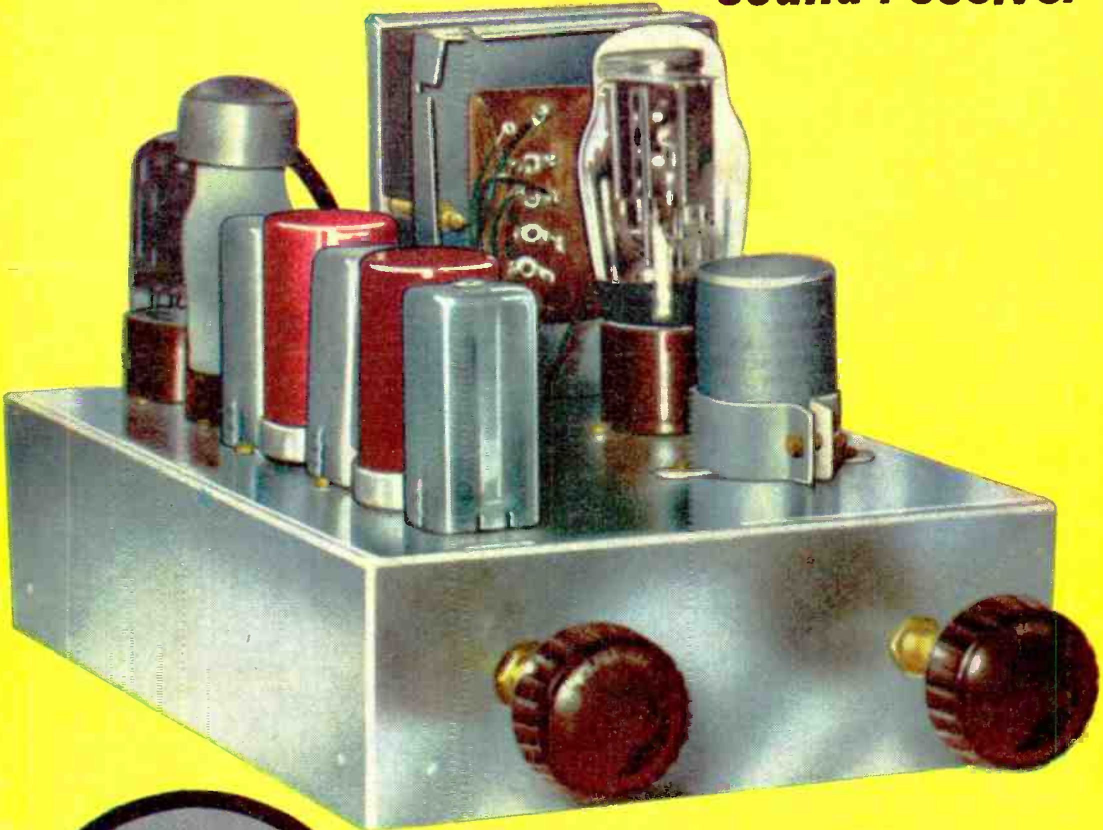
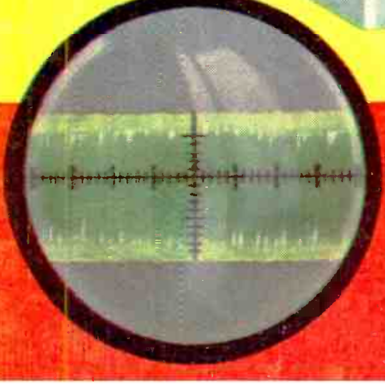
Practical TELEVISION

FEBRUARY 1962

1'9

Self-powered Band I sound receiver





The meaning of TELEVISION 'NOISE'

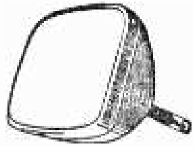
35/- 14 in. TV TUBES 36-24 and 14KP4

Salvage purchase of Rental replacement stocks. Carriage 5/-

TV TUBES

12 MONTHS' GUARANTEE

Insurance and Carriage 15/6

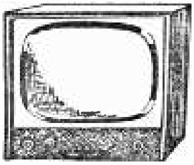


21 in. 99/6

17 in. .. 90/- 15, 14, 12 in. 70/-

£1 extra without old bowl, refundable if same received within 14 days.

LOOK ! EX-RENTAL SETS



17 in. £11.10.0

Excellent table models. ITA/BBC. Famous manufacturer. Personal collection advised. Ins., carr., 25/-. (Regret some delay.) 12 months' guarantee on tubes. 3 months' guarantee on chassis and valves.

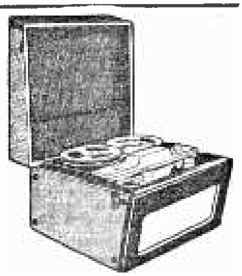
14 in. £7.10.0

ITA/BBC. As 17in. Ideal for caravans, chalets, weekend bungalows, etc. Personal collection advised. Ins., carr. 20/-.
Various makes and sizes available for inspection.

DE-LUXE RECORDER CABINET

79/6

Beautifully styled, rexine covered cabinet in Red or Beige. Size 14½ x 13 x 9½in. Storage compartment in lid for Tapes and microphone. Easily adapted to Record Player Cabinet. Ins: Carr: 5/-.



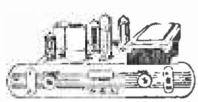
DE-LUXE TAPE RECORDER CABINET only

29/9

Beautifully made Cabinet. Size 13 x 10½ x 7in. Covered in two tone rexine cloth stylish design. Easily adapted to Record Player Cabinet. Exceptional value at this very low price. Post and Packing 5/-.

TAPE RECORDER AMPLIFIERS

£7.19.6 Compact, well designed 5 valve amplifier. Output 3.5W. Input for Microphone, Radio and Gram. Size 8½ x 3 x 4¾in. Ins., carr. 4/6 12 months' guarantee. Terms available. Extras: Dial plate, including sockets and superimpose switch, 3/6. Knobs 2/6.



£9.15.6 By famous manufacturer. Superb 4-valve amplifier. Two controls and superimpose switch. Sockets for Mike and Gram. Size 11 x 4 x 6in. Ins., Carr. 4/6. Drawings FREE with Order.

5¾ in. SCOTCH BOY TAPE Limited quantity. Post Free. **19/9**

DUKE & CO. (London) Ltd. 621/3 ROMFORD RD. MANOR PARK, E12
Send for Free List ILFord 6001/3

For Safety's Sake use AVO Prodclips

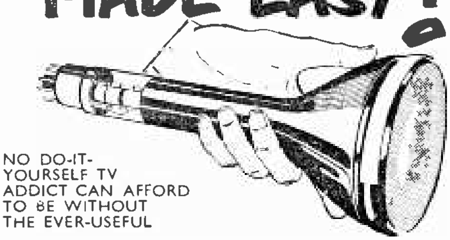
Safety first every time with these patented spring-loaded AVO Prodclips.
Cleverly designed for use as insulated prods, they are invaluable for reaching and holding test points which are difficult of access.

Suitable for use with AvoMeter, Multiminor and Avo Electronic Test Meter Leads.

Post Free **15/-** per pair.

AVO LTD · AVOCET HOUSE, 92-96 VAUXHALL BRIDGE ROAD, LONDON, S.W.1.
VICtoria 3404 (12 lines)
A Member of the Metal Industries Group of Companies

TUBE CHECKS MADE EASY!



NO DO-IT-YOURSELF TV ADDICT CAN AFFORD TO BE WITHOUT THE EVER-USEFUL

DIAMOND 5" MONITOR TUBE

Ideal for test purposes, super speedy tube checks or TV experiments.

ELECTROSTATIC AND MAGNETIC SILVER ACTIVATED SCREEN from the DIAMOND "ALL NEW" RANGE.

"Only the glass is not new"

6v. or 12v., .3 amp. Guaranteed 1 year.
Cash with order. P.P. 7/6 U.K. only. EACH **£4**

DIAMOND ELECTRONICS CO.
SIRON WORKS, 96a WELLINGTON ST., MANCHESTER 18. Tel.: East 3669

All components for the improved
"PIMPERNEL"

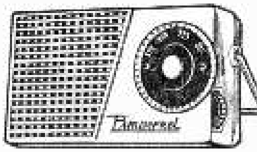
5 Transistor Radio

that works really well!

ONLY 69/6

Postage and Insurance 2/6

Battery 2/-



This remarkable little receiver uses 5 transistors and 2 diodes, 3in. moving coil speaker, tuning condenser, volume control with on/off switch, latest type circuitry giving excellent station separation and ample volume at good tone. Push-pull output circuit ensures long life from PP4 battery.
All components included for Medium wave operation in handsome plastic case with carrying handle as illustrated.

Demonstrations at all branches.

Circuit diagram Free with parts or separately, 2/-

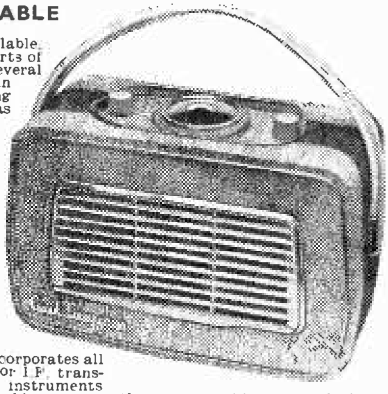
OPTIONAL EXTRAS

All components and switch for Long waves	8/6
Motif "Pimpernel"	2/-

The **"POCKET COMPANION"** is now ready! This is without doubt the most modern and best pocket set available. It uses the very latest I.F. transfilters, Philco R.F. transistors, airspaced tuning condenser in Superhet circuit covering M.W. and L.W. Complete building cost £6.15.0. Battery 2/-. Post and Ins. 2/6. Data free with parts or separately 2/6.

The "GOOD COMPANION"

CAR RADIO & PORTABLE



One of the finest of its kind available. The design is the combined efforts of our technicians and those of several of the leading manufacturers in the country, and the resulting set has a performance as good as if not superior to those selling at £20 and more. *It has the eight transistor set performance!* Features include **American Philco R.F. transistors and Mullard A.F. transistors**—Q.P.P. output giving 750mW—full coverage on Medium and Long—very fine tuning arrangement—excellent reception of difficult stations like 208—variable feed-back control—full tonal qualities—really superior looking cabinet size 11in. x 8in. x 3in. approximately—car aerial attachment — several months' operation from battery costing only **3/6.** Circuit employs six transistors and two diodes. It incorporates all latest refinements, and oscillator I.F. transformers are pre-aligned so no instruments are necessary. Anyone who can solder competently can make this set. The instructions are fully comprehensive with plenty of illustrations. Service is available in the unlikely event of your getting into difficulties. All components fully guaranteed. Price of all components and original cabinet:

£9.19.6 Post and Insurance 5/-. Battery 3/6 extra. Or with new cabinet as illustrated, £1 extra.

MK.2.—Uses latest ceramic transfilters in place of normal I.F. transformers. This saves alignment problems and improves performance. Price **10/-** extra.

Agents wanted to build up our "Companion Receivers." Send addressed envelope for full particulars.

ELECTRONIC PRECISION EQUIPMENT LTD

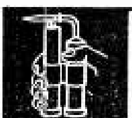
● Orders received by post are despatched from our warehouse. **Dept. 5, 66, Grove Road, Eastbourne**, and to save time, please post your order to this address. Please include enough for postage. Callers, however, should use one of the following addresses:

520 High Street North Manor Park, E.12	42-46 Windmill Hill Ruislip, Mddx.	266 London Road Croydon	29 Stroud Green Road Finsbury Park, N.4	246 High Street Harlesden, N.W.10

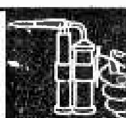
With a Valtock automatic Blowlamp YOU can do

So MANY JOBS so WELL

plumbing, soldering, paint stripping, modelmaking, etc.



The "2000." Ideal for model makers, hobbyists and service engineers for fine delicate work, soft soldering, glass bending, etc. PRICE 14/7

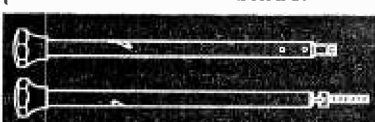


The "Major." A larger version of the "2000" fitted with flame shield to give large flame: for most big soldering jobs about the house PRICE 30/-

The "No 3." The D.I.Y. man's best friend. Full size, powerful. For paint stripping, heavy soldering and all big plumbing jobs. PRICE 63/-

Soldering Iron attachment. Fits the "Major" and "2000" Gives you a soldering iron anywhere—away from electrical supplies. PRICE 5/-

And the SLOTGRIP Torsion Screwdriver the DIY Man's Latest Aid positively grips screws on the end of its blade.



For putting screws in awkward places. Automatic action. Push—it grips. Pull—it's released. PRICE 5" 7/6 10" 12/-

See them at your usual suppliers or send for details to:

VALTOCK LTD

REGENCY HOUSE, 1-4 WARWICK STREET, LONDON. W.1. *Telephone:* GERrard 1667

"SABRINA"

STILL WELL IN FRONT

Make your TV set 100% again **before Prices rise.** (You have been warned!)

COMPLETELY REBUILT C.R. TUBES ALL TYPES (including electrostatics)

12" now	**£5. 0.0**	For Single Tubes
14" to 17" now	**£5.10.0**	
21" now	**£8. 0.0**	

ALL C.W.O.—TRADE SUPPLIED

Special Bonus Scheme for Service Engineers—Reducing to:
12"—87/6; 14"/17"—97/6; 21"—147/6

FREE Pass. transit & Ins. anywhere in British Isles or N. Ireland (12 months' guarantee).

SABRINA C.R. TUBE CO.

Electron Works, North Bar
BANBURY, OXON
Telephone 2390

Practical Television

AND TELEVISION TIMES

VOL. 12, No. 137, FEBRUARY, 1962

Editorial and Advertisement Offices:

PRACTICAL TELEVISION

George Newnes Ltd., Tower House
Southampton Street, W.C.2.

Phone: Temple Bar 4363.
Telegrams: Newnes, Rand, London.

Registered at the G.P.O. for transmission by Canadian Magazine Post.

SUBSCRIPTION RATES
including postage for one year

Inland - - - - £1.5.0 per annum
Abroad - - - - £1.3.6 per annum
Canada - - - - £1.2.0 per annum

Contents

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 the 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, London, W.C.2.

Owing to the rapid progress in the design of radio and television 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.

TV Servicing Under Comment

TELEVISION servicing was one of the subjects dealt with in a recently published booklet, in which various commodities—food, clothing, furniture, etc.—various public services and the retail trade are investigated. In these investigations it brings to the notice of its readers any products or sections of the retail trade which have failed to reach certain standards expected of them—that is, it gives some idea of which manufacturers' products to buy and which not to buy.

The picture it paints of the television servicing trade, in the article devoted to it, is not a pretty one, and to anyone reading it, it would give the impression that the television engineer is a rogue of the highest order. There is no need to list the faults found with various engineers; it is sufficient to say that only two out of six repairers who were faced with the task of remedying two defects—one on sound and one on vision—in a specially prepared receiver, traced and corrected them both fully.

But would it be fair to condemn the whole servicing trade on this evidence—as some people might after reading this article?

It is well known that radio repair specialists never relish the thought of servicing transistor radio sets, for although miniaturisation is a great attraction for the buying public, it is a nightmare for the serviceman, and although television receivers have not yet diminished to pocket size, compactness is nowadays an ever-present axiom to which the television designer must conform.

The television engineer is often faced with printed circuits when practising his profession, faults in which, even with the most comprehensive service sheet, are extremely difficult to trace and repair. The thin threads of copper are reliable enough, but how is he to know without a lengthy overhaul of the set whether or not beneath that blob of solder the lead from a component does not quite reach the printed side of the board, or whether or not an undetected screw is resting out of sight on the board, causing a short between two strips of copper?

Then there are the components themselves to check; not just the valves which can be tested simply in a moment, but the resistors and capacitors lying huddled closely together and presenting as short a length of lead as possible on to which the serviceman can connect the probes of his meters to discover whether or not voltages are of the correct value.

Has the public the right to expect perfection in the television trade? We must remember that television is only about 25 years old, which, when compared with other 20th-century marvels, is not long in which to discover all the ways and means to pin-point the trouble straight away, when part of the machinery fails. We must also remember that the average television repairman, although a skilled electrician, is not a scientist capable of mastering every complication that arises in his work.

When colour and transistorised receivers become commonplace, as they undoubtedly will, the serviceman's job will be many times more difficult than it is today. Some will then say that the development of television is too fast; we are certain some of those will be television servicing engineers.

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

Telenews

Television Receiving Licences

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

Region	*Total*
London	.. 1,955,796
Home Counties	.. 1,624,574
Midland	.. 1,746,929
North Eastern	.. 1,860,409
North Western	.. 1,518,764
South Western	.. 996,599
Wales and Border Counties	.. 701,244
Total England and Wales ..	.. 10,404,315
Scotland	.. 1,058,178
Northern Ireland	.. 171,217
Grand Total	.. 11,633,710

Television Broadcasting Station in Central Wales

THE BBC's new television and VHF sound broadcasting station which has been built near Llandrindod Wells, Radnorshire, was brought into service on Monday, December 4.

This new station is one of several that the BBC is building to extend and improve the coverage of its television and VHF sound services. Although its range is restricted to some extent by the mountainous country, it serves some 23,000 additional people in the Llandrindod Wells area of Central Wales including those living in Rhayader, Llanwrtyd Wells and Builth Wells.

