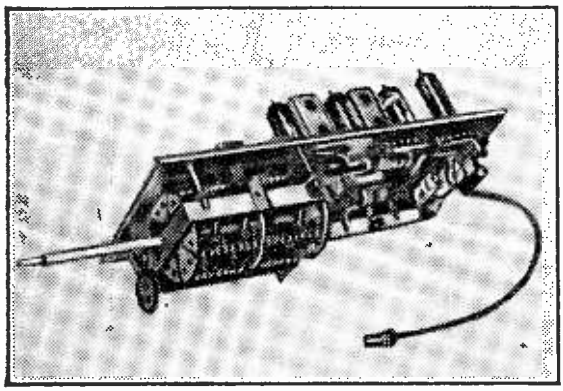


Fig. 4.—Underside of vision strip showing turret tuner.

This section is probably the most important, as it is the one in which most experimental work will be carried out. For instance, early receivers used tubes with a scanning angle of about 50 deg., whilst the majority of present-day tubes are designed for an angle of 70 deg. Some of the larger tubes which are now coming into use (21in.) are designed for a 90 deg. deflection system, and this means that when changing from one tube to another with a different (larger) scanning angle the timebase almost certainly will require modification. It is much simpler to handle a small chassis than a large one, and in addition there is not a risk of upsetting some other part of a circuit which might arise if an entire receiver chassis has to be handled.

Normally the timebases, from the sync separator onwards, may be modified without trouble, provided that the phase is preserved. That is, if a single-sync separator is employed with a negative-going sync pulse, for instance, the timebase must be designed for such an arrangement and any changes must be such that this type of signal will produce the desired result. For the same reason, if a change is made in the vision section the same phase relationship must be observed. These are the only main snags in a changeable timebase system.

Vision Strip

Coming now to the vision and sound strip, it will be seen in Fig. 4 that the modern tendency, commercially, is to include a turret type tuner on the chassis. For the home constructor, however, this type of tuner is not essential, as he is unlikely to take the set about the country, and only needs two or, perhaps, three stations. In this respect a tuner such as the View-Master tuner would be preferable and probably cheaper, as it does not include coils of thirteen channels with the consequent trimmers, etc. It also ensures that the required stations are next to each other on the switch and not, as in some multi-channel tuners, separated by ten or eleven positions on a rotary switch which will only turn in one direction. However, this is a point of individual preference, but it does provide easier trimming facilities, as it may be lined up on sound, for instance, without having dangerous EHT nearby, and if a suitable meter is used the vision circuits may also be lined up, using for the purpose, perhaps, a separate power pack to deliver the same L.T. and H.T. as will finally be fed to the receiver.

At the moment there are no commercially-produced units on the market which the home constructor can purchase to assemble himself, but if the idea appeals to readers we will consider the use of this principle in our next design, and to this effect would be glad to hear readers' opinions on this form of construction.

Automation in TV Sales

AUTOMATION can now be used by dealers and service engineers when they require components from Direct TV Replacements. This company has installed an "Ipsophone" and is the first TV component wholesaler in the country to do so. The G.P.O. state that at present the "Ipsophone" is the only automatic telephone answering machine which they have approved and allowed to be connected to their telephone circuit. This machine will be known as Flibak, and will be in use on Tideway 2330 after normal working hours and during lunch times.

To use it the procedure is as follows. Flibak will normally respond to the fourth telephone ring, it will say "Direct TV Replacements, Flibak speaking and recording your name, address and message. WAIT." Here there will be a short pause and then it will say "Please speak now." It is most important that callers should not speak until requested. Then they should clearly state name, address and message, and it would be an advantage if any difficult or easily misunderstood words were spelt out. The message should be concluded by repeating the name and address. Then by waiting just ten seconds the caller can be certain that his message has been recorded correctly as the machine will give a clear signal to indicate this.

Anyone making toll or trunk calls after 6 p.m., before 9 a.m. or on Sundays should impress on the operator that it is an "Ipsophone" call, and clearly ask to hear the *ringing tone*.

Due to the expansion of Direct TV Replacements, the two existing lines are in constant use throughout the day, and dealers have been finding it increasingly difficult to get through during the normal working hours. At 9 a.m. in the morning all messages are quickly noted from the machine and orders routed through on their way to the dispatch department.

The RF26 Band III Converter

USING THIS USEFUL UNIT FOR THE I.T.A. PROGRAMMES

By "Erg"

THE RF26 unit has proved its worth on Band I transmitters and in conjunction with its I.F. strip, the R1355, has enabled constructors to obtain good reception at long distances.

The R1355 is an I.F. strip comprising five amplifying stages and when used with the RB26 it will pull in usable signals in very weak signal areas.

Many constructors in Eire use this combination and receive satisfactory signals.

RF26 units are still available in the ex-Government market and are really well-built units, using a silver plated chassis. Its normal frequency range is 50-65 Mc/s, but this can be extended by the use of brass cores in the coils to about 80 Mc/s. The RF27 is a similar unit with a higher frequency range normally covering up to about 80 Mc/s. Either of these units can be used in the manner to be described.

The basic circuit of the RF26 is shown in Fig. 1. It comprises an R.F. amplifier using an EF54 (an advanced design on the EF50) which feeds into another EF54 used as a mixer. A separate oscillator is used, a triode valve being employed. Coupling between the oscillator and the mixer is by grid injection through a 2.2 pF condenser.

The EF54 valve was specifically designed for high frequency work and will be found to perform quite well on Band III.

So as to cause as little disturbance as possible to the existing set-up (and to save work) it was decided to reduce modifications to a minimum. Undoubtedly the employment of some of the modern miniature valves would have resulted in improved performance, but a great deal of work would have been involved and the shell only of the unit employed.

The output of the R.F. unit is retained at the same frequency as the original, i.e., between 7-8 Mc/s. If desired, an I.F. in the region of 30 Mc/s could have been used, but this would have involved rewinding the I.F. coils and as there are seven of them it was not thought worth while.

One defect of the RF26 unit is that it is inclined to suffer from I.F. break-through, but this is not normally noticed when the desired transmitter is tuned in. It generally becomes apparent when not tuned in to a carrier. In bad cases it becomes necessary to fit a filter in the aerial circuit to reject inputs at intermediate frequency.

Tuning is effected by 0-75 pF variable condensers which are ganged; these are not used in the conversion.

Before detailing the modifications it should be pointed out that stray capacitances come into play at Band III frequencies and slight alterations have a considerable effect.

COMPONENTS LIST

One trimmer condenser 0-9 pF T.C.C. type CC159N.
Three Aladdin coil forms ⅜in. with iron-dust cores.
One 22 pF condenser.
One 10 pF condenser.
One 2.2 K resistor.
One 5 pF condenser.

The Modified Circuit

The modified circuit is shown in Fig. 2 and if compared with Fig. 1 it will be found to conform fairly closely to the original.

Input to the R.F. valve is taken through a Band I filter, and the small transformer originally fitted in the unit to couple the aerial circuit to the first valve is not used.

Tuned anode coupling is employed between the R.F. stage and the mixer, and the original form of grid injection from the oscillator is used again, mainly because it involves the minimum of modification. Losses do occur, but they should not prove troublesome.

The oscillator circuit has been modified a little, but in general principle adheres to the original. There should be no difficulty in getting it going, as the valve performs quite well at high frequencies—it can even be made to oscillate as high as 400 Mc/s.

Cascode input circuits are commonly employed in Band III converters, as they are less noisy than the straight R.F. stage. Generally, however, the gain of an R.F. stage is greater, and also the insertion of a pentode between the mixer and the aerial assists materially in preventing that annoying form of interference where the Band III signal becomes re-radiated into the aerial circuit and impresses itself on neighbouring receivers.

Incidentally, it is quite a good point to fit such an R.F. amplifier where re-radiation trouble is experienced, and an RF26 suitably modified on the lines given in this article can be usefully employed for this purpose. The unit is completely self-contained and thereby forms its own screen.

Modifications

First remove the condenser coupling the transformer to the aerial socket, and also remove the coil former which is used for the transformer and replace it with a smaller one—the ⅜in. Aladdin type tuned with an iron dust core.

On this new coil former should be wound 2½ turns of wire, a tap being made at half a turn up from the "earthy" end. The turns should be spaced at about ⅛-¼in. apart. The bottom end of the wire should be taken to the adjacent earth tag and the top end to the next coil form which is used as a filter.

The inner of the aerial socket should be taken to this tap to obtain correct matching and the necessary step-up.

The bottom end of the existing first tuned circuit is connected to the fixed vanes of the variable condenser. The wire should be unsoldered and the

bottom end of the coil connected to the grid of the valve. The existing wire from the grid of the valve to the top of the coil should be removed.

Note that if the converter is used in the London or Holme Moss area, or on any transmitter in Channel 1 or Channel 2, then an iron dust core should be inserted. A 22 pF condenser should be connected across this coil, but if it is found that it does not reject the Band I signal sufficiently, then this value can be increased.

Note that there are two small trimmers connected to the grid circuit of the R.F. valve and these should be removed. In practice it may be found useful to take out the one fitted on the side of the chassis above the ganged condenser and leave the other one which is underneath the chassis in case it may be required to boost the tuning of the Band III coil. It is not always necessary, but it is handy to have a stand-by if the stray wiring capacitances and the coil winding is found to require a little extra capacity to cover the channel required.

The next step is to take out the grid coil of V2 and to replace it with a ¼in. Aladdin type. It should be wound with 2½ turns of wire spaced at from ⅛ to ¼in. The present anode circuit of V1 is broken (i.e., the 5.6K resistor is removed) and the coil inserted in the circuit, with a 2.7K resistor going to the existing H.T. line.

There is a 100 pF condenser existing from the anode of V1 to the grid of V2 and this should be replaced with one of 10 pF value.

The connection from the grid of V2 to the small trimmer located by the coil should be removed, but the trimmer can stay in position if required for possible use later as explained in the case of V1.

It will be found that there is a small 2 pF condenser wired from the coupling line going to the oscillator section and the grid of V2 and this should remain *in situ*.

No further work is required at this valve, the anode circuit remaining complete as it is and the H.T. feed to the screened grid remaining untouched.

In some cases it may be found beneficial to replace the cathode resistor with a variable component of 1K in order to obtain optimum mixing conditions, the final value being checked and the variable then being replaced with a fixed resistor of the appropriate value. This is a refinement which in some cases may pay dividends.

At the anode of V2 is a small 10 pF condenser which feeds to the output prong of the Jones plug via a short length of coaxial cable, and this should not be touched; nor should the core of the coil in the anode circuit of V2 which is tuned to intermediate frequency and is sealed with wax. If this core is disturbed it is often very difficult to obtain maximum output from the unit.

Before commencing work on the oscillator section, the dial and ganged condenser can be removed. There is a grub screw in the side of the dial mounting which must be released to release the dial, and screws will be found that keep the mounting plate in position, underneath the dial.

The dial light is a plug arrangement and the mounting for the light can be easily removed by lifting it bodily, vertically.

A coupling section will be found between the shaft of the dial and the shaft of the first variable condenser and this is kept in position by screws—or in some cases a nut and bolt—which should be removed. In cases where the nut is sealed, a small drop of methylated spirit will soon loosen and dissolve the sealing compound.