The Llandrindod Wells station receives both its television and sound programmes by radio from the BBC's station at Wenvoe. It retransmits the television programmes on Channel 1 (Vision 45Mc/s, Sound 41·5Mc/s) and the VHF sound programmes on 93·5Mc/s (Welsh Home Service), 89·1Mc/s (Light Programme) and 91·3Mc/s (Third Programme and Network Three). Both the television and sound transmissions are horizontally polarised, which means that receiving aerials should be horizontal.

TV in Northern Ireland

INDEPENDENT television programes will soon be available, for the first time, to a further quarter of a million people in Northern Ireland. The Independent Television Authority has placed an order with EMI Electronics Ltd. to supply a television mast and aerial for their new Londonderry - Enniskillen network.

The new 1000ft mast which will carry a 40ft aerial will be erected on Koram Hill, near Strabane, twenty miles south of Londonderry. The full wave dipole aerial array, which will be vertically polarized, will transmit on Channel 8.

Although miles apart, the Enniskillen district and the populous Londonderry area will both be served by the one aerial.

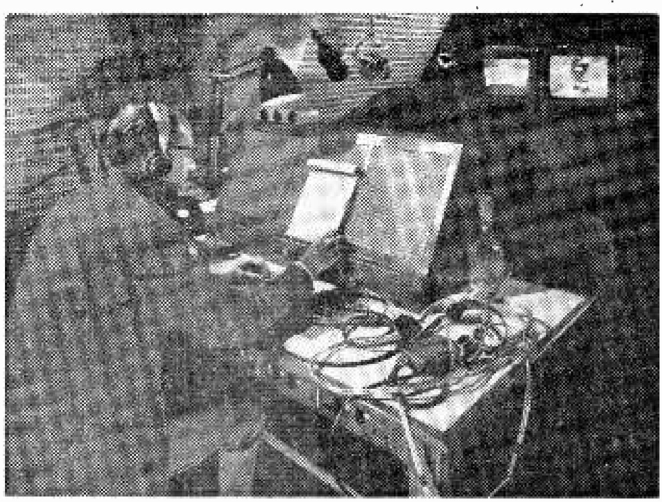
This latest installation is part of the Independent Television Authority's plan to extend its coverage to West Ulster.

It is hoped to be able to hand over the completed mast and aerial to the Independent Television Authority by the summer of 1962.

New News Studio

AFTER an eighteen month building programme, ITN have opened their re-built and re-equipped studio in Television House, Kingsway, London.

When ITN started in 1955, its operations were conducted from two inconveniently separated areas—the first and eighth floors of Television House. The staff had to work from a small studio and from tightly packed technical areas. With the news room on

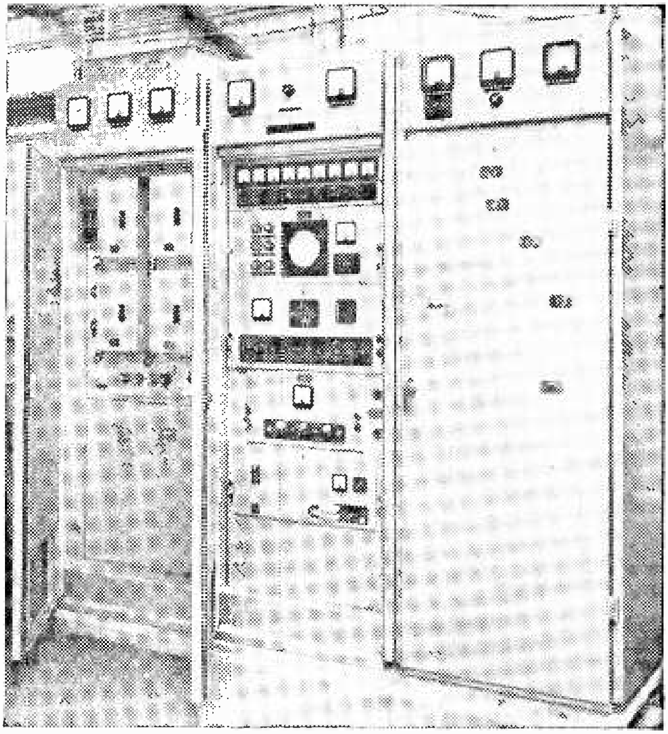


After an 18-month building programme, the re-built studio and technical areas of Independent Television News in Television House, Kingsway, London, W.C.2., are now complete. The illustration shows the separate film commentary studio.

the first floor and the studio, processing, film editing and dubbing equipment on the eighth floor, liaison was always a difficulty, and, on occasion, bulletins were endangered because vital material got held up in the lifts.

The new studio employs control and switching centres which facilitate bringing in material from other regions in Britain, as well as from the Eurovision link from the Continent.

The complete installation comprises the studio, the control room suite (including separate production, sound, gramophone, and camera control rooms), the film commentary studio, the central apparatus room, the tele-recording room, the electronic maintenance room, and the gramophone record library.



The Royal Board of Swedish Telecommunications has placed another order for television and sound broadcasting transmitters with Marconi's Wireless Telegraph Company Limited. This picture shows a BD 366C 5 kW Band III vision transmitter, 14 of which are included in the order.

Western Germany Orders British Television Equipment

GERMANY'S largest independent TV studios, Riva Film and Television Studios, Munich, have just placed an order on EMI Electronics Ltd for four complete 4½in. image orthicon camera channels and ancillary equipment.

Most of the equipment was sent by EMI to Munich some months ago, so that the customer could judge the performance of the cameras under actual production conditions.

The studio equipped with EMI cameras will be used for the production of videotape recordings, which will be supplied by Riva Studios to German and foreign customers.

Television Lighting for Coventry Cathedral

WHEN the new Cathedral Church of St. Michael, Coventry is consecrated next May, the service will be the subject of a major outside broadcast by the BBC.

This programme and all future programmes from Coventry Cathedral will be lit by equipment installed to the specifications of the BBC and paid for by the Corporation.

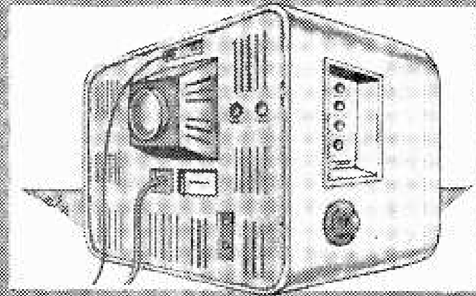
About a year ago BBC engineers began studying the special problems involved in lighting a television outside broadcast from the new cathedral. Unlike the mediaeval building, with arches, pillars and side chapels all carved ornately in stone, the design at Coventry is austerely modern and the walls rise sheer to a height of eighty feet without ornamentation of any kind. Any temporary installation of television lighting could not be hidden, would ruin the conception of the whole, and was naturally ruled out by those concerned with the appearance of the completed building.

After many discussions with both the architect, Sir Basil Spence, and the cathedral authorities, a scheme, approved on all sides, was evolved. Visible to members of the congregation is a vaulted ceiling. This is supported from above by a false ceiling and by climbing a circular stone staircase, one can reach a "catwalk" running between the false ceiling and the concrete roof of the Cathedral. The space in which this catwalk is situated is where a series of motorised winches will be used to raise and lower a series of lighting bars, which will be eased over the edges of the vaulting by specially designed skids, so as to avoid any possibility of damage. When television lighting is needed, the lighting bars will be lowered to ground level so that the lamp units can be attached. These will then be raised to a height of about 45ft. After use, the lamps will be detached and the bars will be raised to their concealed position above the false ceiling.

Improved Aerial Systems at Television Transmitting Stations

FOR the past several weeks the BBC has been installing new and improved directional aerial systems at its Norwich and Rowridge television stations. This work has now been completed and the new aerials have been brought into service at both stations. Together with increases in the transmitter power, these modifications have improved reception in parts of the service area which will help to reduce the effects of interference from Continental stations that occurs at times in the fringe areas.

Servicing Television Receivers



No. 76—EKCO T283 AND T284

By L. Lawry-Johns

(Continued from page 171 of the January issue)

IT should be noted that all the fault conditions explained last month came under the heading of "misleading" since they could lead to wrong diagnosis. Before proceeding to more straightforward fault conditions one other misleading fault may be mentioned.

No Picture, Sound in Order

The EHT will be absent and thus there will be no U25 heater glow or spark from the single-wire end.

Observation may show that the 30P4 is overheating, but it may be found that the 500mA fuse has failed. If the fuse has failed, replacement may not produce normal timebase working and the 30P4 may be found overheating. Lack of line drive from the line oscillator (V18 6/30L2) would be the normal diagnosis and this could well be the case, but if a fine whistle is audible as the hold control is adjusted, and a negative voltage reading can be obtained at C105/R104 or pin 5 of the 30P4, it may be assumed that the line oscillator is functioning. In this case, not only should a new 30P4 be tried, but also a new U191 as this latter valve is often responsible. It should be noted that a PL36 is not a direct equivalent of the 30P4, and if a PL36 is to be tried, pin 1 should be freed of connections.

In these receivers, pin 1 is used as an anchoring point and the leads should be removed complete, not separately. (Pin 1 of a PL36 is a g2 connection as well as pin 4.)

Tuner Unit

The usual trouble due to inefficient contacts may be experienced and this usually takes the form of inability to switch to the Band III channels instantly. The bottom cover of the receiver should be removed and the front of the tuner bottom cover raised to clear the slots at the rear. Cleaning and polishing of the turret studs should restore normal switching and a little lubricant such as MS4 silicone grease or "Electrolube" may be applied to prevent further tarnishing.

Coil Adjustment

The oscillator coil core is adjusted from the side of the tuner and a hole is provided in the side of the cabinet, usually plugged, to enable a very thin trimming tool to be inserted and angled downward. On no account should a larger tool than specified be used as the cores are very small and the coil former can easily be damaged by rough handling.

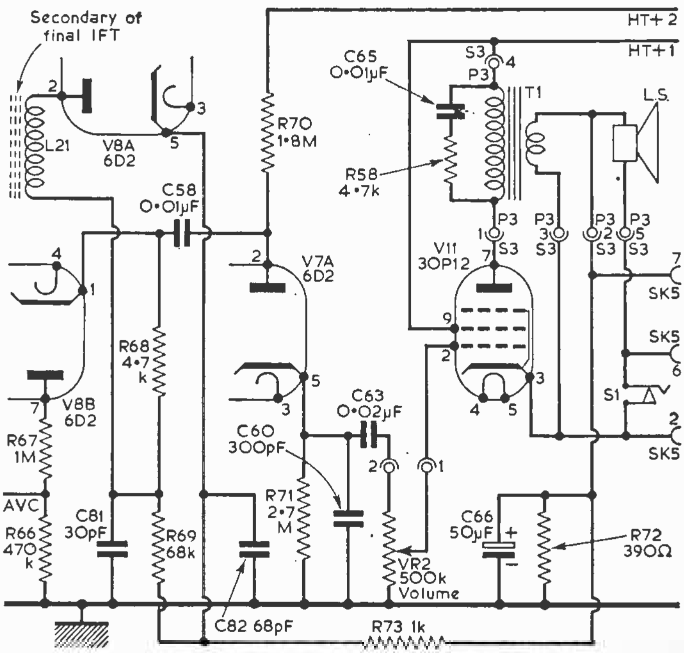


Fig. 4—The sound detector, limiter and output stages.

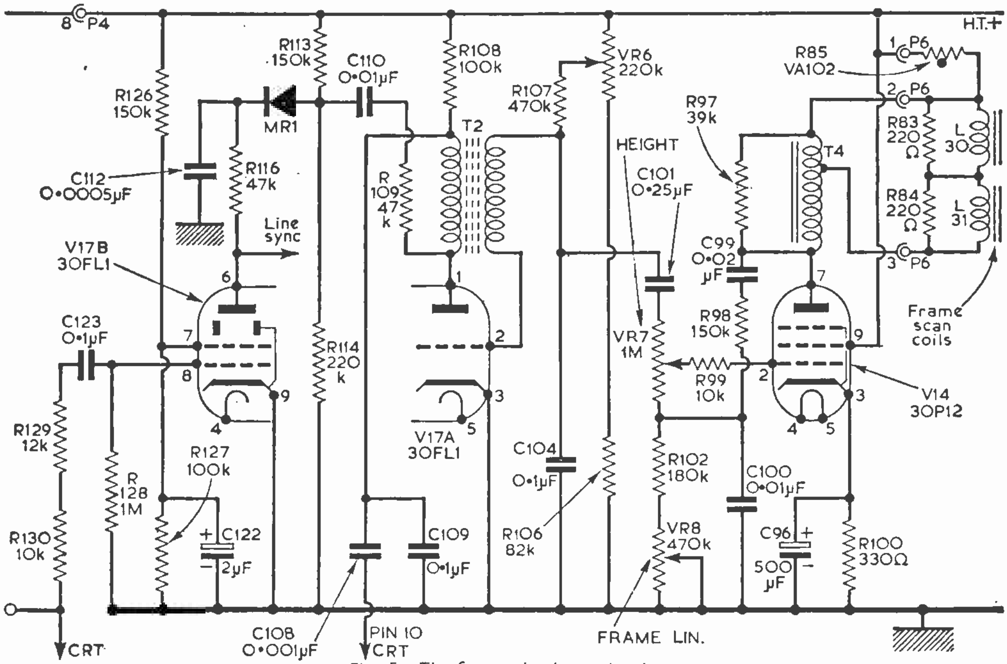


Fig. 5—The frame timebase circuit.

Vision O.K., No Sound

Check V11, V8, V7, V6 and V4 and voltage supplies to each. Ensure that the rear left loudspeaker plug is in order and that H.T. is present at pin 3 as well as pin 4 (pin 3 connects to pin 7, anode, of V11). If there is H.T. at pin 4, but not at 3, check the continuity of output transformer primary.

Distorted Sound

Check 1·8M resistor to pin 2 of V7A (6D2).

Poor Line Hold

Check V18 (6/30L2), V19 (6D2) and components associated with T5.

Bent Verticals

Check valves as above, also C107 (16µF) and note the effect of connecting a 25µF capacitor across R117, 2·7k (from pin 3 of V18 to chassis).

Line Hold at One End

Check V18 and R112 (300k).

Ripples and Interference on Picture

Tap U25 with insulated tool. If this causes the condition to clear or worsen, change the U25.

Frame Hold

If the control is at one end of its travel, check V17 and R107 (470k).

If the sync is poor with very critical hold setting, check MR1 interlace diode, V17, R126 and C122.

Bottom Compression

Check V14 and C96.

Later Models

Later models in the Ekco range (and some Ferranti sets) use a 30PL1 as a frame oscillator/output valve and in cases of poor height and hold, this valve (centre) should be checked.

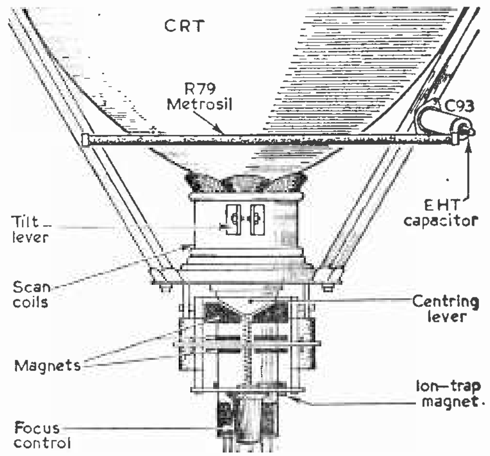


Fig. 6—The tube cradle.

Chassis Removal

Remove the spring clips from the front controls and remove the outer plate. Remove the side plate centre screw and plate. Remove the rear chassis flange screws, the tube base socket, EHT cap, rear left loudspeaker plug and SK6 plug (scanning coils leads). Remove the chassis leaving the CRT cradle in the cabinet.

(Continued on page 230)

HOW TV SETS WORK—3: The sound section

(*Continued from page 174 of the January issue*)

IN this article we investigate the components in the sound section of a "typical" receiver. Such a section is shown in Fig. 3, which comprises the sound I.F. amplifier stage, the sound detector, the sound interference limiter, the A.F. amplifier and output stages.

The sound I.F. signals from the common I.F. stage—which was dealt with in Part 2 of this series—are developed across the primary (L117) of the first sound I.F. transformer. These signals are induced into the secondary winding (L118) and are then applied to the control grid of the sound I.F. valve (V10).

The secondary of this transformer is tuned by C132 and a dust-iron core exactly to the sound intermediate-frequency which, on the set under discussion, is 38·15Mc/s. Capacitor C133 holds the "earthy" side of L118 at chassis potential so far as the signal is concerned, but it also provides D.C. isolation so that an AGC bias may be applied to the control grid of V10 through L118.

Vision-on-Sound

Should either C133 or C132 alter in value, or go open-circuit, detuning of the I.F. transformer would occur. Not only would this cause a serious loss in sound volume, but it would also be likely to give rise to the symptom of vision-on-sound due to the misalignment allowing some of the vision signal to enter the sound channel.

Vision-on-sound is a disturbing buzz from the speaker which alters in pitch and intensity with changes in picture content. As is well known, this effect occurs when the fine tuning control is turned away from its maximum sound position, but, with misalignment of the sound I.F. stages, the effect is present to some degree at all settings of the control and on all channels.

If sound channel alignment drift is suspected, the fine tuning control should be adjusted for the best possible picture definition and minimum sound-on-vision, and then the cores in each sound I.F. transformer should be adjusted in turn for maximum sound. If it is found that one core will not peak within the range of the adjustment, the capacitors associated with that winding should be checked, such as C132 and C133, should this trouble be exhibited when adjusting the core of L118.

Fixed Bias

Grid bias for V10 is provided by R156 in the cathode circuit. Anode and screen current passes through this resistor and as a result causes a voltage drop across it. This makes the cathode of the valve positive with respect to chassis, and since the control grid is connected to chassis through R153, R158 and R161, the grid in effect is made *negative* with respect to *cathode*. Moreover, since the suppressor grid is also connected to chassis instead of cathode, this grid also has a negative bias applied to it due to the voltage dropped across the cathode resistor.

The voltage across the cathode resistor gives a good indication as to how the stage is behaving. Under normal conditions, there is about 2·3V across the resistor. If there is no voltage, as may be discovered during the process of diagnosing for lack of sound, this would mean that the valve is not passing current, which could be caused either by failure of the valve itself or by a discontinuity in the anode or screen circuits.

Cathode By-pass

Besides a D.C. voltage across the cathode resistor, there exists also a small voltage. To prevent this signal from being applied back to the control grid (as with the D.C. bias) and causing degeneration due to negative feedback, the signal is effectively short-circuited through C135, which is called the cathode by-pass capacitor. Its value is chosen in relation to the signal frequency it is to by-pass and the value of the resistor across which the signal exists.

A short in this capacitor, therefore, would cut off the bias supply to the valve which would probably be shown by over-heating of the valve and sound channel instability. On the other hand, an open-circuit would considerably reduce the gain of the stage, and may even give the effect of sound channel misalignment.

Screen Decoupling

The screen grid of the valve is supplied with H.T. voltage through the screen grid decoupling resistor R155. The signal voltage across that resistor is effectively by-passed by C137. An open-circuit in the resistor would, of course, stop the valve from conducting and no voltage would appear across the cathode resistor. A short in C137 would have a similar effect, but, in addition, R155 would pass a very heavy current and would quickly over-heat and burn out. This is a very common fault. An open-circuit in C137 may well cause sound channel instability accompanied in some cases by apparent lack of sensitivity and misalignment symptoms.

dust-iron core. The detector in this circuit takes the form of the germanium diode (OA71) the load of which is R160 and R161 in series.

Inductors L121 and L122 are really small low-capacitance chokes which act as I.F. filters. They allow the unrestricted passage of the detected sound signals (audio) yet offer a fairly high impedance to the I.F. signals. The filter is completed by the two filter capacitors C140 and C142 the function of which is to remove any residual I.F. signal and to ensure that the sound interference limiter and subsequent A.F. stages receive audio signals which are totally free from I.F. signals.

Poor I.F. filtering may result in the amplified I.F. signals being fed back to earlier stages, thereby

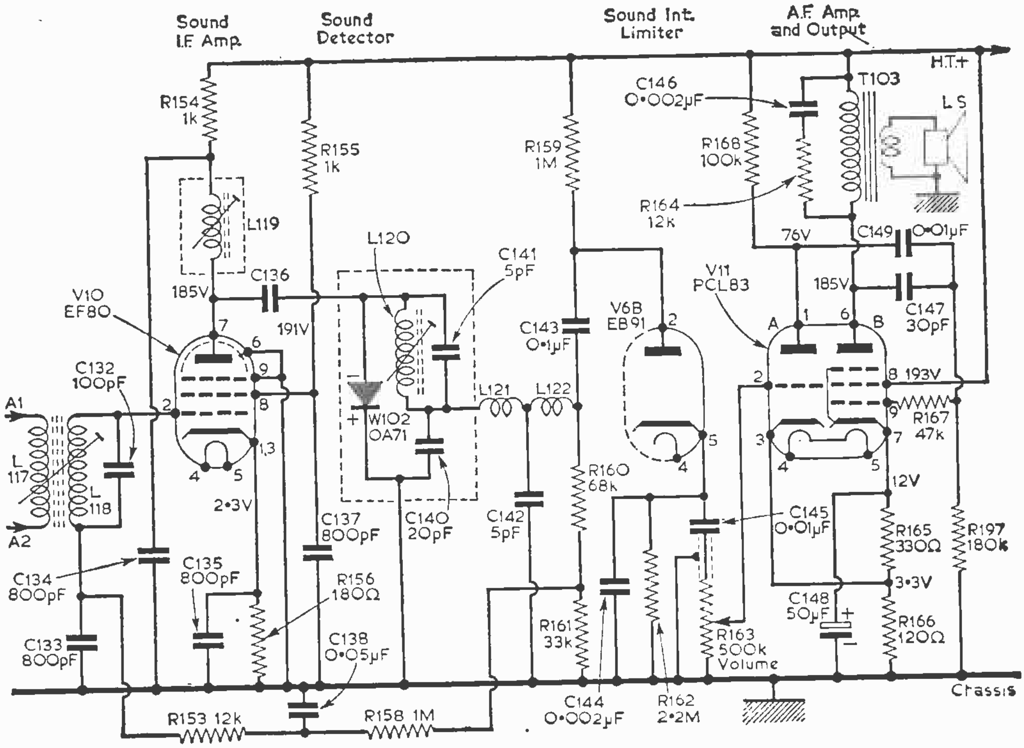


Fig. 3—All the components shown in this circuit section are dealt with in the text. The circuit is of the Ferguson 306T and 308T models and covers the sound I.F. stage, the sound detector, the sound interference limiter and the A.F. and output stages.

The amplified I.F. signal is developed across L119, which is the sound I.F. anode coil. This is tuned to the sound I.F. by the dust-iron core and by the anode capacitance of the valve. The anode circuit is decoupled by R154 and C134, the operation and possible faults of which are similar to those of the screen grid decoupling circuit.

Sound Detector

The sound I.F. signal is coupled through C136 to the detector coil L120 which is also tuned to the sound I.F. by C141, stray capacitances and by its

giving rise to whistles and instability. Open-circuiting of C136 would, of course, cut off sound altogether, while a small leak in this component would apply an undesirable forward bias on the germanium diode and cause poor volume and distortion. In addition, it would also upset the AGC action.

Sound AGC

When the sound I.F. signal is detected as well as the audio component of the signal appearing across the load resistors, there is also present a D.C.

voltage (negative with respect to chassis) the value of which depends on the strength of the I.F. signal. Some of this D.C. voltage is tapped off the load at the junction of R160-R161, and the fraction developed solely across R161 is fed back to the control grid of the I.F. amplifier valve.

This bias is, of course, in addition to that provided by the cathode resistor, and when the signal is strong the AGC bias has a greater negative value. This decreases the effective slope (mutual conductance, or gm ') of the valve and thus reduces the stage gain. In fact, the stage gain is modified according to the strength of the I.F. signal. When the signal is weak, then there is little or no bias and the stage is working at maximum sensitivity.

As a further precaution against I.F. signal being fed back to the input of the stage, additional filter components, namely, R158, R153 and C138, are included to eliminate all traces of I.F. signal and leave only the D.C. voltage. R161 and R158 in series in conjunction with C138 form a time-constant, which is known as the AGC time-constant.

When servicing this section, it is essential that the germanium diode is connected in circuit the right way round (positive to chassis). If the diode is inadvertently reversed—and this sometimes happens—the AGC action is destroyed and, instead of the valve control grid going more negative with increase in signal strength, it goes more positive. This often gives sound instability with high signal inputs—a most unusual effect.

Sound Interference Limiter

The vision interference limiter diode is V6B. This is held in a conducting condition since its anode is connected to H.T. positive through R159. The valve thus passes a small current which is also present in R162, and this gives a voltage drop across the resistor. The audio from the detector is applied to the anode of the valve through the A.F. coupling capacitor C143, and since the valve is conducting, the audio appears across R162, superimposed on the D.C. voltage. The audio is coupled to the volume control R163 through C145, the latter passing the audio but blocking the D.C. voltage. Under normal conditions, therefore, the diode circuit has no affect whatever on the audio.

However, in the event of a sudden burst of impulsive interference, such as that created by car ignition systems and the like, the diode anode becomes negative with respect to its cathode. The positive voltage from the H.T. line is overcome and the diode ceases conducting, and in effect the diode circuit is open. It is clear, then, that the interference pulse will not pass into the A.F. sections.

To avoid the quality of the A.F. signal from being badly mutilated by the action of the limiter under persistent conditions of interference, C144 is put in parallel with the cathode resistor R162 to form a time-constant. This means that when a short-duration interference pulse arrives together with the sound signal, the cathode of the diode is held at its original value for a short while until the charge in C144 leaks away through R162. When it has leaked away, partial conduction of the diode again occurs. and this conduction is balanced against the A.F. signal and the interference, thereby providing the best possible conditions for suppression without completely cutting off the audio signal.

Pulse Duration

It is interesting to note that the efficiency of the sound interference limiter is somewhat governed by the *duration* of each interference pulse applied to the diode. The pulse itself may last little more than a fraction of a microsecond at the source, but this time can be magnified in the receiver circuits due to a restricted bandwidth. As an example, an interference pulse lasting, say, 5μsec in a sound channel with a 200kc/s bandwidth may last for as long as 20μsec in a sound channel with a 50kc/s bandwidth. For this reason it pays to make the sound bandwidth as large as possible consistent with minimum vision interference on sound. Normally, however, most sound stages are designed for 100-200kc/s bandwidth provided the normal alignment techniques are followed.

Sound Distortion

A frequent cause of sound distortion is increase in value or open-circuiting of the resistor in the anode of the sound interference limiter valve. Should this happen, the diode could not possibly conduct properly under conditions of zero interference. Part of the audio signal is thereby clipped off and low volume and severe distortion results.

The A.F. Stages

The A.F. signal across the volume control is tapped off as required, depending on the setting of the control, and fed to the grid of the triode section of V11 (V11A). The triode is arranged as an A.F. amplifier in which R168 is the anode load resistor, and it is across this that the amplified audio is developed.

This is passed on through the A.F. coupling capacitor C149 to the control grid of the pentode section (V11B) through R167, the latter functioning as a grid stopper. This tends to suppress the tendency for parasitic oscillations, which may otherwise occur in a relatively high gain A.F. section due to spurious reactances. The grid leak is R197 and the pentode section is biased by the voltage dropped across R165 and R166 in series. As the cathode of the triode section is connected to the junction of the two cathode resistors, only the voltage developed across R166 is used as grid bias on that stage. C148 is the cathode by-pass capacitor, and its relatively large value ensures that degeneration does not occur due to negative feedback.

Negative Feedback

The anode of the pentode section is loaded by the primary of the speaker transformer T103, while the speaker is connected across the secondary winding in the normal way. The network C146 and R164 tends to attenuate the higher audio frequencies and thus gives a degree of tone correction. The 30pF capacitor, C147, provides a certain degree of high-frequency negative feedback and considerably improves the response of the A.F. section.

There are several faults which often occur in these sections, such as C149 or C147 becoming slightly leaky. This makes the control grid of the pentode slightly positive and counteracts the bias. The valve overheats and serious distortion is well in evidence. An increase in value of the anode load, R168 may also give distortion and low volume. *(To be continued)*

Servicing Data and Modifications

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

By D. Elliot

FOLLOWING the launching of a new receiver it is sometimes discovered that certain inherent faults exist. Such faults rarely show up in the design and prototype laboratories of the various manufacturers, but require field tests to reveal them.

"Stock" Faults

Manufacturers are extremely helpful to their agents in sorting out trouble of this kind, but for some reason or other all the sets concerned may not be attended to, and viewers may continue using receivers on which the reception could be improved by a relatively simple modification or adjustment. This is not to suggest that receivers could be in any way damaged by continual use without the modification being implemented—this is hardly ever the case, and if it were then the manufacturer would make sure that each and every receiver were modified.

It usually happens that dealers undertake the proposed modification when the set next comes in for service. It may be seen, therefore, that the modification may never be performed, since the viewer may move to another part of the country, he may change his dealer or his set may never go wrong! Then, again, the do-it-yourself repairer may be totally ignorant that a modification exists.

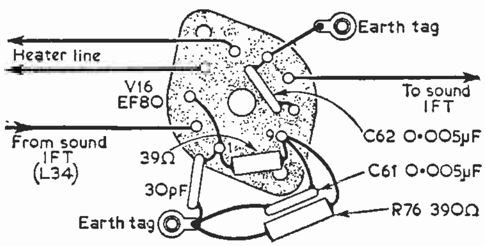
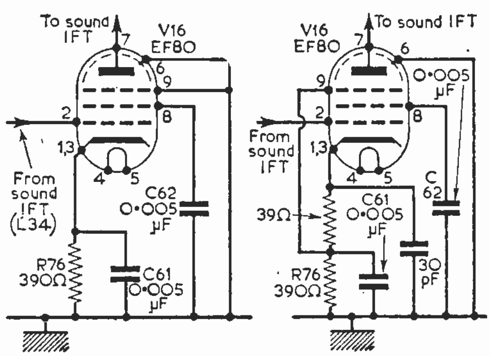


Fig. 1—Modifying Decca DM4/C models to clear adjacent channel interference; (above) the component layout around the valvebase, after modification, (below left) the circuit before modification and (below right) after modification.



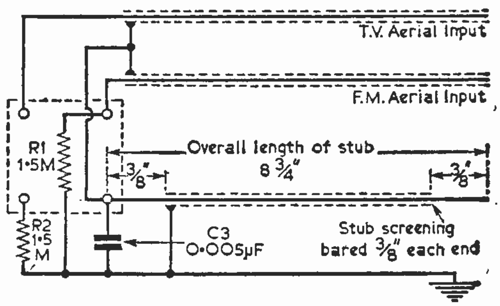


Fig. 2—Eliminating pattern interference on Band III.

Similarly, after a certain time in the field, receivers sometimes exhibit certain fault conditions, sometimes called "stock" faults. These are brought to the notice of the manufacturer and a full-scale enquiry is invariably undertaken in the laboratory. The findings of the enquiry are then made known to the agents so that when a receiver is returned to them with such a stock fault their servicing problems are considerably eased. Such troubles are not exclusive to the television trade, but exist also in other trades, such as the motor trade. However, since a television set is a highly technical device its associated problems can also be highly technical.

It is the purpose of these articles to detail modifications and stock faults of the kind mentioned, and the receivers concerned will not be of recent vintage but those which are handled more by the experimenter than are recent models.

Decca DM4/C—Sound Interference

On early models of this series adjacent channel sound interference was sometimes troublesome. From serial number 60501 modifications were introduced by the manufacturer to overcome the effect. On receivers with serial numbers less than that given above, the modifications may or may not be effected.

The modifications are relatively simple and are focused around the two I.F. amplifier valves (EF80's V16 and V17 in the maker's circuit). The first sound I.F. stage should be dealt with first, and the modification consists of breaking the cathode

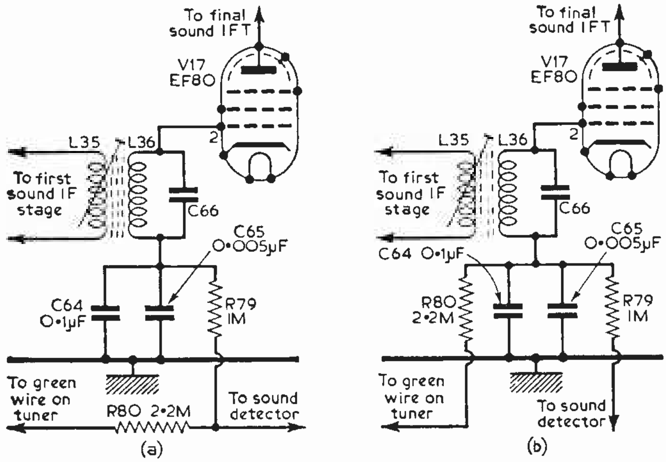


Fig. 3 (a)—The original circuit; (b)—the circuit after modification on the DM4 series to cure sound-on-vision.

wire and inserting a resistor of 39Ω (5% $\frac{1}{2}$W) between the cathode tag and the original 390Ω resistor. The new resistor should be bypassed by a 30pF capacitor connected between the cathode

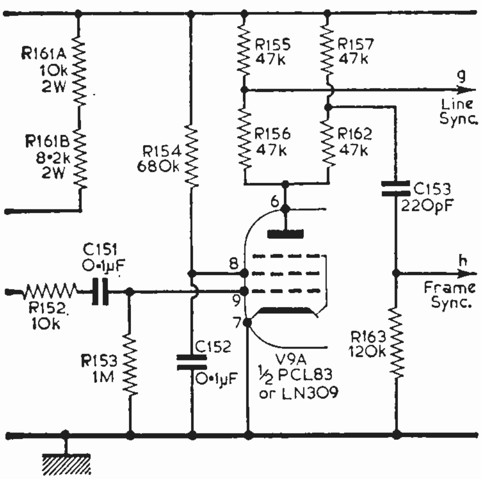


Fig. 4—This circuit modification, on the English Electric T40 series, will improve frame stability.

tag and an adjacent "earthing" lug on the chassis, as shown in Fig. 1(a). Fig. 1(b) shows the original circuit and Fig. 1(c) shows the modified circuit.

The second sound I.F. valve should be modified in a like manner, but here the additional bypass capacitor should be 47pF instead of 30pF.