When the ganged condenser is removed the fine tuning condenser (type CC159N, TCC) can be

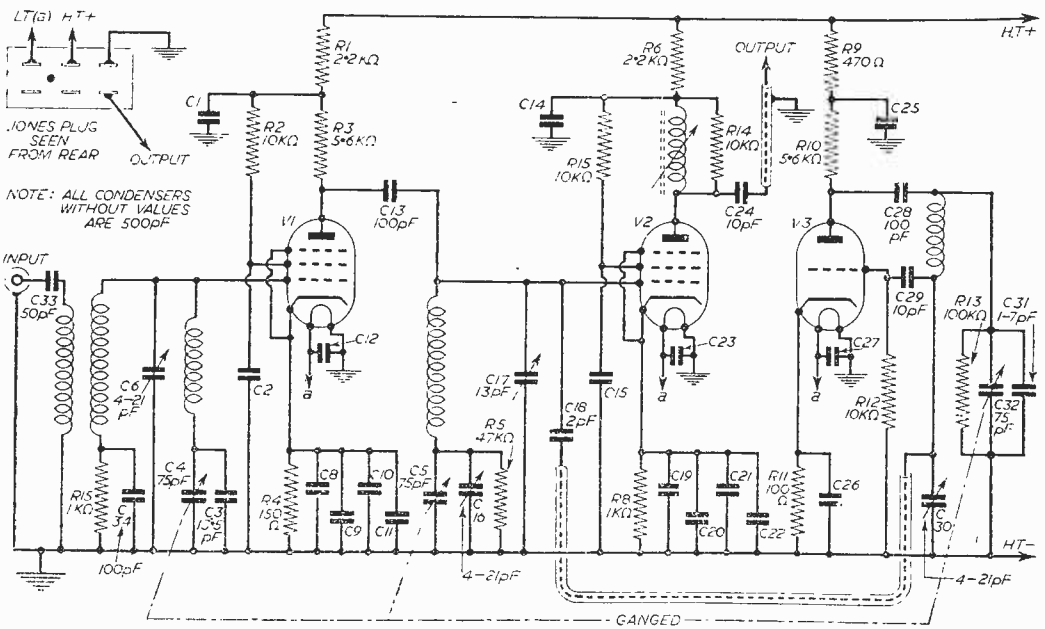


Fig. 1. — The circuit of the RF26.

mounted in the position previously occupied by the oscillator variable. A small mounting plate can be fitted and a short length of rod used to extend the control outside the unit if desired.

It is considered that this is the best method as any slight tendency to oscillator drift can be countered by operation of the trimmer. If the constructor decides to use this method, then the dial and mounting can remain untouched and the coupling pieces of the original ganged condenser unit employed to couple the trimmer to the dial movement.

The Oscillator Section

The first move is to take out the existing coil form and to replace it with one of the Aladdin type ¼in. The small trimmer beside the coil can remain.

Remove the 100K resistor which was connected from the top end of the variable condenser across the trimmer on top of the chassis. The 10 pF condenser connected to the grid circuit of V3 should remain, but the 100 pF from the anode of V3 to the coil is removed, and the coil connected directly.

The trimmer is connected between grid of V3 and chassis and the connecting wire should be made as short as possible.

Wind on three turns of wire on the coil form spaced at ¼in apart.

The cathode circuit is not touched and the connection to coupler to take the oscillator output to the mixer should, of course, be left.

The oscillator is one of the trickiest sections of the job. There is very little difference between the oscillator frequency and the signal frequency and very slight variations can make a lot of difference in the I.F. frequency.

It is advisable to treat this section with great care and if difficulty is experienced in getting the unit going, suspect trouble in this section.

The number of turns on the coil have been given deliberately a little on the high side (2½ turns should prove suitable), but this is to cater for variations to be made when setting the unit up. The turns spacing can be widened out or closed up. One turn can be removed or one turn added and these variations should cater for discrepancies in stray capacitances so that the correct operating frequency is found.

Alignment

Having completed and checked the modifications, then the unit can be placed in position in the 1355 I.F. strip. (It is assumed that the IF1355 strip has been modified previously for TV reception.)

It is wise to omit the screened cover of the unit at this stage so that access can be obtained to the tuning coils.

Having allowed a suitable period for warming up, short circuit the aerial socket to cut down possibility of I.F. breakthrough, then screw in the cores of the tuning coils so that they are level with the tops of the coil formers.

A metal trimmer must not be used for trimming and if a proper tool is not available then one should be made by sharpening the end of a wooden penholder so that it is chisel shaped.

Set the fine tuning trimmer at about midpoint and then adjust the oscillator core for maximum noise. Next adjust the core of the mixer coil for maximum noise.

Disconnect the short-circuit across the aerial socket and connect the aerial; readjust all cores for maximum noise. Now swing the fine tuner in an effort to pick up the signal. If nothing is heard, then alter

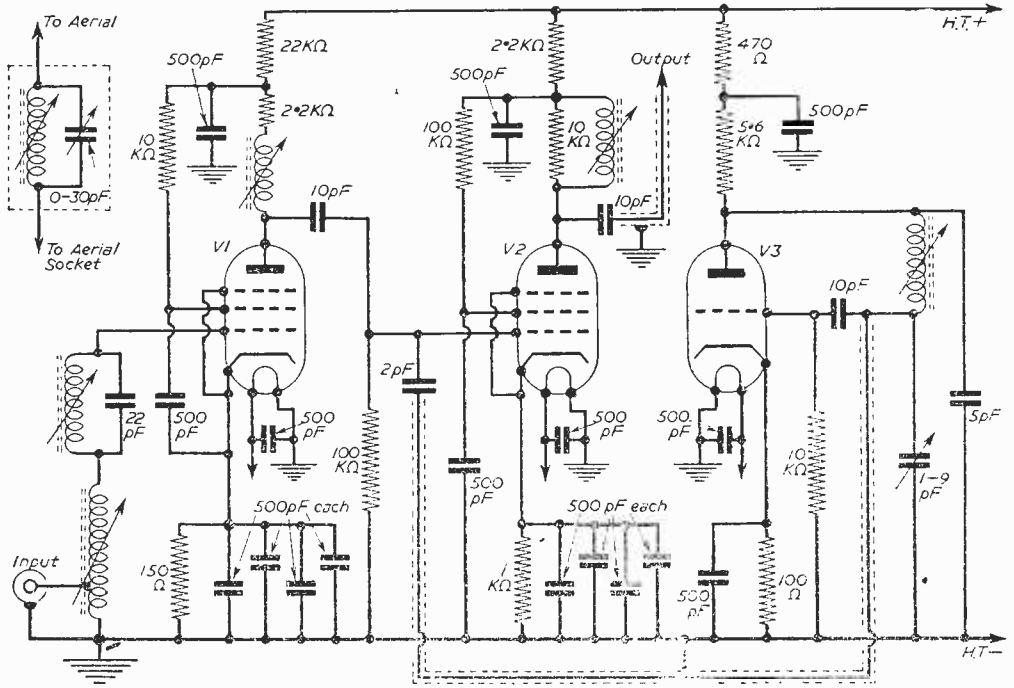


Fig 2. The complete circuit

the oscillator core by half a turn and try again, repeat if necessary.

If it is found that still no signal is picked up, unscrew the mixer core and the R.F. core by half a turn and repeat the above process. Repeat the whole system again until the signal is heard.

When the signal is received, adjust the mixer and R.F. cores for maximum signal and then the oscillator core so that the fine tuner is set about mid-channel and thus gives an allowance on either side for possible frequency drift.

If no signal is obtained then widen the turns spacing of the oscillator coil ; also try closing up the turns ; also try using a brass core ; also try removing one turn. Don't forget that the trimmers have been left in so that they can be employed to cover the frequency desired.

Should the receiver be wanted for the vision channel, after everything has been adjusted for maximum signal and the fine tuner has been set in mid-position, then adjust the core of the oscillator by screwing it in so that the "volume" of the picture signal is reduced by half. This is the position for maximum quality as the signal should be set so that it is 6 db down on the carrier. (Standard single-sideband conditions.)

Sound and Vision

Many constructors have modified their R1355 for sound and vision channels and in this case some further difficulties may crop up. In some cases it will be found that the oscillator covers a wide range and it may be possible to get the following conditions :

Sound, no vision : Vision, no sound : Sound on vision only : Vision on sound only : Vision on vision and sound on sound.

The last one is, of course, the one that is required.

If any of the other conditions are obtained then the oscillator must be adjusted to cater for the correct conditions. All the phenomena mentioned are due to incorrect setting of the oscillator frequency.

Without the aid of a signal generator, aligning a brand new rig often requires plenty of patience as one is working in the dark all the time.

Checking the I.F. Stages

It is a very simple matter to check the I.F. stages of the receiver as there are plenty of sound transmitters which operate at the intermediate frequency. All that is necessary is to touch the finger on to the top cap of the first I.F. valve, when several stations operating in the 7-8 Mc/s band should be picked up.

Where adjustments may be necessary to the I.F. tuning, then a short length of wire can be connected to this cap and signals will be found coming in very strongly. As mentioned earlier, the R1355 is a very powerful receiver.

The most likely trouble at I.F. is the pick-up of unwanted signals. It is common to find that stations in the 7-8 Mc/s band are heard when tuning in the R.F. unit, and if these are found to be very troublesome then a filter unit can be fitted. This is a coil wound for the intermediate frequency tuned with a variable capacitor across it of 0-30 pF. It should be inserted in series with the aerial. It could even be mounted inside the R.F. unit adjacent to the aerial socket. A $\frac{3}{8}$in. coil form tuned with an iron core and wound with 26 turns of 34 s.w.g. enamelled wire should do the trick.

Band I Breakthrough

As this converter is not feeding into a normal televisor tuned to a Band I station, trouble from breakthrough should not be experienced.

If it should, however, the fault is catered for in the design as the aerial circuit feeds into a Band I filter and the core of this should be adjusted to eliminate the trouble.

Undoubtedly the best time to do this is when a Band I signal is being radiated while there is nothing on the Band III channel. If no trouble from Band I breakthrough is experienced then this coil could very well be by-passed, or rewound to act as an I.F. filter to prevent I.F. breakthrough on the lines given in the preceding section.

Channels 8 and 10

As designed the unit should cover all three channels at present in use on Band III and there should be no difficulty in obtaining the required channel provided the instructions given are faithfully followed.

Re-radiation

The oscillator frequency, it should be remembered, is only 7 Mc/s apart from the operating frequency and it is possible for re-radiation to take place. The use of a pentode front-end does much to mitigate against this possibility, and once the unit is working and has been aligned there should be no difficulty.

The danger period is mainly when doing the alignment and care must be taken to avoid causing trouble to neighbouring viewers.

Patterning on the screen may result from spurious frequencies being generated within the converter section but this is very difficult to diagnose accurately as the sources of patterning are so varied.

The patterning could be caused by I.F. breakthrough, and in the vision section it can be verified by listening to the vision signal produced at the output of the video valve. A pair of phones, or loudspeaker in series with a condenser, tapped between the anode of the video valve and chassis is sufficient for this test.

Aerials

A converted RF26 with R1355 forms a very powerful and sensitive combination, but a good aerial system is essential. This is especially true where really long-distance reception is being attempted.

In distant localities, nothing less than a double Yagi array such as the Aerialite "Double Five" or the "J-Beam Slot" should be used.

The greatest enemy of the Band III transmissions is the noise generated within the receiver, and to counteract this every effort must be made to present as large a signal as is possible to the receiver so as to obtain a high signal-to-noise ratio.

Noise shows itself on the screen as a background of little specks which appear like snow, hence the common term for it—snow. In milder cases the picture may have a grainy effect. To reduce noise effects utilise the very best aerial possible.

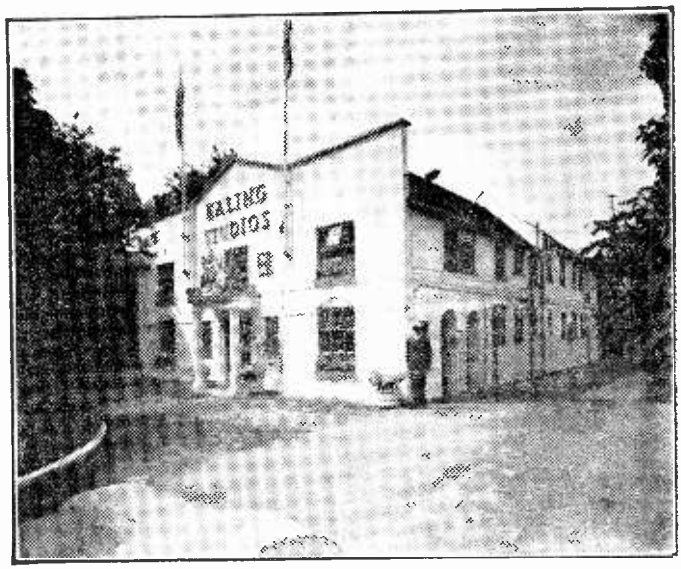
DIRECT T.V. REPLACEMENTS 'PHONE No.

OWING to an unfortunate error on the part of our printers, in the advertisement of Messrs. Direct T.V. Replacements, 134-136, Lewisham Way, New Cross, S.E.14, appearing in the issue dated January, the day or night telephone number was incorrectly given as TID 2230. This should have been TID 2330.