Finally, the spacing between the windings of the second sound I.F. transformer should be altered to $\frac{9}{16}$in. In some cases, it may be necessary to peak the sound I.F. transformers for the best result.

Band III Patterning on Decca Models

As a function of the fifth harmonic of the local oscillator it sometimes happens that a pattern interference occurs on Band III, which can be altered in formation by rotating the fine tuning control. When this is the case, one is often tempted to adjust the fine tuner for minimum pattern effect rather than for optimum sound and vision. This is not good since the picture quality is bound to be affected.

Decca discovered that the trouble can be considerably reduced by fitting a coaxial stub in parallel with the aerial input. A low-loss coaxial cable should be used and should first be about 12in. long, and gradually cut down a quarter inch at a time until the interference is at a minimum or eliminated. The average length of a correctly cut stub is around 8¾in.

Caution should be exercised when the stub is installed to avoid the possibility of a short occurring between the inner and outer conductors, as this might cause the aerial to become "live". Fig. 2 shows how the stub should be connected in relation to the existing aerial input arrangements. While this circuit applies essentially to models of the DM4/C series, which have separate inputs for VHF/F.M. and television, it could possibly be used to advantage with sets of different makes and models.

Sound-on-Vision

On early Decca DM4/C models sound-on-vision was sometimes caused by poor filtering of the sound AGC. The filtering can be improved and the sound interference eliminated by disconnecting the AGC feed resistor R80 from the junction of R79 and the sound detector wire (which also connects to a switch wafer) and reconnecting it to the other side of R79. The modification was later incorporated on production models, and is shown in Fig. 3.

V17 is the second sound I.F. amplifier, and the circuit at (a) shows the original wiring and that at (b) the modification.

Fitting Gram Input and Extension Speaker Sockets to Decca Sets

We are often asked by readers to suggest methods of installing pick-up or extension speaker sockets to television receivers, and in this respect it is of interest to note the view of Decca. It is said that such a procedure cannot be recommended. So far as pick-ups are concerned, this would mean fitting suitable high-voltage isolating capacitors which would probably result in considerable hum pick up and, more important, the risk of dangerous installation in the case of breakdown of one of the capacitors.

(Continued on page 244)

How TV Signals Travel

By T. Vernon

THE BASIC PRINCIPLES GOVERNING PROPAGATION

IT may seem curious that barely a trace of a television picture from a station upwards of one hundred or so miles distant can be received under ordinary conditions of reception even though the effective radiated power of a principal television transmitter is often far in excess of that of sound broadcasting transmitters on the medium frequencies which can, nevertheless, be received easily in all parts of the world. This fact is sometimes revealed to those viewers who move from one reception area to another. A receiver tuned, for example, to Channel 1 may be moved to a Channel 4 area—perhaps a hundred miles away—and if the set is fixed tuned or does not feature Channel 4 coils, the viewer may attempt to make it work on the original channel with the old aerial.

Differing Conditions

When reception conditions are normal, the viewer will be lucky to lock a picture, though at other times he may receive a grainy picture (depending on the distance from the transmitter and the height of the aerial) or occasionally a remarkably good picture may be received. His ordinary A.M. sound radio, on the other hand, will still continue to receive consistently the stations that he was using at his original location with barely any change in signal strength.

Now that it is possible on most receivers to tune over all the Band I channels and several Band III channels, most viewers, particularly readers of these pages, have tried to pick up more distant stations by turning the channel selector knob. Keen experimenters may go so far as to erect aerials to suit the various channels and beam them on to the stations. It is found that for most of the time there is little entertainment value in the quality of the pictures so received, and yet, at certain times, pictures from distant stations may be received which are equally as good as those from the local station. Indeed, it is sometimes possible to receive Continental stations and, although they may not be locked correctly due to the difference in line standards, the station can readily be identified.

The Ground Wave

Before we can understand why these things happen, we shall have to obtain an idea of how television signals normally travel. A television transmitting aerial radiates signal "rays" in certain selected directions depending on the areas it is required for the signals to cover. Aerials are thus made partially directional. There are two basic rays, those which go skywards and those which travel almost parallel with the ground.

Under normal reception conditions the skywave is of no use to television transmission, since at the very high frequencies used for television the signal rays penetrate the local atmosphere, called the "troposphere", and also the outer atmosphere, called the "ionosphere" and are thus completely lost in space. This, however, is not so with the ground wave which is made up of two components of energy. One part is called the "surface wave" and comprises the signal energy which remains actually in contact with the surface of the earth throughout its travel from the transmitting aerial. At VHF this wave is speedily attenuated with distance from the transmitter and is absorbed by the earth and thus contributes very little in the way of signal at the majority of receiving sites.

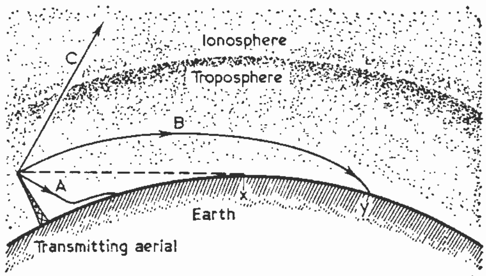


Fig. 1—The surface wave (A), the direct wave (B), and the sky wave (C). The latter wave is usually lost in space.

The second part of the ground wave consists of the signal energy which follows an almost direct path through the troposphere from the transmitting aerial, and it is this component which is responsible for the largest part of the signal which is induced in almost all television aerials located in the primary and secondary reception areas. It is sometimes called the "direct wave".

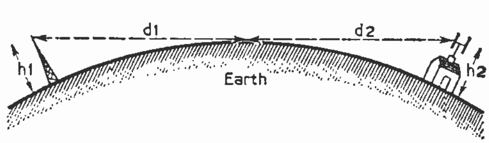


Fig. 2—The line-of-sight distance is equal to the sum of the two horizon distances, d1 and d2. By increasing the height of either aerial, the line-of-sight distance is increased—this is most important in fringe areas.

Diffraction of the Direct Wave

Since the direct wave is travelling almost parallel with the surface of the earth it tends to undergo a small amount of bending and its travel is slightly curved, as is the earth. This bending effect is called "diffraction" and this happens to some degree with all VHF signals. It is for this reason that TV signals are able to negotiate objects on the earth's surface, such as hills, large buildings and so on. If television signals were not subject to bending in this way, then any obstruction in the path of the signal would completely block reception and the normal service areas would be considerably reduced. Moreover, reception would be possible only within the line-of-sight distance between transmitting and receiving aerials; i.e. within the optical range. The general idea of all this is illustrated in Fig. 1. The surface wave is shown at A, the direct wave at B and the skywave at C. The broken line indicates the line-of-sight or optical range from the transmitting aerial, and distance x-y in excess of the optical range is due solely to diffraction of the direct wave by the curvature of the earth.

Line-of-Sight Distance

The primary service area of a television transmitter is practically confined to that area where the receiving aerials are in line of sight of the transmitting aerial, as shown in Fig. 2. The line-of-sight distance is directly dependent on the height of the aerials, and in miles is approximately equal to 1·22 times the square-root of the height of the aerial in feet.

Thus, if h1 (Fig. 2) is, say, 1000ft above the surface of the earth, then the horizon distance d1 is a little over 35ml. If h2 is 30ft, which is about average for a receiving aerial, the horizon distance d2 is about 6½ml. By adding together the two horizon distances (d1 + d2) the line-of-sight distance between the two aerials is obtained, and in this example is about 41½ml. The actual signal conditions within the service area, however, are somewhat influenced by the terrain and buildings, for the surface of the earth is never perfectly smooth.

The secondary service area extends very approximately 25% to 30% outside the primary service area and signals are present because the direct wave is curved by the influence of the earth, as already described. The line-of-sight path in that case falls below the horizon, as shown in Fig. 3.

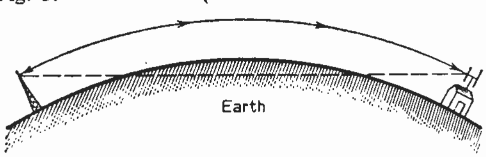
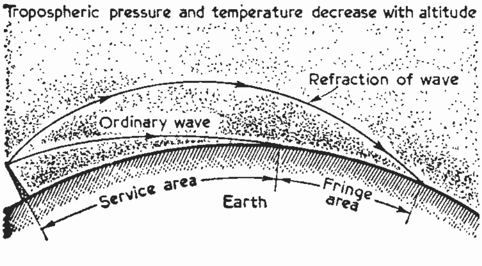


Fig. 3 (above)—Bending of the wave due to an effect of the earth, allows television signals to be received in advance of the line-of-sight distance.

Fig. 4 (below)—Fringe area reception is possible because of refraction of the wave in the troposphere. Fading may, however, be experienced due to changing tropospheric conditions.



Fringe Area Reception

Apart from the earth itself causing diffraction of the direct wave, the troposphere also influences the bending of the wave. Under normal weather conditions, both the pressure and the temperature of the troposphere decrease with altitude above the earth. This results in a decrease of the refractive index of the troposphere with increase in height, which causes continuous bending of the wave from the regions of low refractive index to regions where the index is higher. The effect is shown in Fig. 4 from which it may be seen that the signal is propagated over an even greater distance round the curved surface of the earth.

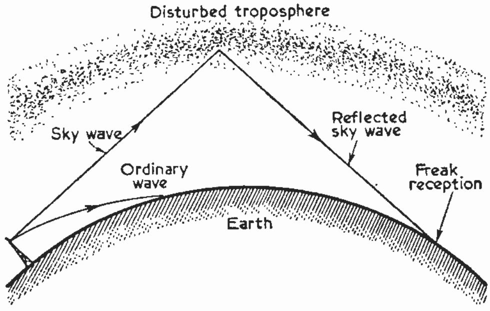


Fig. 5—Freak reception is caused by the long-range reflection of the wave by the troposphere. This happens when the state of the troposphere differs from normal and is generally associated with periods of fine weather.

Fringe area reception therefore, is, possible because of tropospheric refraction. Unfortunately the conditions in the troposphere are rarely constant. There are continuous changes in both temperature and pressure, and these changes alter the refractive index and thus the strength of the received signal, which is the reason why fading is more in evidence in fringe areas than in service areas.

How the Weather Affects VHF Reception

Under certain weather conditions the normal state of the troposphere may undergo a considerable change. The temperature and pressure may not progressively decrease with height, but may remain fairly constant or, in fact, may tend to increase. When this happens the troposphere, or certain parts of it, have the power of *reflecting* television signals. A spurious skywave, in fact, may not pass into space but may be reflected by the disturbed troposphere and reflected down to earth again at some distant point from the transmitting station, as shown in Fig. 5.

This is known as "freak reception" and is very troublesome in this country where several high-power distant stations share the same channel. Whereas under normal conditions other stations sharing the channel would be too far away to cause trouble to local reception, when conditions exist for

(Continued on page 235)

Television Filters

By T. Kemp

(Continued from page 178 of the January issue)

DIPLEXERS FOR TV AERIAL SYSTEMS

A Practical Diplexer

Owing to the wide separation between the Band I and Band III frequencies (about 140Mc/s) it is possible in practice to simplify the filter network of Fig. 8 to that in Fig. 9 (last month). Here only half filter sections are used and, as will be noticed by the hi-fi enthusiasts, this represents the kind of circuit used in loudspeaker cross-over networks. It may thus be termed an aerial cross-over network.

Fig 10 shows the frequency and attenuation characteristics of such a filter network designed for a cross-over frequency around 95Mc/s. It will be seen that with increasing frequency the attenuation of the low-pass half-section increases rapidly, but has a small loss towards the Band I channels. Conversely, with decreasing frequency the attenuation of the high-pass section increases rapidly, but has small loss towards the Band III channels. This, of course, is exactly what is required.

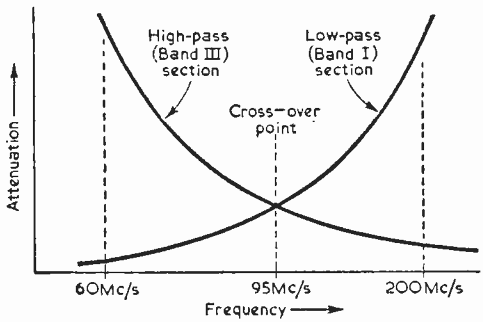


Fig. 10—The frequency and attenuation characteristics of a simple diplexer (or aerial cross-over network) of the kind shown in Fig. 9 last month.

The formulae for working out the L and C elements are as follows:

$$L1 = L2 = Ro/2\pi fc$$
$$C1 = C2 = 1/2\pi fcRo$$

where Ro is the impedance and fc is the cross-over frequency. With a cross-over frequency of 95Mc/s and an impedance of 75—90Ω, the values for L1 and L2 work out to 9·126μH and for C1 and C2, 22pF.

There are two fairly simple ways of constructing the unit, either on a tagboard, as shown in Fig. 11, or in a small tobacco tin, as shown in Fig. 12. The tagboard method allows the network to be wired inside the receiver cabinet, while the "tin" type of construction results in a neat and solid external unit.

The coils for the tagboard arrangement should be self-supporting, ¼in. diameter and wound with 18 or 20s.w.g. tinned copper wire. Four turns have been found to give the best results, but improvement may be possible by altering the turns spacing slightly.

The coils for the tin construction should be found on ¼in. formers with 26s.w.g. enamelled covered wire. Three and a half turns close-wound provides an inductance reasonably close to that required by calculation.

The Triplexer

The triplexer contains a band-pass filter section in addition to low-pass and high-pass sections, as shown in Fig. 13. The low-pass and high-pass sections are worked out described last month. The band-pass section, however, is slightly more involved and, in relation to Fig. 13, is calculated as follows:

$$L3 = Ro/\pi(f1 - f2)$$
$$L4 = Ro(f1 - f2)/4\pi.f1.f2$$
$$C3 = L4/Ro^2$$
$$C4 = L3/Ro^2$$

where Ro is the required terminal impedance in ohms, f1 is the upper cut-off frequency in c/s and f2 the lower cut-off frequency in c/s. In practice, the lower cut-off frequency is around 65Mc/s and the upper cut-off frequency is around 180Mc/s.

The band-pass section allows the passage of Band II (F.M.) signals while offering a reasonably high attenuation at both Band I and Band III frequencies.

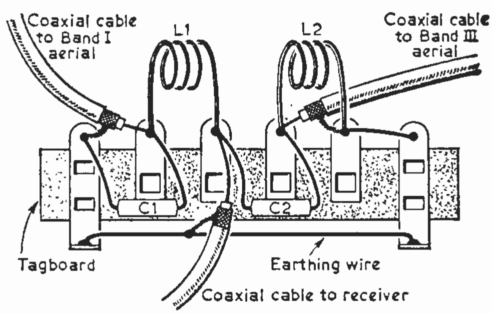


Fig. 11—The tag-board construction of a simple aerial cross-over network.

It is rather difficult to mount all the inductors and capacitors on a tag-strip as with the simple Band I/Band III aerial cross-over network, but quite a neat unit can be made up in a small tobacco tin after the style of Fig. 12.

Multiple Filters

Now that the general mode of operation of the diplexer and triplexer is known, multiple filters for combining one or more Band I aerials with two or more Band III aerials and a Band II aerial can be made up to specification. As an example, there are now some areas where two ITV programmes can be received provided two Band III aerials are erected. These two aerials plus Band I

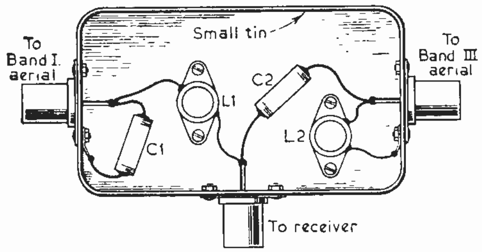
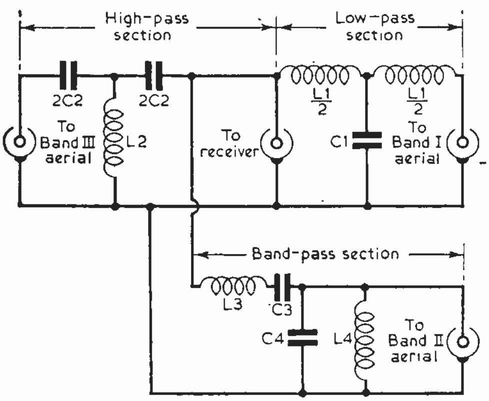


Fig. 12 (above)—An aerial cross-over unit, constructed in a small tobacco tin.

Fig. 13 (below)—Three filters (high-pass, low-pass and band-pass) are combined as shown to form a triplexer.



and Band II aerials can be combined to a common downlead by the use of suitably designed filters similar in style to those already described. For the best results, a low-pass section would be designed for Band I in the ordinary way. A band-pass section would be designed for Band II, while sharp cut-off band-pass sections would probably be designed individually for the two Band III aerials. Once the basic design has been established it may well be necessary to adjust the inductive elements of the Band III filters to give the least insertion loss and the minimum of interaction.

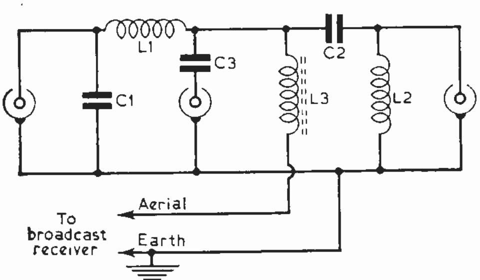


Fig. 14—By the addition of an inductor (L3) and a capacitor (C3) the television aerials can also serve the ordinary broadcast receiver to advantage.

Ordinary Broadcast Signals

By the addition of a small inductor and capacitor in the diplexer, the television aerials can also be used to considerable advantage to operate an ordinary A.M. broadcast receiver without in any way interfering with the performance on the television bands.

How this is accomplished is shown in Fig. 14. Here is shown the simple aerial cross-over network of Fig. 9 with the addition of C3 and L3. L3 is a small dust-iron inductor of the kind used in electric motors for the suppression of television interference, such as marketed by Radiospares, Belling and Lee and others, and has an inductance approaching 5μH. The reactance of this kind of component is very small at broadcast frequencies, while relatively high at television frequencies. It thus allows the passage of broadcast signals without unduly loading the television signal circuits.

Isolation

Capacitor C3 is for isolation and for preventing the broadcast signals from being severely attenuated by the aerial input circuit of the television receiver. Its value should be in the region of 100pF or a little higher.

Broadcast Filter

This kind of broadcast filter can, of course, be incorporated in any diplexer or triplexer, or it may even be fitted in the outlet box at the end of the television downlead in the event of the combining filter being near to the aerials or if a combined aerial is used.

Such filtering has been in use for some time to isolate low-frequency power from the signal when a coaxial downlead is used to feed power up to a pre-amplifier near the aerial, but this will be dealt with in a future article. ■

(To be continued)

ANGLO-AMERICAN TV FILMS AND TAPES EXCHANGE

Exchange of tapes and films between British and American television companies, and joint co-operative production of television productions to be shared, are now becoming more common. Both ITV and BBC have arrangements of various kinds with American networks but the difference in line standards puts a limitation on the use of videotape.

Some British companies have already used 525- or 625-line tapes for recording programmes for American or Continental consumption, with transfer to 405-line tapes for the British television networks. Results of this transfer have not always been good.

The best modern classics, for international television use, are still on film, 35mm and 16mm. Documentary reports of life in American small towns, have always proved successful when screened for British audiences. There is quite an opportunity for the exchange of really good films between the U.K. and the U.S.A. which deal with towns other than London and New York; Norwich, U.K. and Norwich, Connecticut for instance; and Plymouth, U.K. and Plymouth, U.S.A. We see too much of the metropolitan scenes in New York, Chicago and London. Small town backgrounds give a freshness which is often quite delightful.—Iconos.

NOISE

By J. Elliott

HOW "NOISE" CAN AFFECT YOUR TV PICTURE

IN sound-only days, the term " noise " was a reasonably apt description of the symptom, but now that noise is related also to vision it tends to cause some confusion. Noise in this context does not refer to a fault condition, but rather to a shortcoming in the equipment, whether it be radio or television.

Meaning of "Noise"

It is true that noises are sometimes produced from the loudspeaker when the set is at fault; a faulty resistor or transformer winding, for example, very often causes bad crackles. Similarly, a passing car may cause crackling on the sound of a television set, or a defective valve may cause ringing and hissing noises. These sounds are caused by actual faults or interference and the resulting disturbances should not normally be classified as " noise ".

A radio or television set in perfect working condition and receiving an interference-free signal creates in itself a spurious signal which is true noise. If the signal which the set is receiving is very weak, then the noise signal produced by the set itself is likely to be troublesome, for the simple reason that the noise signal may be equal to or sometimes greater than the strength of the required signal from the aerial.

The Noise Signal

Before we can investigate noise in any detail we shall have to understand how it is produced and what it looks and sounds like. Over the past years there has been considerable research to discover ways and means of reducing noise, for any amplifier is only as sensitive as the noise it produces allows. That is to say, the smaller the noise signal produced, the smaller the signal that can be amplified.

The noise signal is produced by the random movement of electrons in a conductor since this movement constitutes a current flow which sets up a potential difference. Take a resistor; if a voltmeter is connected across such a component, one would be surprised if a reading were indicated. Actually, there is a voltage across its terminals (a noise voltage), but it is so small that it cannot be measured by normal means.

It is not a D.C. voltage, since this can only occur from an orderly movement of electrons, and while there may be a D.C. voltage across the terminals at one instant in time a very small fraction of a second later the polarity would have changed. The polarity is thus continuously changing simply because the movement of the electrons is random.

An entirely different set of conditions comes into play if a current of electricity is passed through the resistor, for then most of the electrons move in one direction only in an orderly manner, as governed by the polarity of the applied voltage. Nevertheless, some electrons continue in a random movement, and therefore, even by passing a current of electricity through a conductor, one cannot eliminate the noise voltage.

Temperature Effect

When a resistor or conductor is heated, the random movement of the electrons increases. The electrons are agitated by the heat and, as would be expected, produce a greater noise voltage. Conversely, when a conductor is cooled, the electron movement slows down, and the noise voltage decreases. Indeed, with this fact in mind, engineers have of recent years been developing low-noise amplifiers in liquid gas. The gas having been liquified by extremely low temperatures almost completely stops the random movement of electrons and hence the noise.

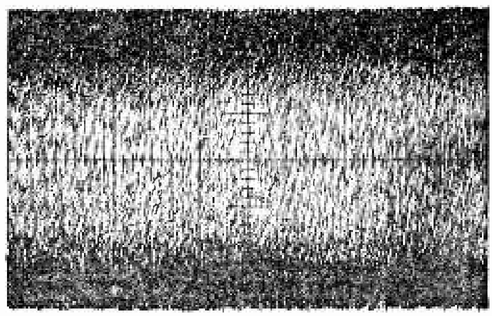


Fig. 1—A picture of noise taken from the screen of an oscilloscope.

Unfortunately such techniques are only possible for very specialised work, particularly where it is necessary to amplify the minute signals from outer space. The noise of an ordinary amplifier, of course, would mask all but the strongest signals.

Noise Figure

Apart from conductors and resistors, other components in radio and television sets produce noise; in fact, all components produce noise. As we have already observed, the noise is of little importance provided the signal which is wanted is far stronger that the noise signal. Where noise really does matter, however, is in the first stage of a set where the wanted signals are weak since they have not yet been amplified.

When the signals have been amplified (these signals may carry amplified noise from the first stage), they are usually far in excess of any normal noise produced in subsequent stages.

The noise performance of an amplifier is judged by its " noise figure ", which is a figure of merit which reveals how much noise an amplifier produces compared with the noise of a perfect amplifier. However, no amplifier can be truly perfect, and the noise voltage developed in a resistor is used to represent a " perfect " amplifier —the noise being used as a basis for comparison.

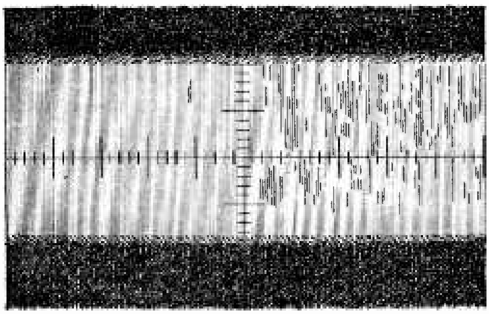


Fig. 2—An R.F. carrier modulated by noise.

Ratios

Let us take the case of a 75Ω resistor; this produces 1.1μV of noise at normal temperature, so if we find that the noise of the amplifier is 2.2μV we can say that the amplifier has a noise figure of 2-to-1. The noise figure is thus a ratio, and as ratios are usually expressed in decibels in radio work it would be said of this example that the amplifier has a noise figure of 6dB, simply because 6dB corresponds to a voltage ratio of 2-to-1.

A table of decibels will show that a voltage ratio of 3-to-1 is approximately 9.5dB, that 4-to-1 is 12dB, that 6-to-1 is about 15.5dB, that 10-to-1 is 20dB and so on. For example, if an amplifier is said to have a noise figure of 12dB we now know that the noise it produces is about 4.4μV compared with the 1.1μV noise in a 75Ω resistor.

Signal-to-Noise Ratio

Noise shows up on a television picture as grain or snow and in some cases it can be so severe as to cause trouble with the frame and line holds. It also causes ragged edges to the vertical parts of a picture.

To achieve a good noise-free picture, the aerial signal should be at least 100 times greater than the noise of the first stage of the receiver. Thus, if our receiver, working on 75Ω coaxial cable, is said to have a noise figure of 6dB the amplifier noise is about 2·2μV, so in order to outweigh that, the aerial signal should be at least 220μV. A good picture would then be obtained virtually free from noise.

Most television tuners have a noise figure when new between 6 and 10dB, depending on the channel. The lower figures occur on the lower Band I channels, while the figure increases progressively towards the top end of Band III. This is one of the reasons why noise is more troublesome on Band III channels than on Band I channels, for if equal signals are obtained on the local channels of both bands—say, around 220μV—then, while there may be no noise on BBC, ITA noise may be quite prominent since, with a 10dB Band III noise figure, the signal-to-noise ratio will only be about 50-to-1 instead of the desirable 100-to-1.

Different Bands

This trouble is often aggravated by the Band III signal being below the strength of the Band I signal in many areas towards the fringe of the stations Generally speaking, the minimum aerial signal to give noise free pictures is about 220μV on Band I and 400μV on Band III. On Bands IV and V, where tuner noise figures are much higher, 600 to 1,000μV of aerial signals may well be required to produce a noise-free picture.

Some experimenters and viewers endeavour to improve reception by installing a pre-amplifier between the aerial and the set. This is a good idea provided the noise figure of the pre-amplifier is at least as good as that of the receiver itself. For optimum results, of course, the pre-amplifier noise figure should be better than the set. If this is not possible, then it is a waste of money to try to improve the performance by using a pre-amplifier. The money would be far better spent on improvements to the aerial system, for increasing the aerial signal must always improve the signal-to-noise ratio. ■

SERVICING TV RECEIVERS

(Continued from page 219)

CRT Removal

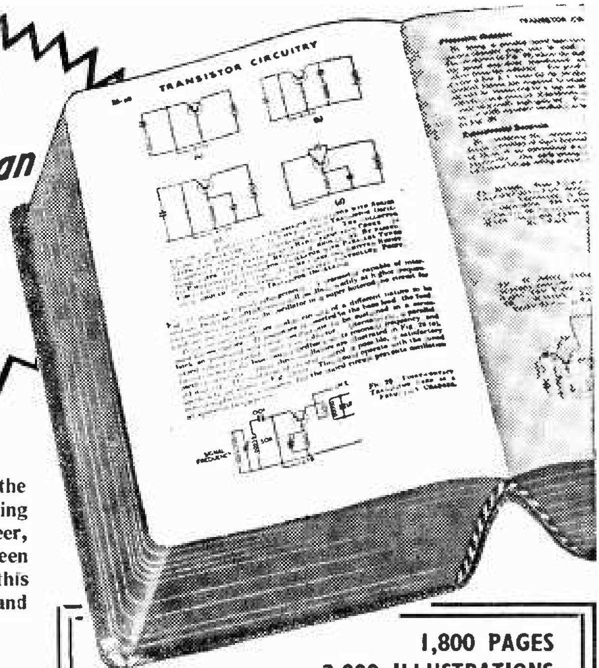
Place cabinet face down, remove the four corner nuts and washers, raise the cradle, rock it down to clear the top fixings and remove the cradle, rocking it upwards to clear. Complete the tube removal (details have been given in the series on this subject by H. Peters).

Valve Functions

V1 PCC84 Cascode R.F. amplifier.
V2 PCF80 Frequency-changer.
V3 EF85 1st Vision I.F. amplifier.
V4 30F5 1st Sound I.F. amplifier.
V5 30F5 2nd Vision I.F. amplifier.
V6 30F5 2nd Sound I.F. amplifier.
V7 6D2 Vision AGC rectifier and sound limiter.
V8 6D2 Sound detector and AGC diode.
V9 30FL1 Video amplifier and cathode follower.
V10 6/30L2 Spot inverter and AGC clamp.
V11 30P12 Sound output.
V12 CRM141/CRM171 Cathode Ray Tube.
V13 U25 EHT rectifier.
V14 30P12 Frame output.
V15 U191 Efficiency diode.
V16 30P4 Line output.
V17 30FL1 Sync separator and frame oscillator.
V18 6/30L2 Flywheel amplifier and line oscillator.
V19 6D2 Flywheel discriminator.

Radio & TV Engineers' Reference Book

FREE
to every keen radio man
FOR A WEEK
WITHOUT OBLIGATION TO BUY



(Editor) J. P. HAWKER
(Advisory Editor) W. E. PANNETT, A.M.I.E.E.

Now you can have for 7 days' free examination the revised 3rd Edition of this very practical engineering and servicing work. If you are a Radio Engineer, Technician, Mechanic, Instructor, Student, Keen Amateur, or engaged in the electronics field, this great wealth of data in all branches of radio and television will prove invaluable.

BROADCASTING · COMMUNICATIONS
SERVICING · NAVIGATION
HIGH FIDELITY · COMPONENTS

Written for you by 47 Specialists

Including L. S. Allard, B.SC., A.INST.P. (*G.E.C. Cathode-ray Tube Group*); S. W. Amos, B.SC.(HONS.), A.M.I.E.E. (*B.B.C. Tech. Instructions Section*); E. S. Bacon, M.SC.(LOND.), A.R.I.C. (*Chief Supervisor Elec. Labs. Ever Ready Co. (G.B.) Ltd.*); W. T. Blackband, M.SC., A.M.I.E.E. (*Aerials Research, R.A.E., Farnborough*); R. H. Burdick, A.G.C.I., A.M.I.E.E. (*Marconi's*); L. Driscoll, B.SC., A.M.I.E.E., A.M.BRIT.I.R.E. (*Murphy Radio*); E. A. Fielding, B.SC.TECH.(HONS.), A.M.C.T., M.I.E.E., A.I.R.E. (*Salford Electrical Instruments Ltd.*); D. H. Fisher, A.M.I.E.E. (*Regentone*); L. S. Foskett (*E.M.I.*); R. C. Glass, M.A., B.SC., A.M.I.E.E. (*Lecturer Applied Physics, Northampton Coll. Adv. Technology, London*); F. J. Grimm, A.M.BRIT.I.R.E. (*Pye*); P. Jones (*Aerialite Ltd.*); J. M. Kirk M.B.E., B.SC.(HONS.), D.I.C., A.C.G.I., M.I.E.E. (*Standard Telephones and Cables Ltd.*); L. A. Moxon, B.SC.(ENG.), A.M.I.E.E. (*R.N. Scientific Service*); D. F. Urquhart (*Erie Resistor Ltd.*); V. Valchera (*Valradio Ltd.*); A. H. B. Walker, B.SC.(ENG.), D.I.C., A.C.G.I., M.I.E.E. (*Westinghouse Research Lab.*).

1,800 PAGES
2,000 ILLUSTRATIONS

Includes:—Formulæ, Calculations, Communication Theory, Electron Optics, Colour TV, Materials, Studio Equipment, Transmitter Power Plant, Broadcasting and Communication Transmitters, V.H.F. Equipment, Amateur Radio Equipment, TV Transmitters and Aerials, Radio-Frequency Transmission Lines, Waveguides, Broadcasting Receivers, TV Receiver Design, Commercial H.F. Radio Links, Broad-band Systems, Radio Navigation and Radar, Aero Radio and Radar, Radio Astronomy and Satellite Communication, Aerials, Valves, Tubes, A.C. Rectification and Ripple Filters, Transistors, Diodes, Resistors, Capacitors, Inductors, Transformers, Gramophone Pick-ups, Speakers, Interference, Recording, Batteries and Conversion Equipment, H.F. Reproduction, Measuring and Test Equipment, Radio and TV Installation and Servicing, Projection TV, Oscillators, Industrial TV, Units & Symbols, Progress & Developments.

POST NOW
7-DAY FREE TEST

GEORGE NEWNES LTD., 15-17 LONG ACRE, LONDON, W.C.2.

Please send me Newnes RADIO AND TELEVISION ENGINEERS' REFERENCE BOOK without obligation to purchase. I will either return the work within eight days or I will send the first payment of 5/- eight days after delivery, then ten monthly subscriptions of 10/- until the sum of £5. 5s. has been paid. Cash in eight days is £5.

Name ....

Address ....

....

Occupation ....

Your Signature ....
(Or your Parent signs if you are under 21)

RB538/5

Tick (√) where applicable

HouseOWNER	
Householder	
Living with Parents	
Lodging Address	

RADIO BARGAINS

SIGNAL GENERATOR

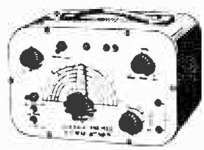
£6.19.6 or 25/- deposit and 6 monthly payments of 21/6. P. & P. 5/6 extra. **Coverage 100 Kc/s. 100 Mc/s on fundamentals and 100 Mc/s to 200 Mc/s on harmonics.** Metal case 10 x 6½ x 5½in., grey hammer finish. Incorporating three miniature valves and Metal Rectifier. A.C. Mains 200/250. Internal modulation of 400 c.p.s. to a depth of 30%; modulated or unmodulated R.F., output continuously variable. 800 milli-volts. O.W. and mod. switch variable A.F. output. Incorporating magic-eye as output indicator. Accuracy plus or minus 2%.