The BBC Film Studios

ICONOS VISITS THE NEW HOME OF BBC TELEVISION FILMS

"W5." signifies a particular area of London, over which the house agents enthuse: Ealing. They call it the "Queen of the Suburbs," a jewel in a Victorian setting, full of desirable residences amongst beautiful parks and greens and boasting a huge modern technical college and a famous film studio; all, as the advertisements say, "5 mins. wlk. Elng. Bdwy. stn." It has long been ripe for colonisation by the BBC whose imperialistic penetration of this part of London had, up to 1955, been halted at Shepherd's Bush.



An administrative building for the Ealing Film Studio since 1908. The Old Lodge, a converted Victorian House, photographed before being taken over by the BBC.

The BBC Move In

It seemed inevitable that the BBC should establish an outpost in this pleasant conglomeration of Victorian and modern architecture, a mixture which is also characteristic of the film studio premises they acquired in Ealing. Sir Michael Balcon's team of film makers handed over the premises in January, 1956, and departed to Elstree, where they continue to make Ealing films. The BBC moved in, and from the very first day of their occupation started making films for their television service—at the same time modifying the premises to bring them into line with their special TV requirements.

The Original Ealing Studios

Parts of the studio premises at Ealing have been used for film production for about fifty years! It was in 1908 that Will G. Barker, an enterprising British producer of topical films, decided to go in for "staged" comedies and dramas, and purchased a small seven-acre estate between Ealing Green and Walpole Park. Here he erected three glasshouse-type studios (which used daylight supplemented with arcs as an illuminant), with workshops and laboratories adjacent, and with offices and dressing rooms in two of the early Victorian residences on the site. His company was called "Barker Motion Photography Ltd." and his films proudly carried the trade mark of a British bulldog. His most famous films were *Sixty Years a Queen*, *Brigadier Gerard*, *East Lynne*, *Jane Shore* and *Tommy Atkins*, all made in the days of the silent film. He even induced Sir Herbert Beerbohm Tree to appear in a film of Shakespeare's *Henry VIII*, not the "private life" one, but a silent version made in 1912. Tree insisted that all the dialogue scenes should be photographed in full, notwithstanding the fact that it was projected at the cinemas without sound but with sub-titles. I am told that in the declamatory passages his mute Henry VIII was not unlike an angry goldfish!

Talkies Come to Ealing

Will Barker had experimented with early primitive talking picture apparatus before 1914, but it was not until about 1930—long after he had sold the premises—that two of the glasshouse stages were pulled down and replaced with the elaborated sound-proofed buildings overlooking Walpole Park where so many Ealing Studios films were made. These have proved to be ideal for the BBC television films, though considerable alteration has had to be made to the layout of the departments servicing the five stages.

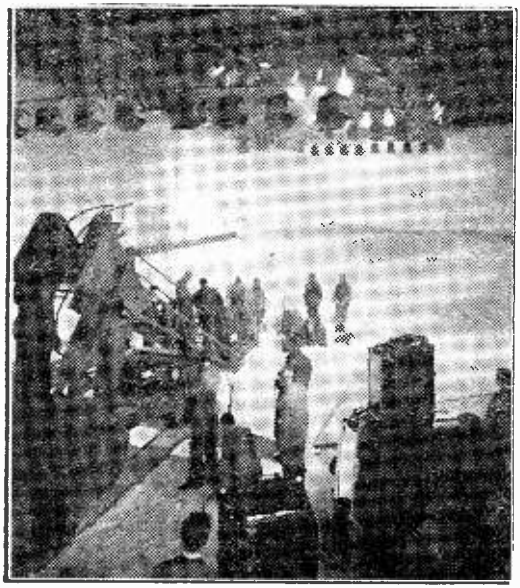
At first sight there seems to be little change, and the old-world house at the front gate still contains executive offices. The elaborate film constructional departments—carpenters, plasterers, fitters, mill, special effects, set-erection—have disappeared.

All set construction intended for BBC television at Ealing, Lime Grove and Riverside Studios, together with the TV theatres at Shepherd's Bush Empire and Kings Theatre, Hammersmith, has been centralised at the BBC Television Centre, Wood Lane, Shepherd's Bush. Settings for live or filmed television are of a much lighter and simpler type than for feature films, and can be pre-fabricated before erection. The former constructional departments at Ealing are now occupied by a large maintenance department, which services all film camera, sound recording, editing and studio lighting equipment.

Editing

The next big change is in the amount of space, equipment and personnel devoted to the highly important craft of film editing. For feature films nine cutting rooms and four review theatres sufficed, one theatre being devoted entirely to the complicated job of re-recording dialogue, music and effects. All of these rooms are still busy with the same kind of film editing work, but no less than 14 new cutting rooms have now been added. Three more theatres

will shortly be in action, and a further three are proposed—making 10 theatres in all. It must be realised that an immense amount of film footage is shot by the BBC outside of the studios for various features, quite apart from newsreels, and all of this requires manipulation of both negative and prints apart from storage.



Inside Stage 2 at BBC-TV. studios, Ealing, photographed when "Scott Of The Antarctic" was being filmed (note the camera crane and hundreds of arcs required for shooting colour).

The Stages

The five stages used for feature films are relatively unchanged. Indeed, they are not yet used to their full capacity. Their dimensions are large compared with the studio stages used for similar purposes in the U.S.A. Their sizes are :

(1) 58ft. × 34ft. (3A) 85ft. × 71ft.
(2) 126ft. × 76ft. (3B) 85ft × 71ft.
Model Stage 79ft. × 61ft.

All stages are in use except No. 2, which is being used temporarily as a store.

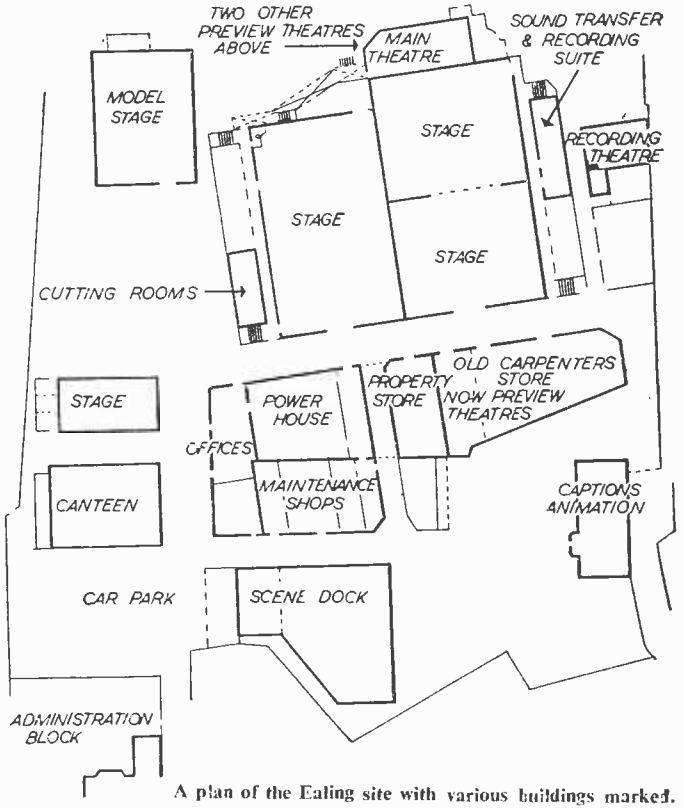
One very small stage has been added ; the former still-portrait studio in the old West Lodge building has been turned into a well-equipped captions and animation room. Here titles and cartoons are photographed, three vertical shooting rostra carrying, respectively, Newall 35 mm., Bell-Mitchell 35 mm., and Kodak Cine-Special 16 mm. film cameras. Electricity for set lighting is generated in the power house with diesel-electric plant ; 7,500 amps. at 115 volts is available, on a three-wire system.

Sound Department

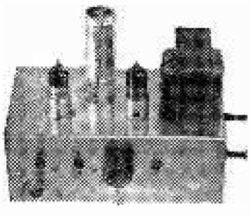
Considerable changes have been made in the sound department, particularly in the dubbing theatre. There is now a mixture of R.C.A., Westrex and G.B.-Kalee film recording equipment, both photographic and magnetic, together with six turntables, 16 mm. projectors have been added, and all equipment has been adjusted to run at 25 frames per second. There is an elaborate sound transfer suite, where sound recorded on tape or magnetic film can be recorded on to photographic film.

Walpole Park Studios

The organisation of all these changes has been carried out by Jack Mewett, head of television films, and John Byers, film technical manager, to whom much credit is due. It has been excellently planned and carried out. The only thing about the plant that I found confusing was the name. The BBC can't call it Ealing Studios, for obvious reasons. So they have given it the rather ambiguous title of "The BBC TV Film Studios, Ealing." How much better it would have been to have changed the name altogether to "Walpole Park Studios" ; then there would have been no mistakes, postal or otherwise. There is a precedent for this ; there already exist in the London area the Merton Park Studios and the Clapham Park Studios.



A plan of the Ealing site with various buildings marked.



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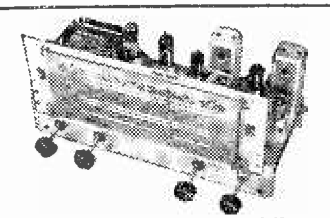

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6Q7	8 6	ECC84	12 6	EZ40	8/6	UBC41	9/6
6SN7	8/6	ECF80	12 6	EZ80	8/6	UCH42	10/6
6V6	7/6	ECF82	12 6	MU14	9/6		
6X4	7 6	ECH42	10 6	PCC84	10/6	UF41	10/-
6X5	7 6			PCF80	10/6	UL41	10 6
DAF96	9/-	ECH81	10 6	PCF82	10,6	UY41	8,6

SPECIAL PRICE PER SET

1R5, 1T4, 1S5, 1S4 or 3S4, or 3V4	27/6
DK96, DF96, DAF96, DL96	35/-
6K8, 6K7, 6Q7, 6V6, 5Z4 or 6X5	35/-

SPEAKER FRET. Expanded Bronze anodised metal 8in. x 8in., **2 3**; 12in. x 8in., **3/-**; 12in. x 12in., **4 3**; 12in. x 16in., **6/-**; 24in. x 12in., **8/6,** etc.
BRIMISTORS. CZ1 for .3a. heater chains, **3 6.** CZ2 for .15a. or .2a., **2 6.** CZ3 (Pilot Lamp), **1 6.**
COPPER ENAMEL WIRE. ¼ lb. 14 to 20 s.w.g., **2 6**; 22 to 28 s.w.g., **3/-**; 30 to 40 s.w.g., **3.9.**
SWITCH CLEANER Fluid. 10 oz. tin **3 9.**
CHARGER TRANS. Prim. 0 200 250 v., sec., 0-9 v.-15 v. (for charging 6 v. and 12 v.), 1.5a., **13 6**; 3a., **19 6**; 4a., **22,6**; 6a., **28,6.**

ELECTROLYTICS ALL TYPES NEW STOCK

Tubular Wire Ends			
25/25 v., 50/12 v.	1/9	32+32/350 v. B.E.C.	5 6
		Can. Types, Clips, 3d. ea.	
50/50 v., 1/500 v.	2/-	8+8/450 v. T.C.C.	4 6
100/25 v., 2/450 v.	2/-	8+16/450 v. Hunts	5
8/450 v. B.E.C.	2 3	16+16/350 v.	5 6
8/500 v. Dub.	2 6	16+16/450 v. T.C.C.	5 6
8+8/500 v. Dub.	4 6	16+24+8/350 v.	6.
8+16/450 v. T.C.C.	5	32/350 v.	4
16/450 v. B.E.C.	3 6	32+32/450 v. T.C.C.	6 6
16/500 v. Dub.	4/-	60/350 v. T.C.C.	6 6
16+16/450 v. T.C.C.	5/6	60+100/350 v.	11 6
32/350 v. Dub.	4/	60+250/275 v.	12 6
32/500 v. Dub.	5/-	100+200/275 v.	12 6
50+50/350 v. B.E.C.	6/6	3,000 mfd. 6 v.	3 6

SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES.—K3/25 2 kV., **5/-**; K3/40 3.2 kV., **6 9**; K3/45 3.6 kV., **7 3**; K3/50 4 kV., **7/9**; K3/100 8 kV., **12/9,** etc.
MAINS TYPES. RM1 125 v., 60 mA., **4/-**; RM2 125 v. 100 mA., **4 9**; RM3 125 v. 120 mA., **5 9.** RM4 250 v., 250 mA., **10/-.**
ENGRAVED CONTROL KNOBS for ¼in. Spindle. 1⅜in. diam. Walnut or Ivory. Gold filled, 16 Standard engravings, **1/6** ea. Plain knobs to match above, 1⅜in. **10d.** ea., 1⅛in. dia., **8d.** ea. Walnut or Ivory, 1⅜in., **1/-** ea.; 1in. **9d.** ea. Pointer Knobs Black with White Line, **9d.**
WEARITE "P" TYPE COILS. All ranges, 1 to 7, **2/6** ea. Osmor Q series Coils. Slug tuned. All ranges from **3/6.** Full range popular Coil Packs.