OSCILLOSCOPE FOR D.C. and A.C. APPLICATIONS

A high gain, extremely stable differential Y-amplifier (30 mV/C.M.). Provide ample sensitivity with A.C. or D.C. inputs. Especially suitable for measurements of transistor operating conditions where maintenance of D.C. level is of paramount importance. Push-pull X amplifier; Flyback suppression; Internal Time-base Scan Waveform available for external use; pulse output available for checking TV line O/P Transformers, etc. Provision for external—I/P and C.R.T. Brightness Modulation. A.C. mains 200/250v. **£15.15.0.** P. & P. 8/- or **30/-** deposit, plus P. & P. 8/- and 12 monthly payments of **26/6. Full 12 Months' Guarantee including Valves and Tube.**

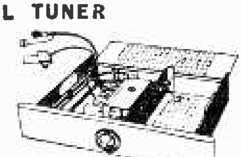
ALIGNMENT ANALYSER

TYPE MC12



A.C. mains 200/250 v. Provides: **"Wobbulator" (Swept Frequency) Operation,** for FM/TV alignment linear frequency sweep up to 12 Mc/s. From 400 kc/s -80 Mc/s. **Capacitance Measurement.** Two ranges provided 0-60pF and 0-12pF. **Special Facility** enables true resonant frequency of any tuned oct. I.F. transformer, etc.. to be rapidly determined. Cash price **£6.19.6,** plus 5/6 P. & P. H.P. terms 25/- deposit, plus 5/6 P. & P. and six monthly payments of 21/6.

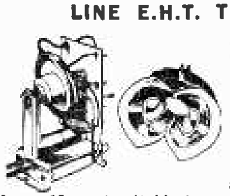
CHANNEL TUNER



Will tune to all Band 1 and Band III stations. BRAND NEW by famous manufacturer. Complete with P.C.C. 84 and P.C.F. 80 valves (in series). **I.F. 16-19** or **33-38.** Also can be modified as an aerial converter (instructions supplied). Complete with knobs. **32/6** plus 4/6 P. & P.

HEATER TRANSFORMER
To suit the above, 200-250 v., **6/-**, plus 2/- P. & P.

LINE E.H.T. TRANSFORMERS



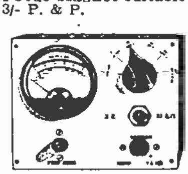
With built-in line and width control. 14kV. Scan coil, 90in. deflection on ferrite yokes. Frame O.P. transformer pl. 18 kV smoothing condenser. Can be used for 14in., 17in. or 21in. tubes. Complete with circuit diagram.

29/6 Plus 4/6 P. & P.

As above, but for 625 lines. £2.10.0, plus 4/6 P. & P.

Focus Magnet suitable for the above (state tube). 10/- plus 3/- P. & P.

A.C./D.C. POCKET MULTIMETER KIT



2in. moving coil meter, scale calibrated in A.C./D.C. volts, ohms and milliamps. Voltage range A.C./D.C. 0-50, 0-100, 0-250, 0-500. Milliamps 0-10, 0-100. Ohms range 0-10,000. Front panel, range switch, wirewound pot (for ohms zero setting), toggle switch resistor and rectifier, 19/6. P. & P. 2/-. Wiring diagram 1/-, free with kit.

RADIO & T.V. COMPONENTS (Acton) LTD.

23c HIGH STREET, ACTON, LONDON, W.3

All enquiries S.A.E. **Goods Not Despatched Outside U.K.**

CLARKSON'S TUBE CHANGE

6A DENISON ROAD, LEEDS 2
Tel. Leeds 24576.

We are now able to offer SUPER SCREEN TV TUBES with 12 months' guarantee at the keenest exchange price ever.

Example:

Tubes all types	Cash allowance on return of old tube	Actual cost of Tube
12"—14" £5	**15/-**	**£4. 5.0**
15"—17" £6	**25/-**	**£4.15.0**
21" £8	**30/-**	**£6.10.0**

Carriage and Insurance 10/- *extra*

These tubes are COMPLETELY REBUILT by experts, with the most up-to-date electronic equipment, and are fitted with the famous American Golden Grid Electron Gun. Many thousands of these tubes are in service today. Our factory is open to inspection to readers of "Practical TV". Technical advice and queries are answered free of obligation. All tubes are dispatched with adhesive paper and return labels. Cash allowance is sent on receipt of old tube.

RST

MAIL ORDER DEPARTMENT
211 Streatham Road, Mitcham, Surrey
ALL VALVES LISTED ARE NEW STOCK
& Terms C.W.O. or C.O.D. Postage 3d. per valve.
MITCHAM 6201

AZ1	15/-
B65	8/6
DAF91	7/6
DAF96	8/9
DF91	4/-
DH719	6/-
DK91	8/-
EABC80	6/-
EAF42	9/6
EB91	4/-
EBC41	9/-
EBF80	8/6
EBF89	8/6
EC91	9/6
ECC33	5/-
ECC81	5/9
ECC83	7/6
ECC84	8/6
ECC85	8/-
ECF80	8/6
ECF82	8/6
ECH42	9/6
ECH81	8/-
ECL80	9/-
ECL82	9/6
EF37A	8/-
EF40	15/-
EF41	8/-
EF42	10/-
EF50(A)	4/-
EF80	5/-
EF85	5/-
EF86	10/6
EF89	9/-
EF91	4/-
EF92	4/-
EL42	10/-
EL84	6/9
EL90	8/6
EM80	8/6
EM81	8/6
EY81	8/6
EY84	10/-
EY86	8/6
EY91	4/-
EZ35	6/-
EZ40	7/-
EZ41	7/-
EZ80	7/-
EZ81	7/-
FC2	21/-
FC4	15/-
FC13	21/-
FC13C	21/-
GZ32	10/6
H30	5/-
H63	9/-
HBC90	9/6
HL92	8/6
HL133D	10/-
KT33C	8/-
KT66	15/-
LZ319	12/6
MKT4(5) (or 7)	17/6
ML4	8/6
MSP4	17/6
MU14	9/-
MX40	15/-
N142	9/6
N153	10/-
PCC84	9/-
PCF80	9/6
PCF82	7/-
PCL82	9/6
PCL83	12/6
PENA4	17/6
PEN4VA	17/6
PL36	15/-
PL81	12/-
PL82	8/-
PL83	10/6
PY80	7/6
PY81	7/6
PY82	7/6
PY83	8/6
R10	10/-
R19	19/-
TDD4	12/6
TP22	15/-
U142	7/6
U147	7/-
U153	8/6
UABC80	7/-
UAF42	8/6
UBC41	8/6
UBF80	8/6
UCH42	9/6
UCH81	8/-
UCL83	13/6
UF41	7/6
UF89	6/6
UL41	8/6
UL84	7/-
UY41	7/6
UY85	7/-
VP4B	17/6
W81M	6/-
W142	8/6
W719	7/6
W727	7/6
X78	21/-
X79	21/-
Z21	12/6
Z77	4/-
Z152	5/-
Z719	5/-
1R5	7/6
5U4G	4/6
5V4G	9/6
5Y3GT	8/6
5Z4G	10/-
6A8GT	13/6
6AL5	6/-
6AM6	4/-
6AN5	7/6
6AQ5	6/6
6BA6	6/-
6BE6	6/-
6BJ6	6/-
6BR7	12/6
6BW6	7/-
6BW7	5/-
6BX6	5/-
6D2	4/-
6F1	10/6
6F12	4/-
6F13	10/-
6F5G	4/6
6J7GT	7/6
6K7	2/-
6K7G	3/-
6K7GT	8/6
6K8G	7/6
6K8GT	9/6
6L1	13/-
6L8G	7/6
6L18	10/-
6L19	17/6
6N7G/GT	6/6
6SL7GT	6/-
6SN7GT	5/6
6V6G	5/-
6X5GT	5/-
7S7	10/-
7Y4	7/6
8D3	4/-
10LD11	15/-
12AH8	9/-
12AT6	7/6
12AT7	5/-
12AU7	8/6
12AX7	7/6
12BA6	7/6
12BE6	7/6
12BH7	10/-
12J7G/GT	8/6
12K7GT	5/-
12K8GT	10/-
12Q7	8/6
12Q7GT	6/6
35Z4GT	7/6
50L6GT	9/-

SEND FOR LISTS.
Quotations given for any types not listed. Obsolete and old types a speciality.

A Band V Receiver

THE PRACTICAL DETAILS OF THE CONSTRUCTION

By R. B. Archer

(Continued from page 186 of the January issue)

ALTHOUGH most of the layout and wiring of this receiver is not critical, it is necessary in the cascode stage to keep the output anode connection 'out of sight' of its cathode pin. This is arranged in this receiver by a suitable positioning of the heater decoupling capacitor C28 or the grid decoupling capacitor C10. Heater and H.T. leads must be kept well out of the way of circuits carrying R.F., but no heater chokes have been found necessary in the I.F. section.

Construction (see Fig. 3)

The input circuits are constructed as follows. A hole of suitable size is drilled in one vertical side of the chassis, 2¼in. from the back edge, to take the low-loss aerial coaxial cable. No coaxial socket is used, as it introduces a capacitive discontinuity in the input lead too near the input circuit. At points X and Y an ⅛in. hole is drilled, and ¼in. 6B.A. brass bolts inserted, so as to project *below* the chassis. These are

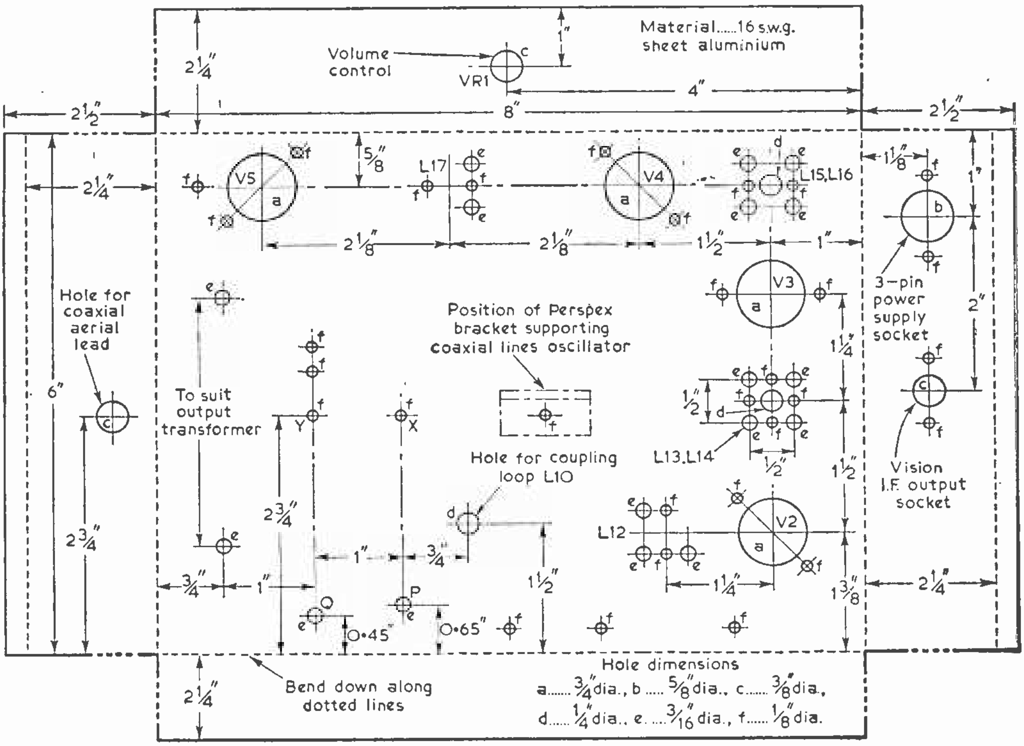


Fig. 3—The drilling details of the chassis.

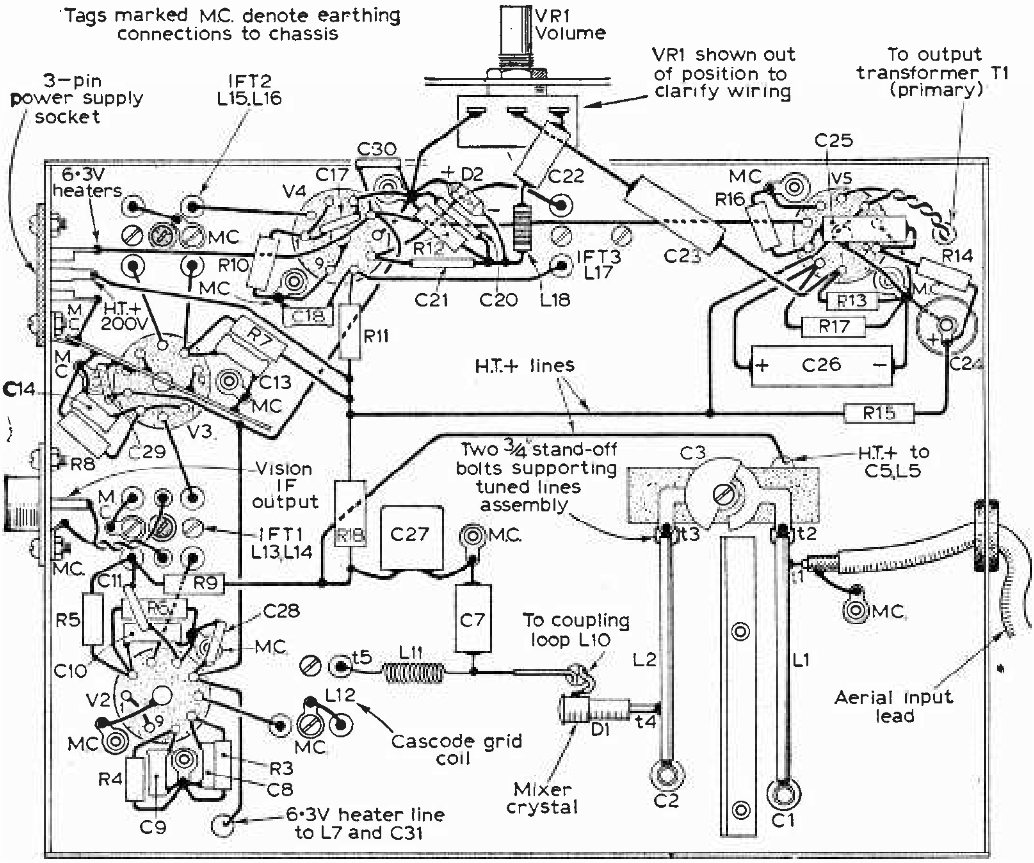


Fig. 4—The underchassis layout and wiring of the receiver.

secured firmly with a nut and washer, and using a hot iron, the end of each is tinned. Holes P and Q are next drilled, and enlarged with a small file to be $\frac{7}{32}$in. square; these are to take the tubular ceramic capacitors which tune the input circuits, and the latter may now be fixed in place with their flexible screw clips projecting below the chassis. A small screen is now put in place just midway between the lines PY and QY. When in place this screen should measure about $1\frac{1}{4}$in. × $2\frac{1}{2}$in. (see Fig. 4.)

Two pieces of silver-plated copper tubing, L1 and L2, $\frac{1}{4}$in. o.d. are now prepared. The larger, L1, is soldered to the top of the bolt Y, and measures 2·0in. in length. The other end will now just reach to the tubular capacitor C1, and the wire end of C1 is soldered to it, making sure L1 lies parallel to the chassis and the small screen. The shorter tube L2 is now similarly mounted and soldered to the tubular capacitor C2.

Next the air-spaced variable capacitor C3 is mounted between X and Y, soldering it securely. The aerial is not attached yet, for reasons of practical convenience, but later the inner conductor will be soldered to L1 at a point 1·7in. from the end attached to C1.

Mixer

Clips are now prepared for the silicon crystal. Both are readily fashioned from thin brass sheet—the top contact strip of a spent cycle battery serves admirably. The smaller clip is a roll formed round a $\frac{1}{16}$in. drill, this is soldered on to L2 at a point 0·6in. from the end joined to capacitor P, and is arranged to lie across L2. The larger clip is formed round a $\frac{7}{32}$in. or $\frac{3}{16}$in. drill and its inherent springiness enables the crystal to be gripped securely. This clip has a projecting end, which is tinned for attaching to the coupling loop L10.

L10 consists of a length of PVC insulated wire 4in. in length. At the centre it is wound into a two-turn loop about 1cm in diameter—wound, for example, on a pencil. The ends of the loop are bared and tinned, and put through a suitably placed hole, about $\frac{1}{4}$in. in diameter, in the chassis. One end is soldered to the large crystal clip, the other to the capacitor C7, which has been fixed to the chassis. At the same time, the choke L11 is added, and connected to the tapping point on L12. The coupling loop L10 now projects about $\frac{3}{4}$in. above the chassis and will later be adjusted in position, near the oscillator circuit, to give the correct crystal current.

Coaxial Lines

The oscillator is next constructed, but is not assembled on the chassis until the I.F. and audio amplifiers have been wired, tested and aligned. It consists of a coaxial lines oscillator (see Fig. 5), and the elements are so designed as to have a low impedance; this implies that its physical size is about as large as possible for a given frequency.

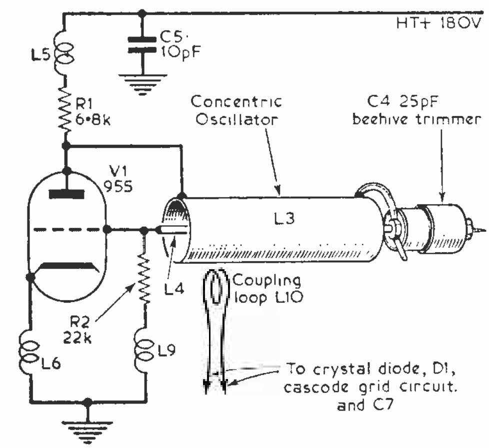


Fig. 5—The coaxial lines oscillator.

The outer tube is a brass cylinder of internal diameter $\frac{9}{16}$in. and 1·9in. in length. The thickness of the walls of the tube hardly matters, but in the prototype the outside diameter is $\frac{5}{8}$in. This tube is carefully cleaned internally (and, for appearance, exernally also) and is silver-plated internally at least. This will require some care, and because of the difficulty of stirring the electrolyte inside the tube it is recommended that a warm bath be used —about 60°C—and the current kept to about 20mA or less. The silver anode should be in the form of a strip of silver about 2in. long and $\frac{1}{8}$in. wide. A 2in. length of $\frac{1}{8}$in. o.d. copper tube is also prepared and silvered; this forms the inner conductor of the coaxial assembly.

Next, the small diameter tube is pushed over the centre lug of the beehive trimmer, and, using a really hot iron, is soldered into place. The outer tube is now positioned and is soldered to both the outer lugs of the beehive trimmer. At this stage some care is needed to ensure that the tubes are coaxial, or as near as may be. Small errors, up to about $\frac{1}{16}$in. eccentricity, do not make any appreciable difference to the working of the oscillator.

Suitable clips are now soldered to the other ends of the coaxial tubes, to take the pins of the 955 acorn valve. Edge-gripping clips are much to be preferred because the acorn pins can then be inserted right up to the glass envelope of the valve. When cool, the coaxial tubes are mounted on a Perspex bracket (with a hole in it) affixed to the chassis top side. If the assembly turns out to be slack in the hole it can be secured with a little contact adhesive. Before this is done, however, it will be as well to attach R1, and R2; the anode resistor is mounted on the end of the outer coaxial tube nearest the beehive trimmer; the grid resistor R2 is mounted on the inner conductor close to the acorn grid clip. To enable this to be done the inner conductor projects about $\frac{1}{16}$in. from the coaxial assembly.

By using a closely coupled high-Q assembly of this nature the frequency of oscillation can be brought very nearly to the limit for the valve. In one experiment the acorn behaved quite well at about 800Mc/s, so no difficulty will be experienced at 619Mc/s or even 700Mc/s if that frequency is required at any time.

(To be continued)

HOW TV SIGNALS TRAVEL

(Continued from page 226)

freak reception, mutual interference (called "co-channel interference") is very likely to occur, particularly in the fringe areas where the local signal is in any case not very strong.

This interference may take the form of regular horizontal bars moving up or down the received picture (often called "Venetian blind interference" due to its appearance), or it may form "moiré patterns", rather like watered silk; and interference may also occur on the sound channel.

The higher frequency Band III signals are less affected in this way, as they tend more to penetrate the troposphere in spite of its being disturbed. Future signals in Bands IV and V may be less affected again, and it is most likely that these ultra-high-frequency signals will be propagated only over those areas which are truly in optical range of the transmitter.

Ionospheric Reflection

Ordinary medium frequency and short-wave signals are propagated over very great distances because signals of such frequencies are reflected by the ionosphere rather like television signals are reflected by a disturbed troposphere. The distances covered by such propagation are greater than those due to tropospheric reflection because the ionosphere occurs at a greater distance above the surface of the earth—well above the troposphere.

Moreover, at the points on the earth where the reflected signals arrive, further reflection may occur and send the signals back up to the ionosphere, where they undergo further reflection and so on.

This very rarely happens with VHF television signals, though there have been reports of Channel 1 signals having been received on occasion in South Africa and in the U.S.A., in the latter case with sufficient intensity for a picture to be resolved. It is unlikely that such propagation is due solely to tropospheric reflection, for the ionosphere would almost certainly have to play a part in such long-range reception. ■

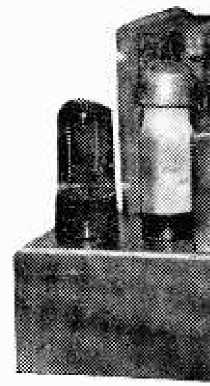
POSSIBLY at first sight the title of this article might lead the reader to believe that the receiver about to be described is of only limited use, and therefore not a particularly worthwhile project for construction. However, it is felt that the circumstances existing in the writer's home, which led up to its construction, may well be representative of conditions existing in many households.

Uses

Soon after the start of the BBC Saturday morning experimental broadcasts of stereophonic sound, the writer designed and built a stereo radiogram, actually the 'Stereo Seven', described in the companion journal PRACTICAL WIRELESS in April, May and June 1959 issues), and obtained great enjoyment from the wide range of stereo records now available, but at the same time, it was desired to continue to listen to the stereo broadcasts put out by the BBC, and it was here that difficulty arose. As readers will be aware, the system at present in use is for the right-hand channel to be received on the local Band I TV frequency, and the left-hand channel on the "Network Three" frequency, either in the medium waveband, or on the VHF band; thus it is necessary to have the TV receiver and a normal sound receiver in the same room, correctly spaced and positioned for satisfactory results. Here was the difficulty, the TV receiver was situated in one room, and the existing radiogram in another, and, as in so many households, the one room is normally used for living purposes, and the other occupied only on "high days and holidays". It was therefore necessary to carry the TV receiver into the sitting room, accompanied by a long trailing connection to its aerial, and set it up in the correct position whenever stereo broadcasts were to be received.

Separate Receiver

The obvious solution was to provide a separate receiver for the TV sound channel, which should be of small size and thus easily accommodated in the existing cabinet of the radiogram. In actual fact, the chassis about to be described, was housed in the right-hand channel loudspeaker cabinet, and a simple switching device incorporated so that the speaker can be switched to form the output termination of either the radiogram or the TV sound unit, and at the same time switch in a dummy load across the unit not in use, to prevent any danger of damage to the output transformer not in use. For the benefit of anyone wishing to incorporate this refinement, the switching will



self-powered BAND I sound

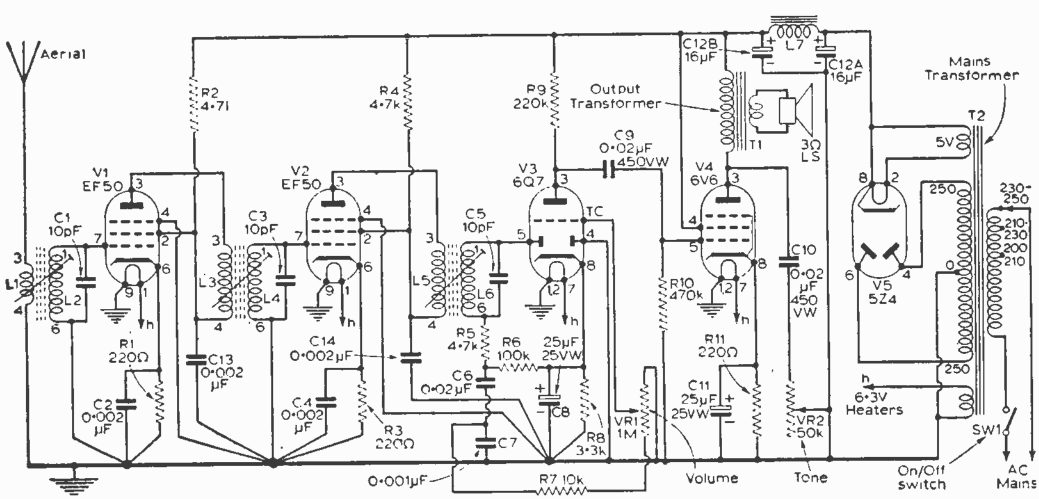
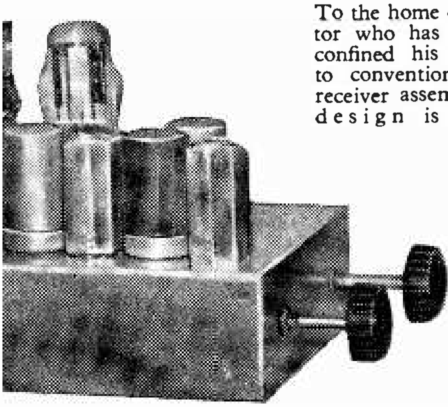


Fig. 1—The complete circuit diagram.

be described in a later part of this article. There is of course no need for a "stereo" installation to be already in existence, provided one already has available a receiver capable of good quality reproduction of the Network Three programme (preferably on VHF), which can be positioned to form the left-hand channel. Construction of this TV sound unit, and its housing in a suitable independent cabinet, will be all that is required to obtain full enjoyment from the extremely varied stereo broadcasts which are transmitted.

Quite apart from this, the constructor of a simple "TV" receiver of this sort, will gain much useful practical experience in the type of constructional work involved in TV circuitry, which will prove invaluable when more ambitious projects are undertaken at a later date. To the home constructor who has formerly confined his activities to conventional radio receiver assembly, this design is strongly



eceiver

By J. B. Willmott

recommended as an introduction to TV receiver construction.

Circuit Description

The requirements are simple; the receiver needs only sufficient gain and bandwidth to ensure good reception of the local BBC TV sound signal in Band I, and, if the audio section is capable of providing a reasonably good quality output, comparable with that of the domestic broadcast receiver in use for the second "channel", then good results are assured. As the tuning is "fixed" to that of the local TV sound channel, only two variable controls are required, namely volume and a simple top-cut tone control. Some readers might be tempted to omit the latter, but if it is intended to use the unit in conjunction with the existing broadcast receiver, for reception of stereo transmissions, some means of adjusting the tonal balance of the output is

LIST OF COMPONENTS

1 chassis 10in. x 7in. x $2\frac{3}{4}$in.
4 $\frac{3}{8}$in. rubber grommets
2 B9G type valveholders (EF50), with valve retaining clips
3 I.O. type valveholders
3 coil formers ($2\frac{1}{2}$in.) and cans (Aladdin)
1 coaxial aerial socket
1 3-way tag strip (1 earthed tag)
1 2-way tag strip (1 earthed tag)
1 mains transformer, 250V-0-250V 80mA, 6·3V and 5V
1 smoothing choke, 80mA
1 output transformer, to match 6V6 to 3Ω speech coil (45:1, 60mA)
2 EF50 valves
1 EBC33 (or 6Q7) valve
1 6V6 valve
1 5Z4 valve
1 top cap grid connector
1 1M pot., with switch (volume control, VR1)
1 50k pot., without switch (tone control, VR2)
2 control knobs
Single screened wire (1yd)
Coaxial cable (1ft)

Resistors ($\frac{1}{2}$W):

R1	220Ω	R5	4·7k	R9	220k
R2	4·7k	R6	100k	R10	470k
R3	220Ω	R7	10k	R11	220Ω
R4	4·7k	R8	3·3k		

Capacitors:

C1	10pF silver mica
C2	·002μF mica
C3	10pF silver mica
C4	0·002μF mica
C5	10pF silver mica
C6	0·02μF tubular
C7	0·001μF mica
C8	25μF 25VW electrolytic
C9	0·02μF tubular (450VW)
C10	0·02μF tubular (450VW)
C11	25μF 25VW electrolytic
C12	A/B 16+16μF 450VW electrolytic
C13	0·002μF mica
C14	0·002μF mica

Sundries:

Nuts and bolts, solder tags, connecting wire, 32s.w.g. DSC wire (for coils), coil dope, mains lead and plug.

Loudspeaker:

Any standard 3Ω impedance speaker; if the receiver is required for stereo sound reproduction, the speaker should be of a similar size and type to that used for the existing channel.

essential, for unless the frequency response of the two channels is reasonably similar, some peculiar and disturbing effects will be noticeable, particularly if a solo voice or instrument is being broadcast. If the two channels are not reasonably similar in tonal characteristics, the sound will appear to " wander " about according to the pitch of the note being reproduced. Thus, some control over " tone " is almost essential. It is convenient to combine the function of on/off switching with the audio volume control, and this is done in the design in question, SW1 being combined with VR1 (see Fig. 1).

setting of the core of L2. The signal is applied to the control grid of V1, which is an EF50 valve. The author chose this type of valve for use in the V1 and V2 position in preference to a more modern all-glass type (such as an EF80) purely on the grounds of economy. A considerable number of EF50 valves lay unused in the spares box as a legacy from the earlier days of TV set construction and ex-Government units. In any case, these valves are now very cheaply obtainable from advertisers in this magazine, and there is little to be gained by using more expensive types. In addition, their larger

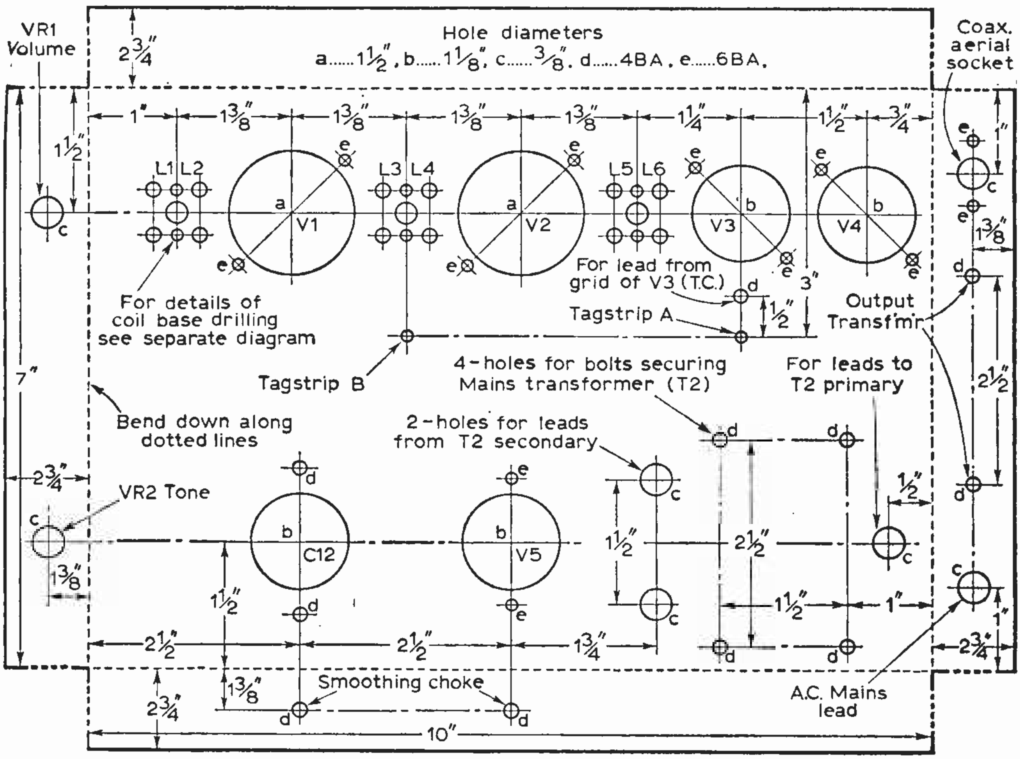


Fig. 2—The chassis drilling details.

Circuit

Briefly, the circuit required to fulfil the requirements outlined above, comprises two stages of R.F. amplification (V1 and V2) followed by a diode detector and first stage of audio amplification (V3) and finally a power output stage (V4), all being fed from a conventional power supply with full-wave rectification provided by V5. The whole can be easily mounted on a chassis measuring 10in. x 7in. x 2½in.

Signals are fed from the aerial input socket by a length of coaxial cable, to the primary winding of the aerial input transformer L1, and the induced signal set up across the secondary winding L2 is tuned partly by the inherent capacity of the circuit wiring and valve, together with the fixed capacitor C1, and is capable of adjustment by variation in the diameter base provides more room for mounting components and for interstage wiring, which renders construction, especially to the novice, much easier.

Further to ensure ease of construction and to simplify assembly work, the modern method of coil construction is utilised for all R.F. coils, utilising the " Haynes " type formers and screening cans, which are readily obtainable. All coils are easily wound by hand, and full details will be given. Returning to the theoretical circuit, as shown in Fig. 1, after amplification by V1, the signal passes via the R.F. transformer L3/L4 (the secondary winding of which is tuned by C3 and adjustment of the core of L4) to the control grid of V2, another EF50 valve, where amplification at signal frequency again takes place.

(To be continued)

Underneath the Dipole

A MONTHLY COMMENTARY

By Iconos

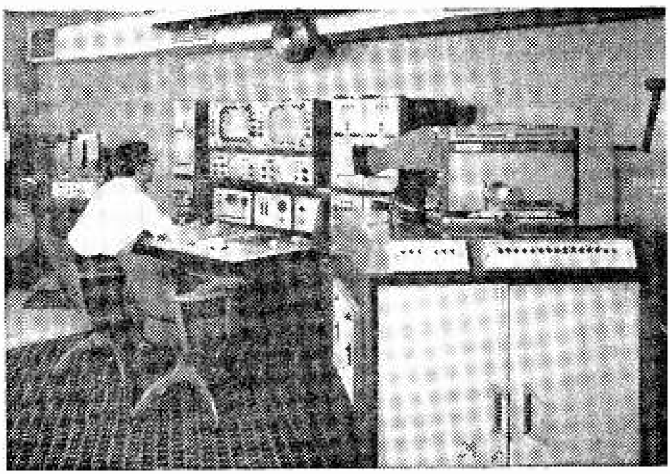
So many things are going on at the moment in the television world that it is not easy to forecast the end-product—what the viewer will see—in a year's time. What with the controversial evidence submitted to the Pilkington Committee, the varying points of view on line-standards and colour TV, the battles of Equity, the closing down of major television-film studios and the ever-increasing power of the Independent Television Authority itself, the outlook is puzzling, to say the least. The ITA has now moved its scattered administrative and engineering offices under one roof, into a new building in Brompton Road, London. Practical co-ordination of its complex activities has become easier. Opinions, technical and otherwise, which issue from Sir Robert Fraser's office bear the stamp of increasing power and influence, and the collective opinions of a fine technical team, under Mr. P. A. T. Bevan, carry great weight, not only with the British Post Office but in international television circles.