I.F. TRANSFORMERS—465 kc/s

Brand new ex-manufacturer's midget I.F.T. size 2½in. x ¾in. x ¾in. dust core tuning. Litz wound coils, High Q. Bargain offer, **7 6** pair.

MAINS TRANSFORMERS.—Made in our own Workshops to Top Grade spec. Fully interleaved and impregnated. **RADIO AND AMPLIFIER TYPE.** 250 v., 60 ma. F.W. sec. 5 v. or 6.3 v. 1 a. rect. 6.3 v. 2.5 a. set Htrs., **21/-,** etc. **C.R.T. HTR., ISOLATION TYPE.**—Low leakage with or without 25% sec. boost voltage. Ratio 1 : 1 or 1.25, 2 v., **10 6**; 4 v., **10/6**; 6.3 v., **10/6**; 13.3 v., **10 6.** Ditto with mains primaries 200 250 v., **12 6.** Specials to order.
L.F. CHOKES. –10 H. 65 ma., **5/-**; 15 H. 100 ma., **10.6**; 10 H. 120 ma., **10 6**; 20 H. 150 ma., **15 6**; Simplex, **10 6**; Soundmaster, **10/6.**
ERSIN MULTICORE SOLDER 60/40 grade. 18g., **3d.** per yd.; 16g., **4d.** per yd.; ½lb., **2 6.**
LOUDSPEAKERS P.M. 3 OHM. 5in. Celes., **17 6**; 6in. Celes., **18.6**; 7 x 4in., Goodmans Elliptical **18.6**; 8in. Elac., **20/-**; 8in. Goodmans special **21 6**; 10in. R. and A., **25/-**; 12in. Plessey, **35/-**; 8in. M.E. 2 k. ohms field, tapped O.P. trans., **24 6.**
SCOTCH BOY, EMITAPE, etc., 1,200 ft., **20/-.** Long playing, 1,800ft. reels, **45/-.** Paper tape, good quality, 1,200ft., **12/6.** Reels only, 5in., **3 8.** 7in., **4 3.**
TWIN GANG TUNING CONDENSERS. .0005 pf. Midget, **6 6**; .0005 mfd. Standard size with feet, **8 6.**
TYGAN FRET (Murphy pattern). –12in. x 12in. **2/-**, 12in. x 18in., **3/-**; 12in. x 24in., **4/-**; etc., etc.
FULL WAVE BRIDGE SELENIUM RECTIFIERS. 6 or 12 v. 1½ amps., **8 9**; 3 a., **15/6**; 4 a., **18 6**; 6 a., **24.6.**

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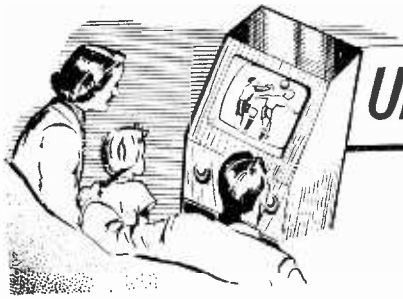


UNDERNEATH THE DIPOLE

TELEVISION PICK-UPS AND REFLECTIONS

By Iconos

THE Independent Television Network seems to be getting well into its stride. A-TV, Rediffusion, Granada and ABC-TV are now regularly exchanging programmes through their network, giving viewers plenty of opportunities to observe and compare the styles and tastes of the originating companies with the BBC-TV and with each other.

Notwithstanding the results revealed on the audience surveys and polls, I am of the opinion that BBC-TV still holds the lead for smooth technical presentation, especially in plays, panel games and documentary items, excluding news. A-TV excels at light programmes, Rediffusion for more serious items and—still trailing behind, I'm afraid, come Granada and ABC-TV. Nevertheless, there have been some good plays from Granada ; and " Jekyll and Hyde " from ABC-TV.

I would sum up their respective styles as follows :—

BBC-TV : Dependable, solid—and sometimes too heavy.

A-TV : Slick entertainment at all costs.

Rediffusion : Originality often spoiled by rough presentation.

Granada : Aims high and often scores ; aims low, and often misses.

ABC-TV : Excellent retailers of the best of other people's programmes, plus robust local products.

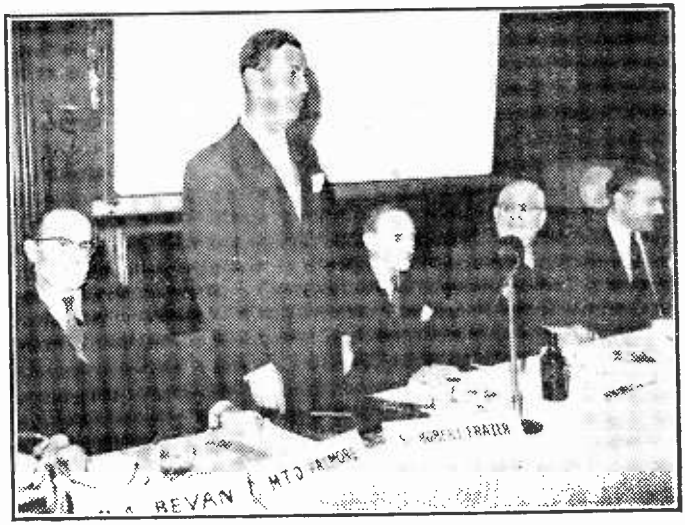
GRANADA DRAMA

THE Granada programmes have shown a remarkable improvement in their drama presentation lately. One of the best plays to come from its Manchester studios was *Another Part of the Forest*, the play by Lillian Hellman, who also wrote the better-known plays *The Little Foxes*, *The Watch on the Rhine* and *The Children's Hour*. *Another Part of the Forest* was a period play, dealing with a rather unpleasant set of people living in the Southern States of America. Nevertheless, the story was so well adapted to television, so well acted and produced that I found it gripping right up to the final rather unsatisfactory situation which served for a " curtain." Excellent performances were given by Walter Fitzgerald, William Sylvester and Diana Fairfax. Miss Fairfax immediately goes into the television star class, in my opinion.

There was drama, too, on some of the Granada documentaries, especially in a crude feature called *Under Fire*. An over-anxious chairman with one eye on the clock prevented an M.P. from replying to provocative questions, thereby giving an impression that he (the chairman) was biased. This badly constructed and badly handled feature should be abandoned—it is too dangerous and sometimes offensive, with its ugly close-ups of hecklers. These do not fit in too well with the glamorous advertising commercials !

FILM TRANSMISSIONS

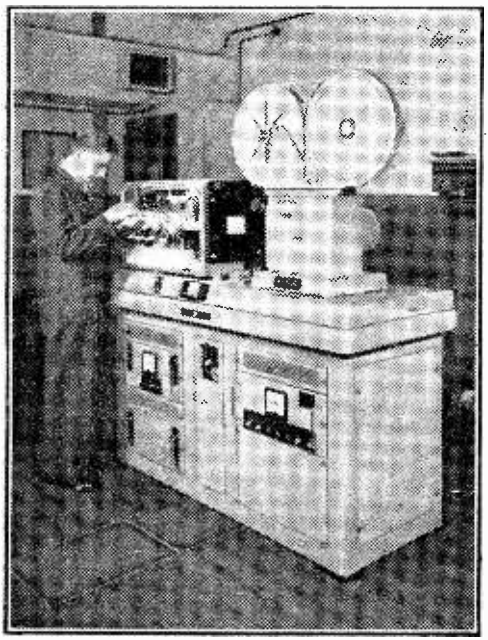
THE transmission on TV of excerpts from cinema films in *Picture Parade* and other programmes, both on the BBC and ITA, is a pleasant form of entertainment and a valuable medium of publicity for the film industry. The quality of the excerpts is, however, very variable ; sometimes the picture is poor or the sound bad, but there have been occasions lately when the quality of both has been outstandingly good. The BBC's six-minute excerpt from the new Jack Hawkins film *The Man in the Sky* was technically so much better than the average transmission that I felt



SCOTTISH INDEPENDENT TELEVISION

Sir Robert Frazer, Chairman of the Independent Authority, addressing a Television Conference and Demonstration held in Glasgow on Wednesday, January 16th. Others in the photograph include Mr. Michael Patmore, M.I.P.A., a director of J. Walter Thompson & Co., Ltd. ; Mr. J. Newcomb, F.I.P.A., Chairman of the Meeting ; Mr. Roy Thomson, Chairman, Scottish Television Limited.

impelled to investigate the reason why. This proved to be a black-and-white picture, of which a print had been specially graded in density and contrast for the particular telefilm apparatus used; a new Cintel machine. In comparison, the other films in the same edition of *Picture Parade* did not fare so well. Generally speaking, the flying spot film scanner still seems to give pictures with the finest resolution, best half-tone reproduction and the fullest range of contrast, besides being free from shading errors. The machines are slow in starting up and stopping and in other ways not so flexible as the storage-tube type of TV film projection equipment—and they are also very expensive, costing around £20,000 apiece. Nevertheless, for TV film programme transmissions as distinct from short snippets of film sequences inserted in TV plays, a good flying spot film scanner seems to be a worth-while investment for any TV station.



A general view of the new Marconi Telerecording Equipment with an engineer examining the underside of one of the sub-chassis from which the covers have been removed. A feature of the equipment is the way in which the sub-chassis are hinged, so that access to units is facilitated and servicing very much simplified.

A QUESTION OF SCIENCE

THIS title might not appeal to many audiences, but those who stayed with the BBC's feature recently instead of turning over to I.T.A. were rewarded with a bright and entertaining feature, introduced by Stephen Black. It dealt with such diverse subjects as the breaking of wine glasses when a singer reaches certain notes, the technique of "fire eating," and the mechanics of the extraordinary double-jointed acrobatic tricks of contortionists. Victoria Elliot, the soprano from Sadlers Wells; Silma Anne, the acrobatic dancer from the Cabaret Club, and Oreste Cortez, the professional fire-eater, all took part in demonstrations and assisted with the explanations of their ability to do these things. Unfortunately, the title probably indicated to many a kind of Third Programme item, instead of a Light Programme gimmick.

HISTORY MADE EASY

THE BBC has made great strides in serving up history in a palatable and easily digested form. It was not at all difficult to assimilate important developments in the history of the British Empire when presented as a background to W. P. Lipscomb's play, *Clive of India*, which I saw many years ago when it had a most successful run at Wyndham's Theatre. This was always a "one man" play—in which nearly all the characters excepting Clive himself appeared to be small-part or "bit" players. In this respect it is a play more suited to the great days of the actor-manager, when Tree, Irving and Benson trod the boards. However, for the TV play, Rudolf Cartier, the producer, selected Marius Goring for the part of Clive—and an excellent choice it was. The story covered a period of sixteen momentous years of British history, and though it had exciting moments, such as the last hours before the Battle of Plassey, it was Clive's personal life and the estrangement with his wife which was the most effective part from the theatrical point of view. Jeanette Sterke played the part of Lady Clive movingly, though it was noticeable that she aged very little over the lengthy period covered by the action. This was much better fare than the gloomy doses of Ibsen and Chekhov which the BBC is so fond of doling out on Sundays. On such sombre Sunday evenings the advertisers on I.T.A. rub their hands. The percentage of viewers who turn over to lighter fare must be very high. Incidentally, I mentioned the great actor-manager, Sir Herbert Tree, earlier in this paragraph. What a fine TV biography could be made of his stormy life and career.

TV SOUND

I THINK that there is a tendency for TV engineers, especially those associated with the I.T.A. companies, to look upon the sound side as being rather unimportant low-frequency stuff. They appear to concentrate their brain-power on the three megacycle band-width, image orthicons and so forth. Time and time again, the sound quality is very much below par. In the case of performances televised from television theatres, this is partly due to fed-back effects from the loudspeakers in the auditoria, installed for the benefit of the invited audiences. Surely, such consideration is misplaced—the viewing audience should come first. If an artiste sings, croons or groans into a microphone on the stage at such a low level that he can't be heard by the audience in the TV theatre without loudspeaker reinforcement, well, then—that's just too bad. After all, they haven't paid to hear him.

Musical balance is another sound problem not too well tackled by the I.T.A. companies—excepting, I think, by Rediffusion. The provincial TV companies especially seem to bother little about sound—excluding the provincial "branches" of the BBC, which maintain a reasonably good standard. But comparison of the sound of any of them with the BBC's frequency modulation transmissions of orchestras on VHF is distinctly odious! The I.T.A. companies should take the wool out of their ears—and their mikes!

C.R.T. ISOLATION TRANSFORMER

Type A. Low leakage windings. Ratio 1 : 1.25 giving a 25% boost on secondary. 2 v., **10 6** ; 4 v., **10 6** ; 6.3 v., **10 6** ; 10.8 v., **10 6** ; 13.3 v., **10 6**.
Ditto with mains primaries, **12 6 each.**

Type B. Mains input 220/240 volts. Multi Output 2, 4, 6.3, 7.3, 10 and 13 volts. Input has two taps which increase output volts by 25% and 50% respectively. Low capacity, suitable for most Cathode Ray Tubes. With Tag Panel, **21 - each.**

Type C. Low capacity wound transformer for use with 2 volt Tubes with falling emission. Input 220/240 volts. Output 2-2¼-2½-2¾-3 volts at 2 amps. With Tag Panel, **17/6 each.**

NOTE.- It is essential to use mains primary types with T.V. receivers having series-connected heaters.

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RESISTORS. All values. 10 ohms to 10 meg., ¼ w., **4d.** ; ½ w., **6d.** ; 1 w., **8d.** ; 2 w., **1/-.**
HIGH STABILITY. ½ w., 1%, **2 -.** Preferred values 100 ohms to 10 meg.

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5 watt } 25 ohms – 10,000 ohms **1 3**
10 watt } **1 6**
15 watt } **2**
15,000 ohms—50,000 ohms, 5 w., **1 9** ; 10 w., **2 3.**

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FERROVOICE 1,200 ft. Plastic Tape 25 -.

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MAINS TRANS. 350-0-350, 80 mA., 6.3 v. tapped 4 v. 4 a., 5 v. tapped 4 v. 2 a., ditto 250-0-250, **21 -.**
HEATER TRANS. Tapped prim., 200/250 v., 6.3 v. 1½ amp., **7 6** ; tapped sec. 2, 4, 6.3 v., 1½ amp., **8/6** ; prim. 230 v. Sec. 6.3 v. 3 amp., **10 6.**
COPPER PLATED AERIAL RODS. ¼ × 12in. push fitting, **3 -** doz., p. & p. 1 -.
ALADDIN FORMERS and core, ¼in., **8d.** ; ⅜in., **10d.**
3in. FORMERS 5937 8 and **Cans TV1 2.** ⅜in. sq. × 2⅝in. and ½in. sq. × 1¾in., **2 -** ea., with cores.
TYANA.—Midget Soldering Iron. 200/220 v. or 230/250 v., **16 9.** **Solon Instrument** Iron, **24 -.**
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LINE CORD. .3 amp., 60 ohms per foot, .2 amp., 100 ohms per foot, 2-way, **6d.** per foot, 3-way **7d.** per foot.
LOUDSPEAKERS P.M. 3 OHM. 2½in. **17 6.** 5in. Goodmans, **17/6.** 7in. × 4in. Goodmans, **21 -.** 3½in. square, Elac., **21/-.** 8in. Elac., **22 6.** 6½in. Goodmans, **18 6.** 10in. R. & A., **30 -.** TSL Tweeter, LSH75, **8 6.** 12in. Plessey, **30 -,** 8in. M.E. 2.5k. field, tapped O.P. transf., **24 6.**
CRYSTAL DIODE, G.E.C., **2 -.** **GEX34, 4 -.**
HIGH RESISTANCE PHONES. 4,000 ohms, **16 6** pr.

CRYSTAL MIKE INSERT by Acos, precision engineered. Size only 1¼ × 3/16in. Bargain Price **6 6.** No transformer required.

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SPEAKER FRET. Expanded Metal Silver, 15⅞in. × 9¼in., **2 -** ea. ; 14½in. × 12 in., **3/-** ea.
GOLD CLOTH. 18in. × 25in., **5/-** ; 25in. × 36in., **10 -.**

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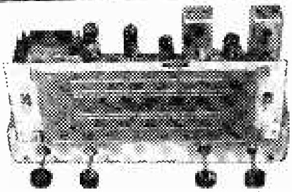
3S4	Equip.	EL148	6K7G	EBC41
3V4	SP61	EB34	LB91	EBF80
5U4	SP41	**3/6**	HVR2	ECL80
6AM6	EF92	3D6	(near)	ECH42
6AT6	PEN 46	6H6M	6SK7	EF41
6J7	**7 6**	**7/6**	**7/6**	EF80
6K8	6BE6	6V6G	12BE6	EL41
6SL7	6BW6	6X4	EL32	EL84
6SN7	6D6	6X5	HVR2A	EZ40
6V6GT	6F6	807	PEN25	KT33C
EBC33	6K7GT	EF39	VP23	MU14
EF50		**11 6**		PY81
Sylv. Red				12K7
EF91				35Z4
EZ80	EY51	U25	PL81	6Q7



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8in., **19/6** ; 10in., **25/-** ; 12in., **30/-.**

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BALANCED TWIN FEEDER, yd. 6d. 80 or 300 ohms.
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WIRE-WOUND POTS. 3 WATT. Pre-Set Min. T.V. Type. All values 25 ohms to 30 K., **3 -** ea. 50 K., **4/-.** (Carbon 50 K. to 2 m., **3,-.**)
WIRE-WOUND 4 WATT. Pots. 2¼in. Spindle. Values, 100 ohms to 50 K., **5 6** ; 100 K., **6 6.**
CONDENSERS. New stock. .001 mfd. 7 kV. T.C.C., **5/6** ; Ditto, 20 kV., **9 6** ; **100 pf.** to 500 pf. **Micas, 6d.** ; Tubular 500 v. .001 to .01 mfd., **9d.** ; .05, .1, **1/-** ; .25, **1 6** ; .5/350 v., **1/9** ; **.1/350** v., **9d.** ; **.1/600** v., **1/3** ; .1 mfd. 2,000 volts, **4/-.**
CERAMIC CONDS., 500 v., .3 pf. to .01 mfd., **10d.**
SILVER MICA CONDENSERS. 10%, **5** pf. to 500 pf., **1,-** ; 600 pf. to 3,000 pf., **1/3.** **DITTO** 1%, 1.5 pf. to 500 pf., **1/9** ; 515 pf. to 5,000 pf., **2 -.**

I.F. TRANSFORMERS 7/6 pair
465 Kc/s Slug tuning Miniature Can. 2⅛in. x ⅞in. x ⅞in. High Q and good bandwidth. By Pye Radio. Data sheet supplied.
Wearite M800 IF 465 Kc s 12/6 per pair.

NEW ELECTROLYTICS. FAMOUS MAKES

TUBULAR		TUBULAR		CAN TYPES	
1/350 v.	2/-	100/25 v.	2,-	8+16/500 v.	5 6
2/450 v.	2/3	8+8/500 v.	4/6	16+16/500 v.	6 -
4/450 v.	2/-	16+16/500 v.		25+20/450 v.	5 6
8/450 v.	2/3		6,-	32+32/350 v.	4 6
8/500 v.	2/9	**CAN TYPES**		32+32/450 v.	6 6
16/450 v.	3/6	Clips	3d.	50+50/350 v.	7 -
16/500 v.	4/-	16/450 v.	3 6	64+120/275 v.	7 6
32/450 v.	5/6	32/350 v.	4 -	100+200/275 v.	12 6
25/25 v.	1/9	64/350 v.	5 6		
50/25 v.	1/9	500/12 v.	3 -	1,000+1,000/6 v.	6 6
50/50 v.	2,-	8+16/450 v.	5 -		

Screw Base Type 512, 8/500 v., **3/-** ; 16/500 v., **4 -.**
SENTERCEL RECTIFIERS. E.H.T. TYPE FLY-BACK VOLTAGES. K3/25 2 kV., **5/-** ; K3/40 3.2 kV., **7/-** ; K3/45, 3.6 kV., **7 6** ; K3/50 4 kV., **8 -** ; K3/100 8 kV., **14/6.** **MAINS TYPE. CONTACT COOLED** 250 v. 50 mA., **8/6,** 85 mA., **9/8.**
COILS Wearite, "P" type, **3,-** each. Osmor Midget "Q" type adj. dust core, **4 -** each. All ranges.
TELETRON, L. & Med. T.R.F., with reaction, **3 6.**
FERRITE ROD AERIALS. M.W., **8/9** ; M. & L., **12 6.**
T.R.F. COILS A/HF, **7/-** pair. **H.F. CHOKES, 2/6.**

ALUMINIUM CHASSIS. 18 s.w.g. undrilled. With 4 sides, riveted corners and lattice fixing holes, 2½in. sides, 7 x 4in., **4 6** ; 9 x 6in., **5 9** ; 11 x 7in., **6/9** ; 13 x 9in., **8 6** ; 14 x 11in., **10/6** ; 15 x 14in., **12/6** ; 18 x 16 x 3in., **16/6.**

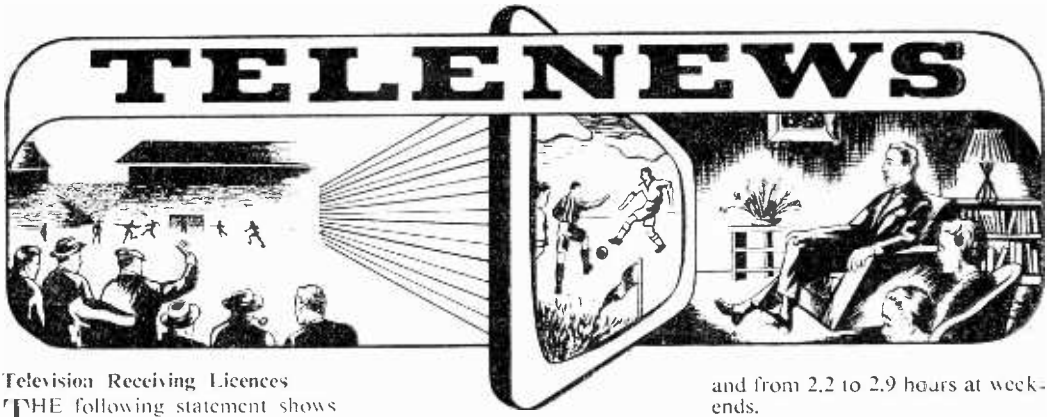
FULL WAVE BRIDGE SELENIUM RECTIFIERS. 2, 6 or 12 v. 1½ amp., **8 9** ; 2 a., **11/3** ; 4 a., **17 6.**
CHARGER TRANSFORMERS. Tapped input 200/250 v. for charging at 2, 6 or 12 v., 1½ amp., **13/6** ; 4 amp., **21/-.**
VALVE MANUALS I, II & III, 5 - each.
TOGGLE SWITCHES. S.P. **2,-.** D.P. **3/6.** D.P.D.T. **4/-**
ACID HYDROMETER. New Ex Govt. Unbreakable. Packed in metal case 7 × 1¼in., dia., **4 6.**
WAVECHANGE SWITCHES.

5 p. 4-way 2 wafer, long spindle	6 6
2 p. 2-way, 3 p. 2-way, short spindle	2 6
2 p. 6-way, 4 p. 2-way, 4 p. 3-way, long spindle	3 6
3 p. 4-way, 1 p. 12-way, long spindle	3 6

VALVEHOLDERS. Pax. Int. Oct., **4d.** EF50, EA50, **6d.** B12A, CRT, **1/3.** Eng. and Amer. 4, 5, 6, 7, and 9 pin, **1 -.** MOULDED Mazda and Int. Oct., **6d.** B7G, B8A, B8G, B9A, **9d.**, B7G with can, **1 6.** VCR97, **2 6,** B9A with can, **2 6.** CERAMIC EF50, B7G, B9A, Int. Oct., **1 -,** B7G with can, **1/9.**
BLACK CRACKLE PAINT, air drying, **3,-** tin.

We have no connection with any other firm. Please address all Mail Orders correctly as below.

RADIO COMPONENT SPECIALISTS 307 WHITEHORSE RD., WEST CROYDON
OPEN ALL DAY—(Wed. 1 p.m.) *10 page list 3d.*
Tel. THO 1665. Buses 133 or 68 pass door. 48-hour postal Service. *P. & P 1/-, £2 orders post free. (Export Extra.) C.O.D. Service 1/6.*



Television Receiving Licences

THE following statement shows the approximate number of Television Receiving Licences in force at the end of December, 1956, in respect of receiving stations situated within the various Postal Regions of England, Wales, Scotland and Northern Ireland.

Region	*Total*
London Postal	1,495,884
Home Counties	770,878
Midland	1,102,760
North Eastern	1,017,276
North Western	938,402
South Western	473,565
Wales and Border Counties ...	365,099
Total England and Wales ...	6,073,864
Scotland	440,401
Northern Ireland	55,832
Grand Total	6,570,097

TV Set Sales

TELEVISION sales in the first 10 months of 1956 exceeded the million mark, according to the monthly retail survey published by the British Radio Equipment Manufacturers' Association. The October sales, 228,000, brought the total for the year to 1,005,000.

The October sales were 30 per cent. higher than in September but 19 per cent lower than in October, 1955, when the Autumn Budget led to heavy buying. This factor also affects the comparison with sales for the first 10 months of 1955, which for TV sets were 2 per cent. higher than those for this year.

TV Licences Record in N.W. England

THE North Western Region of the Post Office joins the London Postal and Midland Regions in having more licences for sound and television than for sound only. At the end of December there were 938,402 licences current in the North Western Region for sound and television and 925,952 for sound only.

Throughout the whole country during December the number of television licences increased by 136,680.

Lancashire I.T.A Viewing Time

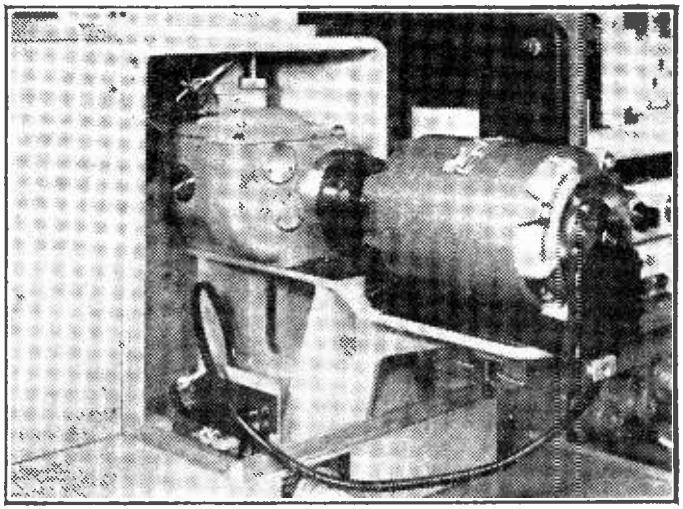
FIGURES issued by Television Audience Measurement Ltd. on the first six months of independent television in the Lancashire I.T.A. area show that I.T.A. homes were tuned to ITV for an average of 2.6 hours each day during the last four weeks ending October 28 compared with only 1.9 hours during the first month of transmissions. Comparative viewing of BBC programmes dropped from 1.7 to 1.2 hours.

T.A.M. adds that the average daily ITV viewing rose from 1.8 to 2.5 hours on Mondays to Fridays and from 2.2 to 2.9 hours at weekends.

Analyses of the amount of viewing by I.T.A. homes shows that although sets were tuned to either ITV or BBC programmes for a weekly average of 25.4 hours the average for the last four weeks was only 23.8 hours, the lowest for any four-week period.

South Wales Transmitter

THE Independent Television Authority has placed a contract with Pye Limited for the transmitter for the South Wales and West of England TV station, which will start operating towards the end of the year. It will be similar to the one at Lichfield and comprises a 20 kW vision transmitter and associated 5 kW sound transmitter. 5 kW vision and 1¼ kW sound transmitters are also being provided as standby equipment.



The Marconi Tele-recording Equipment. See paragraph on page 386 and details on page 364.

A closed-circuit TV system is now in use in a store in France to detect shoplifters. A hidden detective scans the counters by means of a TV camera mounted near the ceiling.

U.S.A. Colour TV Loss

IT is reported that the Radio Corporation of America estimates that it has lost nearly £2,465,000 during 1956 in making colour TV sets and on general promotional activities. The chairman of the company, Mr. David Sarnoff, in making the statement said that the company had sold about 102,000 colour sets during the year, and that the loss was a reasonable expenditure to lay a foundation for a business which promises substantial profits in the near future.

New Tele-recording Equipment

THE production is announced by Marconi's Wireless Telegraph Company Ltd. of a new 16 mm. television recording equipment, which marks a significant advance in the production of high-quality film recordings from standard TV signals combined with simplicity of operation and maintenance of the equipment itself.

One of the first of these has been purchased by a German television authority, Bayerischer Rundfunk, who sent engineers to this country to test the apparatus thoroughly before a decision was made. Installation in Germany is now completed.

The BBC has a similar equipment in use, while yet another is on order for the Australian television station ATN, owned by Amalgamated Television Services Pty. Ltd.

The key feature which gives this equipment its high-quality tele-recording facility is a unique fast pull-down film mechanism.

TV Aids Lecturer

A PYE industrial camera — itself an advanced piece of modern electronic equipment—gave added point to the series of Christmas lectures on "The Meaning of Electronics" at Bradford. It was used to show the audience of over a thousand fifth- and sixth-form pupils from grammar schools and colleges all over the West Riding close-up shots of apparatus which otherwise they would not have seen in detail.

Pictures from the camera were shown on two 4ft. by 3ft. screens during the talks, which were given by Dr. F. E. Jones, former deputy director of Aeronautical Research at Farnborough.

The lectures, which were arranged by Bradford Civic Society, included demonstrations of sound recording from early days to modern Hi-Fi equipment.

Colour Demonstration to M.P.s

THE BBC have arranged to give a demonstration of colour television transmissions to members of both Houses of Parliament. The demonstration will take place in the Houses of Parliament on the day this issue goes to press, and the colour system used will be that which the BBC have been studying for some time, and which was demonstrated last year to delegates of the International Radio Consultative Committee. The BBC are at present making experimental transmissions by this system after programme hours on three evenings each week from their London station, and these can be received as black and white pictures on ordinary receiving sets.

The introduction of colour television, as a public service, must still be regarded as a thing of the future.

New Colour Tube

THE Radio Corporation of America announced it has developed and expects to start making around mid-1957 a colour television picture tube for home receivers with an outer enclosure, or envelope, made entirely of glass.

D. Y. Smith, vice-president and general manager, said the price of the new tube will be the same as the current type, wherein the glass picture face is fixed to a metal housing.

Mr. Smith said R.C.A.'s new, round, all-glass bulb will employ a new technique in glass sealing.

World-wide TV

WITH the advent of man-made space satellites, R. P. Haviland, the American General Electric Company's rocket expert, stated that the satellites can serve as relay stations in the world-wide system. The principle would be the same as that used when a plane recently relayed several live TV programmes from Cuba to the U.S. With a satellite the distances covered could be much greater because of the height of the relay station.

The basic plan calls for four satellite stations travelling 4,000 miles above the equatorial section of the Earth. The satellites would be spaced equally around the Earth so that one would be visible at any instant from any point in the equatorial region. A TV signal could then be transmitted from any ground location in this region to the nearest satellite and be relayed from satellite to satellite. At the proper location the signal would be re-transmitted to a receiving station on Earth.

Each satellite would have to carry a receiver and transmitter. The major ground equipment would be a large directional aerial pointed toward the satellite.

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).

HOW TO USE AN OSCILLOSCOPE

SIR,—I have had correspondence with a reader regarding my article as above, in the January issue. Would readers please note the following corrections: P271, Philips 1458U "Trace at pin 9 *PL81* (V14)" should be "Trace at pin 9 *ECL80* (V14)"; this occurs twice in the text. Also I did not make it clear that V13a is the sync separator and V13b is the frame oscillator. J. HILLMAN (Ballymoney).

SUPERVISOR AND BAND III

SIR,—You may be interested to know that the PRACTICAL TELEVISION "Blueprint" converter is being successfully used in the extreme fringe area of Channel 8. The converter's output is fed into a Supervisor receiver which, incidentally, is just over two years old and has proved trouble-free. The results obtained are equal to many commercial multi-channel receivers I have seen in this district, even with elaborate aerial arrays. My own aerial is a home-constructed, close-spaced, nine-element job mounted on the existing channel 4 mast by way of a cranked arm. The converter is the modified version as per the last June issue of your magazine, and it definitely gives greater gain. It is constructed on a slightly larger 16 S.W.G. aluminium chassis, as I found in its original form on the tobacco tin it became too hot and caused frequency drift. There seems, according to your query page, difficulty by some readers to get the converter to operate. As a point of interest I may add that I am using standard "Hi-k" ceramics in the tuning circuits, the tolerance of which is unknown to me, and the turns of the oscillator coil are almost touching. I can also tune to Channel 9, but find difficulty with patterning here. The converter is mounted inside the Supervisor cabinet and is powered by a separate pack. With reference to your correspondent, E. Snashall, concerning the AT310 overheating, I find this component runs only slightly warm even after a full evening's viewing. I do, however, use a separate transformer for the C.R.T. heater only.

One final point: I recently added the .002μF capacitor for flyback suppression. On trying this refinement out I discovered a "buzzing" noise on sound. The reason I found was that the condenser was close to the volume control leads and re-positioning these leads cured the fault.—E. ANDREWS (Headington).

A SIMPLE TV ATTENUATOR

SIR,—Mr. C. H. Banthorpe, in his article "A Simple TV Signal Attenuator" (page 226, December, 1956), states that ordinary attenuators consisting of carbon resistors are quite useless for high attenuation, particularly on Band III.

I would refer Mr. Banthorpe to page 247 of the same issue, where he will find a description of the new Egen Adjustable Attenuator. This attenuator is of the *ordinary type consisting of carbon resistors* and will give attenuation of 36 db. on both Bands I and III.

Due to the particular design of this component it is capable of greater attenuations than 36 db., 60 db. on Band III being obtained quite easily.

As no requirement exists at present for these high attenuations, this model is arranged to give the 36 db. quoted and, of course, intermediate values down to 6 db. Furthermore, its application entails no risk of bringing out live parts of chassis, etc., to the aerial feeders, as is the case when people are advised to interfere with the actual receiver wiring.—A. EOWMAN (Design Department), Egen Electric Limited.

SPECIAL NOTE

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

SOBELL T121

SIR,—With reference to your reply to your reader in connection with linearity problems on a Sobell T121 I would offer the following comments.

The symptons mentioned usually occur when the original line output transformer has been replaced by a modified type without carrying out the circuit modifications issued with the new transformer. The original transformer was contained in a black bakelite container, whereas the later type is of the modern Ferroxcube type and gives a somewhat higher EHT.

If the transformer has not been changed the line fault may be due to V12 and associated components, or R38, C27 and R39. R53 and R54 should also be checked. The frame fault may be due to V9, C26, C24, C51 or C25. It is worth noting that the combined faults can be due to the line output transformer, but this would also normally be accompanied by an overall dullness of the picture which would also tend to be oversize. Trusting this information is of assistance.—C. W. SHEFFIELD (High Wycombe).

TV WIDOW

SIR,—I hate TV. My husband returns from work at 5.45, has tea till 6.15, reads the paper till 7.00, switches on and turns the lights out. At 10.45 he switches off, puts his chair back in place, and says: "Come on, it's bed time." There is no talking and I can't read with only a small light. What a life!—(Name and address supplied.)

RADAR INTERFERENCE ?

SIR,—many viewers throughout certain regions of the country are experiencing a form of interference which shows as rows of white dots across the screen of their receivers, accompanied by a crackling sound similar to morse interference. This generally affects receivers having an I.F. in the 34-38 Mc/s band. It is believed that this intermittent interference is caused by radar scatter transmissions originating in Iceland.

Perhaps some readers are in a position to confirm this, or suggest an alternative solution to the trouble —L. LAWRY-JOHNS (Gravesend).

"TELLY TRANCE"

SIR,—From my knowledge of TV I would agree with Vic Aldiss when he says that whole families are mesmerised by it, but before he sets himself up as high priest I believe he should buy a set. There is a TV in my home and I have also a daughter studying at high school, so you can see that we have the makings of a real argument: but it doesn't often develop as we use good sense and try to work one in with the other. I think that TV hypnosis will wear off in time and then the moron viewers that remain wouldn't do anything useful even if there were no vision programmes as this section of the public are the same people that have always led useless lives.—J. CHAPPELL (Barnsley).

BBC VERSUS I.T.A.

SIR,—The letter from Mr. G. F. De Lisle published in your November issue has been brought to my attention. If the subject is still open, some comment from an impartial research source may help to explain the different claims published concerning the size of BBC and I.T.A. audiences and relative programme popularity.

Some differences are due to different definitions. It all depends, in other words, what you are measuring and comparing. Others stem from differences of methods of computation.

Worth-while comparisons concerning relative popularity can only be made where both services have an equal chance of being viewed, i.e., in those homes which possess facilities for choosing either I.T.A. or BBC programmes with fairly equal quality of reception.

Even so it is the time devoted by the average family over a given period to viewing this service or that or this programme or that which is the real measure of preference.

True measurement must measure *all* pertinent dimensions. A cube is not comparable with a square. If you argue that more people view BBC than I.T.A. you must state a term and an area or the contention is meaningless. I.T.A. and BBC rival claims are not as a rule based on the same definitions or computed by the same methods.—A. C. NIELSEN CO., LTD.

INTERFERENCE

SIR,—I had fitted a well-known tuner to my View Master (modified as per your recent instructions) and found that I had considerable background of what sounded like talking. One evening the station broke down and then I could clearly hear that the talking was a taxi-cab station routing various cabs—"Pick up, gent at corner of such-and-such street," "Client wants to go from Peckham to Victoria. Who wants this?" and so on. I thought that these transmissions were supposed to keep on a certain wavelength which is quite clear of the television programmes, and furthermore that they are supposed to be F.M. How, then, do I pick up these stations and how can I get rid of them?—F. R. (N.W.5).

TV CONVERTER EXPERIENCES

SIR,—Referring to the letter in the January issue, I should like to state that I also have a converter so working that it is possible to switch from one station to the other. However, this was not until after considerable trouble and difficulty, and here is one particular fault which I should like to mention in case it will help others. When first installed I had one aerial lead in the receiver and one in the converter. I could not cut out BBC on I.T.A. and in spite of much adjustment of trimmers, however, severe patterning took place all the time. It was quite by accident that I went to look at the leads from the aerial to make certain that I had not mixed them up, when I noticed that the picture had cleared up. I moved the aerial leads about and found that the trouble was due to interaction between the leads, in spite of the fact that they are coaxial and the screening is properly earthed. It is definitely possible to introduce the interference by running them near each other.—G. BAKER (Kensington).

THE P.T. DATA SHEETS

(*Concluded from page 358*)

Consideration has been given to ease of servicing, and the majority of the components and circuitry are accessible through a service hatch in the bottom of the cabinet. The C.R.T. and chassis are assembled in one mechanically robust unit which again makes for ease of servicing should the chassis have to be removed from the cabinet.

An interesting feature is the provision for removing the EHT by breaking the H.T. supply to the line oscillator and output stage during alignment.

Care has been taken to position hot components so they are given maximum ventilation, which in reducing the ambient temperature of the receiver benefits the life of all components.

The side-mounted speaker is fitted at an angle in a special enclosure which ensures that the sound is projected forward, resulting in a realistic sound reproduction which would not be achieved otherwise.

TRANSISTOR SIGNAL TRACER
Complete Kit with 2 Transistors, Components, 'Phones with Circuit. **42 6.**

TRANSISTOR SQUARE WAVE GENERATOR
Ideal for signal tracing. **Complete Kit with 2 Transistors, Components and Circuit, 25 -.**

TRANSMITTER RECEIVER ARMY TYPE 17 Mk. II
This well-known R T Transceiver is offered complete with Valves, High Resistance Headphones, No. 3 Handmike and Instruction Book giving complete details and circuit, contained in strong cabinet. Variable tuning.
Frequency Range : 44.0 to 61 Mc/s.
Range approximately : 3 to 8 miles.
Power requirements : Standard 120 v. H.T. and 2 v. L.T.
Ideal for Civil Defence and communications.
BRAND NEW **59 6.**

Calibrated Wavemeter for same **10 -** extra.

TRANSMITTER/RECEIVER SCR 522
Comprising the well-known BC625 and BC624A. Units complete with 17 valves types 2-832, 3-12A6, 3-12SG7, 3-9003, 9002, 6G6G, 1215GT, 12AH7GT, 12C8, 6SS7. The complete unit is in very good condition having very useful parts including Relays, Transformers, Condensers, etc. **Less valves, £3.10.0** carr. paid. **With valves. £7.10.0** carr. paid.

SPECIAL OFFER
Set of four Transistors including one R.F. Transistor, **42.6.**
Set of six Transistors including one R.F. Transistor. **60 -.**

62A INDICATOR UNIT
Containing VCR97 with Mu-Metal Screen, 21 Valves : 12-EF50, 4-SP61, 3-EA50, 2-EB34. Plus Pots, Switches, H.V. Cond., Resistors, Muirhead S M Dial, Double Deck Chassis and Crystal. BRAND NEW, ORIGINAL CASES. **67 6** Carr. free.

INDICATOR UNIT TYPE 182A
Unit contains VCR517 Cathode Ray 6in. tube, complete with Mu-Metal screen, 3 EF50, 4SP61 and 1 5U4G valves, 9 wire-wound volume controls and quantity of resistors and condensers. Offered BRAND NEW (less relay) at **67 6.** Plus 7 6 carr. "Radio-Constructor" scope circuit included.

1355 RECEIVER
Complete with 11 valves 8-SP61, 5U4G, VU120, VR92. As specified for inexpensive T.V. in absolute new condition. **27 6.** carr. 5 -.
R.F.24, **10 -.** R.F.25. **12 6.** R.F.26, **25 -.** Brand new with valves, carr. 2 6.

MALLORY 6 v. VIBRATOR PACKS
Output 180 v. 40 m a., 15/-. Brand new.

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JUNCTION TYPE (Red-Spot) (P.N.P.)

These Red Spot Transistors are ideal for most circuits ; including " W.W." Pocket Transistor Receiver and Transistor Amplifier. All Transistors are British Manufactured and Guaranteed. Send for Circuits and Data.

10/- EACH

(Tested and complete with Data & Circuits)

N.B. These Transistors may be used in place of Mullard OC71 or similar Transistors.

R.F. TRANSISTORS (BLUE-SPOT) 1.6 Mc/s. 15/-.

PRE-SELECTED SEVEN TRANSISTOR PUSH-PULL PORTABLE SUPERHET
Just switch to your favourite Station. No tuning, no aerial or earth. Pre-select 3 stations. Complete with all components and seven Transistors, 7 x 4 Elliptical speaker. Teletron Superhet Coils and I.F.T.s. Powered by 7½ v. dry battery which lasts for months. 150 Milliwatts output. All the above with Circuits, etc. **£9.17.6** Carr. paid.

Or with Matched Mullard OC72's (200 Milliwatts Output) and 7 x 4 Elliptical High Resistance Speaker, **30/-** extra.

Suitable Plastic Cabinet easy to assemble **18 6.**

Call and hear demonstration model working.

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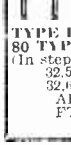
THREE TRANSISTOR POCKET RADIO
(No Aerial or Earth required).
Pre-selected to receive the Light and Home Stations. Total cost, as specified in "Radio Constructor," including Transistors, Transformers, Coils, Condensers and Battery, etc., with Circuit (less insert.) **77/6 POST FREE**
Acos Insert, **15/6.** Single Headphone, **3/6** or Miniature Hearing Aid, **24 -.**

TRANSISTOR PUSH-PULL AUDIO AMPLIFIER (150 MILLIWATTS OUTPUT)
Build this Push-Pull Amplifier which is ideal for Crystal or Magnetic Pick-up Amplification, Baby Alarm, Microphone Amplifier, etc.
Powered by 6-volt Dry Battery lasting for months.
Complete Kit of Parts including 4 Transistors and all Components with Circuit (less speaker). £4.10.0.

QUARTZ CRYSTALS



TYPE FT243 fundamental frequencies, 2 pin ½in. spacing.
120 TYPES. 5675 kc/s. to 8650 (in steps of 25 kc/s.).
80 TYPES. 5705 kc/s. to 8340 kc/s. (in steps of 33.333 kc/s.).
ALL BRAND NEW **10/-** each.
Special price for complete sets of 80 or 120.
Above are suitable for re-grinding.
TYPE FT241A 54th harmonic Crystals. 2 pin ½in. spacing.
80 TYPES AVAILABLE 20 Mc/s.—27.9 Mc/s.
(In steps of 100 kc/s.). COMPLETE SETS AVAILABLE. A Set

32.5 Mc/s.	32.7 Mc/s.	36.4 Mc/s.	36.6 Mc/s.
32.6 Mc/s.	36.3 Mc/s.	36.5 Mc/s.	36.7 Mc/s.

ALL BRAND NEW **7 6** each.
FT241A 200 kc/s. **10 -** each.
Crystal Holders for both Types 1 3 each.

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SEND STAMPS FOR NEW 1957 28-PAGE CATALOGUE
SPECIAL REDUCTION FOR SETS OF VALVES

1A7GT, 1N5GT, 1H5GT, 1A5GT (or 1Q5GT or 3Q5GT)...	37 6 Set
10 EF50 (Ex-Brand New Units) 5/- each.....	45/- ..
10 EF50 (Red Sylvania, ex-new units) **6 -** each	55 - ..
6K8G, 6K7G, 6Q7G, 5Z4G, 6V6G.....	35 - ..
1R5, 1S5, 1T4, 1S4 or (3S4 or 3V4).....	27 6 ..
DK36, DF96, DAF96, DL96	32 6 ..
6K8G, 5K7C, 6Q7G, 25A6G, 25Z5 (or 25Z6G).....	37 6 ..
12K8GT, 12K7GT, 12Q7GT, 35Z4GT, 35L6GT (or 50L6GT)	37 6 ..
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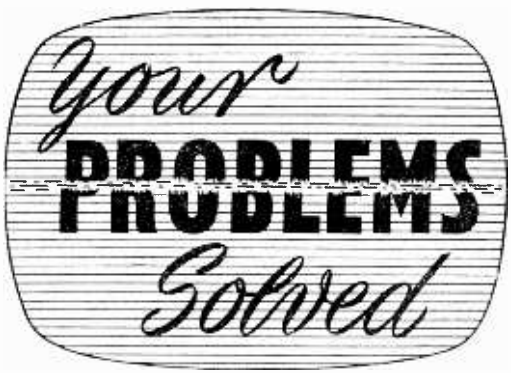

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 397 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

MODEL VT59DA

Quite suddenly the raster collapsed and a diagonal band 1in. wide is left on the tube.

Sound O.K. No raster on the remainder of tube and alteration of contrast or brilliance makes no difference.

The diagonal band is modulated and picture can be seen.

When aerial is removed the diagonal band remains and line drive and width make little difference. Line time base whistle is heard and appears to be operating. —A. Turberville (Willenhall).

From the description given we would suggest that the line scanning coils are at fault or a connection to them shorted, perhaps by a tightly drawn wire against a soldering tag causing an undesired contact.

In any event the scanning coils and their components, leads, etc., should be checked.

T.R.F. RECEIVER

I have a T.R.F. TV manufactured by, I think, H.M.V., although it doesn't own to a name or number. As the set isn't working due to the three VX5019A valves being useless and these are unobtainable, can I convert this set—would it be expensive or worth while—to a superhet 13 channel.—C. F. Smith (Nr. Nuneaton).

We hardly think the conversion would be worth while since the whole receiver is much outdated and the tube, components, etc., are not likely to be in very good shape.

However, to convert for 13-channel working the coils would have to be rewound for 34.5 Mc/s. (vision) and 38 Mc/s (sound) working, approximately, and the first R.F. stage omitted.

PYE B18T

My set is about seven and a half years old. It has given excellent service until recently when large volumes of smoke came from it when I switched on one evening ! It seems to me that the line output/EHT transformer has burnt out and I am wondering whether I could replace it with one giving a higher EHT so as to take a 15in. tube (I suppose that the original EHT transformer had an output in the region of 4/5 kV). The original tube is still in the set, but as you can imagine has a rather prominent ion burn and really needs replacement. If this is feasible, would any further modifications be necessary—apart, of course, from some mechanical adjustments to cater for the larger tube and a new cabinet ? You may consider it hardly worth the expense. If this is possible, would the line EHT 6/9 kV transformer advertised by Lasky's Radio be suitable, and what type 15in. tube would you recommend ?—T. Meriil (Sussex).

You should not consider fitting a different line output transformer unless you are prepared to rebuild and redesign the line output stage.

We would advise you to replace the transformer with one of the same type (if the transformer is at fault) and fit a 12in. tube of the Mullard MW31-74 type or an equivalent. These are offered at very reasonable prices, and apart from fitting a different base socket and an ion trap magnet little other modification will be necessary.

DECCA D14

I had a new Ferranti tube fitted about a month ago. Since then it goes dull after 20 minutes' warming up. I then have to turn up the brilliance control. It then stays all right for the remainder of the evening. When set is turned on the next day, it is far too bright and I have to turn down the brilliance until 20 minutes have passed, then turn it up again. Can you possibly suggest what is wrong and how to correct it ?—E. Hudson (Liverpool).

A slight falling off of brilliance is characteristic of some tubes and we would assume that this is the case with the one which has been fitted in your receiver. Alternatively, the video amplifier may be at fault or a resistor associated with the brilliance control.

MURPHY V200

After about two hours' viewing my set develops the following fault: the picture remains good, but the speech becomes distorted until it becomes impossible to follow. I believe that a previous model had a similar fault, which was caused by a resistor change of value.

I would be grateful if you could let me know if this is also the cause of my trouble and, as no circuit diagram is available, where to look for it.—James McCrindle (Kilmarnock).

The fault is probably caused by the 3.3 MΩ resistor associated with the 20D1 sound noise limiter (and detector) double diode changing its value due to temperature rise. The resistor is coloured orange, orange, green.

PHILIPS 385U/15

On replacing the tube with a Mazda 12in. CRM121A I could not get the picture into focus properly, but rectified this by stepping up the voltage to the magnet coil. This is working quite well at present, but I would like to replace the electro magnet with a permanent magnet type 5073/49 made by Elac. Is this suitable ? Also, could you please tell me what to do with the three leads to the electro magnet and when is the P.M. at its greatest value, with the gap open or closed ? —G. H. Hackney (Widnes).

A triode requires a larger focusing field than a tetrode. The focus unit mentioned should be suitable. We would suggest that you keep the original focus

coil in circuit as its removal might well affect the overall characteristics of the receiver. It could be situated on the inside of the receiver cabinet, but must not be allowed to influence the electron beam in the tube.

PYE FVLC-DL

I have a Pye FVLC-DL, three years old, in which the interlace, modulated or not, is very indistinct.

Having read your articles on the interlace problem of early 1954 I am aware that the line impulses are probably getting into the frame timebase but, on the test you suggest, find the flyback is so spaced as to give evidence that the interlace is intact. It appears to be 50-50 or at least 55-45.

As it is a fairly modern set it possesses flywheel synchronisation, so should I suspect the WX6 interlace diodes, as I have already replaced all the line and frame timebase valves. Line is a little cramped, but I can get it to just fill the screen.

Modulation is all that can be desired, but definition is poor on all but close-ups, which seem rather clearer.

I have no service sheet, but possess the theoretical diagram of the FV4 which succeeded this model, and which has a similar line and timebase circuit.

If you could give me the position of any component which you diagnose as suspect, I should be obliged, as it would enable me to locate them more easily.—W. R. Jackson (Kings Langley).

This trouble is generally caused by a faulty interlace diode, although it has been known for an alteration in value of a resistor associated with the grid circuit of the frame oscillator to have a similar effect. A common cause of the trouble is a faulty frame timebase ECL80. Check that the screens associated with the line timebase are properly secured to chassis.

H.M.V. 1806

The horizontal form control VR4 is overheating badly. So much, in fact, that the casing and the paxolin upon which the wire is wound is burnt away (only the section in use). The wire is not fused.

R58 shows signs of overheating.

C45 no sign at all and tests O.K.

None of the associated wiring shows any sign of shorting or broken insulation. The control arm of VR4 is about ½in. from the earth end.

I replaced the control with another wirewound one but after only a few hours' use the new one was in a similar condition. The control when usable affects the horizontal form in the correct manner.—G. Wall (Southall).

As considerable flyback energy is dissipated in the components mentioned, it is quite normal for them to get hot. It is often desirable to replace with components somewhat over-rated. It is hardly likely that a fault condition exists as it would be exhibited on the picture.

FERGUSON 988T

After the set has been working perfectly for an hour or so the sound begins to fade away gradually. The picture remains perfect. The sound does not vanish completely but becomes faint. On some occasions the sound gradually comes back to normal strength, even though nothing at all is done to the set. On other occasions it does not return to normal and increasing the volume results in distortion of sound. Switching off the supply of electricity to the set for a moment, then switching on again (when the sound has gone faint) brings the sound back to normal.—John C. Fitzpatrick (Liverpool).

Check the condition of the sound detector germanium diode (type CG6). This is situated in the far right-hand corner beneath the chassis as viewed from the rear of the cabinet. Check also the ECL80 sound A.F. valve (situated in the left-hand corner of the chassis, near the brightness control) and associated components. In particular, check the 3.3 Megohm resistor connected to the anode of the sound interference limiter diode.

PYE VT4

Up till just recently I had a very good black and white picture.

Now I have to move the contrast control to maximum to obtain a good black and white picture. Previously with the contrast control in maximum position the picture would be negative.

I also get slight sound on vision. I have tried to eliminate this by adjusting the fine tuner, but without success.

I have a Pye service sheet.—D. Horsfall (Bradford).

This symptom would appear to be the result of a reduction of the sensitivity of the vision channel, assuming, of course, that the sound is still up to standard, and that it is possible to secure full illumination of a raster. In the first place we would suggest that you check the condition of the valves associated with the vision I.F. channel, bearing in mind that a faulty vision detector could be the culprit.

MURPHY 180C

On switching on set a series of horizontal lines appears after the set has warmed up, and a faint image appears of the picture, usually of multiple picture. On adjusting the horizontal hold, through the small hole provided for a screwdriver, I can then get a reasonable picture, but during the first half hour I have to continue to adjust this in a clockwise direction for possibly half a dozen times as the picture slips towards the right-hand side of screen. (That is looking at the front of set.) Also the faces and features appear at times very bright, and on reducing the main contrast to rectify this the screen becomes very dark at both sides. For instance, any reading, or the BBC interval clock, becomes just one blurr. Any lettering in black is reasonably clear, but at all times it is necessary to have the room in darkness to see the programme. This I put down to a deteriorated tube as the set is now five years old.

I have replaced all the six F12 valves, two 6D2 (but not the sync sep.), V-24 replaced and V281. I was thinking of replacing the two 6K25.

I am enclosing a circuit of the set which I would be grateful if you could mark any other resistances or condensers you would suggest I replace.—H. Murrell (Dagenham).

Check the condition of V14 by substitution. Also replace C33 and check the condition of R57 and R59. Low emission tube is probably causing the other troubles.

EKCO TC175

This set has been tuned to Kirk o' Shotts (Channel III) since I got it.

Would you please tell me how to tune this set to

(Continued on page 397)

TELEVISION SETS

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FINSTHWAITE, NEWBY BRIDGE, ULVERSTON, LANCS.

Sandale (Channel IV). There are four knobs on the top of the coils in the back of the set coloured yellow, black, red and green.

Would you please tell me what they are for?—J. D. Wilkinson (Workington).

The coloured knobs on the coils are for the purpose of tuning the set over Band I. The yellow one corresponds to the oscillator coil, the green to the aerial coil, the red to the R.F. coil, and the black to the mixer coil. A signal generator is often necessary to initiate the adjustment, but if you are situated in an area of strong signal and it is required only to change to an adjacent channel, the adjustments can generally be made on the signal itself. First adjust the oscillator coil for maximum sound of the required station, and then adjust the other coils for maximum vision, compromising, if necessary, to secure a good balance between sound and vision; finally, the oscillator should be readjusted for maximum sound consistent with minimum sound interference on vision.

MCMICHAEL TM417

I am not satisfied that I am getting the quality of reception which is possible. I have compared my set with others used in this locality (various makes), and am sure that it could be very much improved. The chief trouble is raggedness—all vertical lines being broken up.

This is very disconcerting, and one has to view from about 12ft. to 14ft. to get a reasonable picture.

Another fault is in the width control. This does not operate properly. The picture can be adjusted to a point about 1in. from each side of the tube and then any further adjustment causes the picture to overlap the tube by a considerable amount—thus quite a lot of the picture is lost.

I would be very grateful for any information which you could give me to clear up these two faults. I am in possession of the maker's service sheet.

I have also a Pye BV30, Channel 4, which I brought here from the Midlands, and I want to use it on Channel H. Could I use the converter described in the September, 1955, issue of "Practical Television" (fringe version of Band III converter)? If so, what would be the coil modifications?—G. F. Horton (St. Marys).

The "ragged" verticals are promoted by general circuit and valve noise of the first one or two stages. The trouble is essentially due to a weak aerial signal which is unable to outweigh the receiver "noise." We would suggest, therefore, that you check on the aerial system before delving into the receiver.

A faulty width control might well be responsible for the other effect described.

The Pye is of the T.R.F. type. A frequency converter would solve the problem mentioned, but we are unable to provide modification details relating to the unit mentioned.

MARCONIPHONE VC53DA

I have a Marconiphone made for London reception, which I have converted for Holme Moss, rewinding the coils as per instructions in "Practical Television," November, 1952, page 258. All coils, vision and sound, were calculated on the assumption that they were wound for 45 Mc/s and were rewound for 52 Mc/s.

Results are very good apart from the fact that there is a loud hum sounding like mains hum but which varies in volume according to the brightness of the picture, being at its worst when the screen is full white as, for example, between advertisements on the Commercial programmes. Re-alignment of the coil cores makes little or no difference to this condition, unless the set is completely detuned.

It appears to me to be a case of vision on sound and I wonder whether it could be caused by wrong winding of the coils, as I have only increased the frequency by 7 Mc/s, but the difference in frequency of sound on the two stations is 16.74 Mc/s.

If this is so will it be necessary to rewind the sound coils, or will a rejector circuit in the sound section solve the problem?—G. Tranter (St. Helens).

Check that the sound coils are tuning properly. If they cannot be peaked, then the number of turns should be modified accordingly. The symptom indicates that the pass-band of the sound strip is either too wide or off the correct frequency. Cross-modulation occurring as the result of a very strong aerial signal would promote the effect. This can be eliminated, of course, by the use of an aerial attenuator.

BUSH TUG24

I have a Bush TUG24 12in.; the tube is about finished. A London firm offer a MW36/24 14in.; will I be able to use this and what modifications would be required to improve E.H.T., and if transformer will stand such modification?—R. Colman (Liverpool).

In our opinion, although a picture will be obtained using an MW36/24 C.R.T., really satisfying results will not be obtained without the use of wide-angle scanning components.

We would advise you to obtain an MW31/74, as several sources are available.

FERGUSON 988T

I purchased a second-hand Ferguson 988T, BBC only. After the set has been working a short time the picture is distorted with black lines which fly across the screen in time with the speech or music. Turning the volume down will not cure it. Could you tell me the age of the set? It has a 12in. screen.—E. B. Bennett (Sutton Coldfield).

Sound on vision on this model is usually caused by improper alignment of the oscillator trimming capacitor. This is mounted on the rear right side of the chassis in the top of a square screening can.

On later models a fine tuner is fitted beneath this, protruding through the rear of the chassis. Only slight adjustment is necessary. Too much will cause a loss of sound, poor vision definition and a loud buzz (vision on sound).

The 988T is a 1951 model. If the sound on vision persists, an attenuator may be required to reduce the signal input from the aerial.

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