TV Film Studios

The closing down of the Danziger Brothers' Studios at Elstree, where so many television series films have been made, is a major blow. This is where eight important TV film series have been made during the last four or five years, including "The Cheaters," "Mark Saber," "The Man from Interpol," and "Richard the Lion Heart." The total of 400 half-hour episodes of films made at this studio specially for television, is a considerable output. They have found favour in the U.S.A., Australia and various parts of the world, quite apart from Britain. The Danziger Studios comprised six modern stages ranging from 1,500sq. ft to 6,000sq. ft each together with all the usual workshops, property stores, dressing rooms, pre-view theatres and offices. They were erected in 1956 and at one time, over 200 technicians were employed there. But costs of production have rocketed up while the selling price of television film series both in Britain and America has remained static. The Danziger Brothers sold their TV films to the BBC and various ITV programme companies, and also made about sixteen second-feature films for the cinemas. The Walton film studios, where the "Robin Hood" and other TV series were made, closed down a few months ago and are now demolished to make way for houses, flats and supermarkets. Let us hope that the well laid-out Danziger Studios do not suffer the same fate.

Old Fashioned Film Studios

After looking at some of the latest television studios, such as the new medium sized stages at Granada (Manchester), Westward, ATV at Elstree and ABC at Teddington, the BBC's Television Centre at Shepherds Bush, or the huge A.R. stage at Wembley, one is impressed with the enormous progress that has been made in lighting and other facilities when compared with the average film studios. These have virtually remained unchanged for many years, with heavy scenery, enormous tubular structures carrying the lighting, noisy ventilation and wood floors which are so uneven that the cameras have to be moved about on metal tracks when a "dollying" shot is required. The tubular lighting suspensions in the British TV studios enable lighting to be arranged quickly, and the same supports are often used for carrying picture monitors, loudspeakers or even pieces of scenery, thus leaving a floor clear of cables and other impedimenta. The thick lino on the floor enables TV camera pedestals to be pushed around the stage with the greatest of ease. The greatest



Much of the technical equipment at Border Television Ltd.'s new Television Centre at Carlisle has been supplied by EMI Electronics Ltd., who were also responsible for the wiring and installation of all the electronic equipment. This illustration shows the telecine suite where two switchable monitors have been installed.

danger to smoothness of the floor arises not from damage from scenery standing on it, nor the " soldiers " or braces which hold the flats up—but the stiletto heels of many of the artistes and guests. A thick lino floor costs over a thousand pounds for a moderate sized stage, and when sections have to be replaced, it is difficult to eliminate the slight level differences at joins. If you are at a television studio and you notice the harassed floor-manager looking at the legs of the actresses and other females before they enter a stage, do not think badly of him! He is on the look-out for those fierce spiked heels which cause so much damage!

The Palladium Show

" Sunday Night at the London Palladium " continued to attract high ratings, in spite of the absence of glamorous chorus girls and elaborate settings, due to the Equity strike. Bruce Forsyth has proved himself to be the comedy-compere virtuoso of all time, keeping up a cracking pace of gags, off-the-cuff and otherwise, which has both the live audience in the theatre and the viewers at home rocking with laughter. The double act with Norman Wisdom was an outstanding performance, demonstrating the great versatility of both of these artists—singing, dancing, beautifully timed cross-talk and visual clowning at its very best. Good clowning is an art in itself and successful slap-stick is the product of personality plus split-second timing of mechanical gags.

Variations of Level

Are you always popping up and down from your chair to make adjustments to picture or sound? The variation of levels during an evening is often most disturbing, even when the set is left switched to one particular station. Volume and quality of sound is frequently judged by the engineers at the stations relying on the kick of the needle of a volume indicator meter rather than on their ears. These meters usually indicate the peaks of speech and music and can be quite misleading so far as volume is concerned. This especially applies when the sound of TV commercials has been excessively compressed. The meter then shows only moderately high readings but the sound sometimes bellows out with a gargantuan blast.

Similarly, some engineers or transmission controllers tend to look too much at their picture waveform monitors and set the peaks too low or crush the high-lights, losing facial tones. More subjective looking and viewing of picture and sound is becoming necessary. The eye and the ear are able to appreciate sound or picture tonal differences far better than any meters, though the meters are essential for initial setting up and double checking. The ITA companies, each with their individual technical policies in this respect, show greater variations in levels than the BBC. So far as sound is concerned, the use of electronic compression often makes throw-away lines and mumbled dialogue audible, without losing the character of the voices. It also assists in ironing out wide differences in volume. But the use of over-compression, as in a few commercials—ugh! Reach for the ear-plugs!

Picture Quality

The January list of meetings of the Television Society included a discussion meeting entitled " Picture Quality Doesn't Matter Any More ". This depressing title is an expression of opinion prompted by the depressing performance of many of the modern TV receivers, turned out to the lowest price target and with more attention being paid to the external appearance than to what is inside the box. It will be interesting to hear the respective points of view of makers, dealers, service men, BBC and ITV engineers. I would add that sound quality reproduction doesn't seem to matter much, either, when one looks at the tiny loudspeakers with which some sets are fitted—to make matters worse—at the sides or tops of the sets. Some manufacturers now advertise "Forward Sound" as a selling point. This gives a gleam of hope.

Oscars and Emmies

The season of annual television awards of merit for artiste and technical achievements is upon us, and like the film festivals at Venice, Edinburgh, Cannes and Mexico, etc., etc., they show every sign of multiplying each year. The awards at the Television Producers and directors' Ball were naturally concerned more with the so-called " creative " side rather than the technical end of television, and this time the majority went to BBC personnel. I applaud the decision which named Andrew Osborn as the recipient of the drama award. His contribution to the smoothness and fluidity of the serious television play has been great. David Attenborough's " special " award was another well-deserved recognition not only of his natural history and exploration features, but of his own personal mastery of appearing before the camera. The S.M.P.T.E. " Emmie " presented jointly to Marconi's and to R.C.A. for the development of the 4½in. image orthicon camera was the first that an American Society has awarded to a British television equipment firm.

★ VALVES BY RETURN OF POST ★

THE MOST COMPREHENSIVE COMPETITIVE VALVE LIST IN THE COUNTRY

10% DISCOUNT SPECIAL OFFER TO PURCHASERS of any SIX VALVES marked in black type (15% in dozen). Post: 1 valve, 6d., 2-11, 1/-.

NEW LOW PRICES GUARANTEED 3 MONTHS

FREE TRANSIT INSURANCE. All valves are new or of fully guaranteed ex-Government or ex-equipment origin. Satisfaction or Money back Guarantee on goods if returned unused within 14 days.

OZ4 5/-	6AG5 3/-	6J5GT 4/-	6X5GT 5/6	12C8 6/6	35T 25/-	DAC32 9/9	ECC32 4/-	EL42 8/9	LN152 7/-	T41 7/6	UF89 7/-
1A5GT 5/-	6AG7 7/6	6J6 4/-	6Y6G 7/6	12E1 17/6	35W4 6/9	DAF91 4/6	ECC33 4/6	EL83 11/-	MU14 7/6	TDD4 7/6	UL41 7/-
1A7GT 11/-	6AK5 5/-	6J7 8/6	7A7 8/6	12J7GT 9/-	35Z4GT 5/6	DAF96 7/3	ECC34 9/-	EL84 7/-	N37 11/-	U14 8/-	UL44 11/-
1C5GT 9/-	6AL5 3/-	6J7G 4/9	7B6 9/-	12K7GT 4/9	35Z5GT 8/-	DET19 2/9	ECC35 6/-	EL91 4/-	N78 13/-	U18 8/-	UL46 9/9
1D5 8/-	6AM6 3/-	6J7GT 7/6	7B7 7/9	12K8 11/-	50C5 9/-	DF33 9/9	ECC40 14/-	EM34 7/6	N108 16/-	U22 6/9	UL84 7/-
1D6 9/9	6AQ5 6/-	6J8 9/6	7C5 7/3	12K8GT 9/6	50CD6G	DF91 3/6	ECC81 5/6	EM80 7/9	N152 8/6	U24 16/-	UM80 9/6
1H5GT 9/9	6AT6 5/9	6K6GT 6/6	7C6 7/6	12Q7GT 5/-	19/-	DF96 7/3	ECC82 6/-	EM81 8/6	PABC80	U25 11/6	UU8 17/-
1L4 3/3	6AU6 7/6	6K7 5/9	7H7 7/3	12SG7 5/-	50L6GT 8/6	DH63 6/-	ECC83 6/6	EM84 9/-	11/6	U26 9/9	UY1N 11/-
1LD5 3/6	6B7 8/6	6K7G 2/3	7K7 9/6	12SH7 3/6	52KU 10/6	DH76 5/-	ECC84 8/-	EM85 10/-	PCC84 6/9	U31 7/-	UY21 11/-
1LN5 4/9	6B8G 3/-	6K7GT 4/6	7Q7 8/6	12SJ7 5/6	53KU 10/6	DK32 11/-	ECC85 7/9	EN31 16/-	PCC85 8/3	U35 12/6	UY41 6/-
1N5GT 9/9	6BA6 5/9	6K8GT 8/9	7R7 10/6	12SK7 4/9	61SPT 11/-	DK91 5/6	ECC88 16/-	EY51	PCC88 14/-	U37 26/-	UY85 6/6
1R5 5/6	6BE8 5/9	6K25 7/6	7S7 9/-	12SN7GT 7/9	62BT 13/6	DK92 7/-	ECC91 4/-	Small 7/9	PCC89 9/-	U50 5/9	VR105/30
1S4 8/-	6BG6G 15/-	6L1 12/6	7V7 7/9	14S7 14/9	62TH 8/6	DK96 7/3	ECF80 8/6	EY86 7/6	PCF80 7/-	U52 4/9	6/9
1S5 4/6	6BH6 6/-	6L6G 6/6	7Y4 6/9	19AQ5 7/6	62VP 8/-	DL33 8/-	ECF82 8/6	EZ35 5/6	PCF82 7/3	U76 5/6	VR150/30
1T4 3/6	6BJ6 6/-	6L18 9/-	7Z4 7/-	19BG6G	63SPT 2/-	DL35 9/-	ECH21 12/6	EZ40 6/6	PCF84 16/-	U78 5/-	6/9
2A3 6/6	6BR7 9/6	6L19 11/-	8D3 3/-	19/-	64NE 7/6	DL82 9/-	ECH35 7/6	EZ41 7/-	PCL82 7/3	U191 12/6	W61M 11/-
2A7 9/6	6BW6 7/6	6LD3 8/-	10C1 11/6	19X3 6/9	65ME 7/9	DL91 8/-	ECH42 8/6	EZ80 6/-	PCL83 10/6	U281 9/6	W76 4/9
3A4 4/9	6BW7 5/6	6LD12 6/9	10C2 14/6	19Y3 6/-	66KU 6/6	DL92 6/-	ECH81 7/9	EZ81 6/6	PCL84 7/6	U282 15/-	W81 7/3
3A5 9/-	6BX6 4/9	6LD20 7/9	10C14 8/-	20D1 9/6	67PT 8/-	DL94 6/9	ECL80 7/-	FW4/500 8/-	PEN45 8/6	U309 6/9	X61M 11/-
3D6 4/6	6C4 3/6	6N7 7/6	10F1 5/9	20F2 9/6	75 6/6	DL96 7/3	ECL82 9/6	FW4/800 8/-	PL33 8/3	U329 6/9	X63 8/6
3Q4 7/-	6C5 5/6	6P1 7/6	10F9 10/6	20L1 16/-	80 5/9	DL145 14/6	ECL83 11/6	GZ32 8/9	PL36 9/6	U339 11/-	X65 11/-
3Q5GT 8/-	6C6 3/9	6P25 8/6	10L14 7/-	20P1 8/9	185BT 19/6	DN143 12/6	EF22 7/-	HABC80 9/6	PL38 16/6	U801 19/-	X66 11/-
3S4 6/-	6C9 11/-	6P28 12/6	10LD3 7/9	20P3 12/6	311SU 6/-	DW4/350	EF36 3/3	HL41DD	PL81 8/6	UABC80 8/-	X76M 11/-
3V4 6/9	6CD6G 19/6	6Q7G 6/-	10LD11 14/6	20P4 18/-	451PT 7/-	8/-	EF39 4/6	8/3	PL82 6/6	UAF42 7/9	X78 21/-
5R4GY 12/6	6CH6 7/6	6Q7GT 8/6	10LD12 8/-	20P5 15/-	803 19/-	DW4/500	EF40 12/-	HVR2 10/6	PL83 6/6	UB41 7/9	X79 16/6
5T4 8/-	6D2 3/-	6R7G 8/6	10P13 11/-	25A6G 8/-	807(A) 5/6	8/-	EF41 8/-	IW4/350 7/6	PL84 8/-	UBC41 7/9	X81M 9/-
5U4G 4/9	6D3 9/6	6SA7 5/6	10P14 9/-	25L6G 6/9	813 55/-	EABC80 6/9	EF42 7/6	IW4/500 7/6	PL820 8/6	UBC81 9/6	Y63 6/3
5V4G 7/9	6D6 4/3	6SG7 4/9	10P18 7/-	25L6GT 7/9	832A 14/-	EAC91 4/6	EF50-BR 2/-	KL35 7/6	PX25 9/6	UBF89 7/6	Z63 4/9
5Y3G 5/9	6F1 4/9	6SH7 3/-	12A6 4/9	25Y5G 8/-	866A 11/6	EAF42 8/-	USA 3/-	KLL32 8/6	PY31 9/-	UBL21 14/6	Z152 4/9
5Y3GT 5/9	6F6G 5/9	6SK7 5/-	12AC6 15/-	25Z4G 7/-	ATP4 2/9	EB41 7/-	EF54 3/3	KT32 6/9	PY32 10/-	UCC84 14/6	Z329 6/-
5Y4G 11/-	6F12 3/-	6SL7GT 5/9	12AD6 17/-	25Z5 8/-	AZ31 8/-	EB91 3/-	EF80 4/9	KT35C 4/6	PY80 6/9	UCC85 7/-	Z719 4/9
5Z4 11/-	6F13 6/9	6SN7GT 4/6	12AE6 13/9	25Z6G 8/-	B36 7/9	EBC33 4/9	EF85 6/6	KT36 12/6	PY81 6/6	UCF80 15/-	Z729 6/6
5Z4G 7/6	6F14 9/6	6SQ7 5/9	12AH8 9/-	30C1 7/-	C1C 9/6	EBC41 8/-	EF86 9/-	KT44 7/6	PY82 6/-	UCH21 12/-	ZD17 4/6
5Z4GT 11/-	6F15 9/6	6SS7 3/6	12AT6 7/6	30F5 6/-	CBL1 26/6	EBC81 7/9	EF89 6/9	KT45 8/6	PY83 7/-	UCH42 7/3	ZD25 7/3
6/30L2 9/-	6F16 8/-	6U4GT 10/6	12AT7 5/6	30FL1 9/6	CBL31 21/-	EBF80 7/9	EF91 3/-	KT61 8/6	PZ30 9/6	UCL83 13/6	ZD152 7/9
6A6 4/9	6F19 6/6	6U5GT 6/3	12AU6 9/6	30L1 6/9	CCH35 14/-	EBF83 9/6	EF92 4/6	KT63 5/9	R18 11/-	UF41 7/6	
6A7 10/-	6F23 6/6	6V6G 5/-	12AU7 6/-	30P4 9/6	CL33 9/6	EBF89 8/6	EF96 3/-	KT76 8/6	R19 11/-	UF42 5/6	
6A8G 8/6	6F32 6/6	6V6GT 6/-	12AX6 6/6	30P12 7/6	CY31 9/-	EBL21 12/6	EL32 4/6	KTW61 5/9	SP41 2/6	UF80 7/-	
6A8GT 13/6	6F33 6/6	6X2 7/9	12BA6 7/6	30P16 6/6	D77 3/6	EBL31 17/6	EL33 7/9	KTW63 5/9	SP61 2/6	UF85 7/6	
6AB8 7/-	6J5 4/3	6X4 5/-	12BE6 7/6	30PL1 9/6	D152 5/9	EC91 4/6	EL35 7/-	KTZ63 5/6	SU25 16/-	UF86 14/6	
6AC7 3/3	6J5G 3/-	6X5G 5/-	12BH7 9/9	35L6GT 8/6	DA30 12/6	ECC31 7/6	EL41 8/-	L63 2/9	SU2150 4/6		

13 CHANNEL TV's

TABLE MODELS—FAMOUS MAKES

Absolutely complete

These sets are unequalled in value due to huge purchase direct from source. They are untested and are not guaranteed to be in working order. CARR., ETC., 15/-.

12"—£2-19-0

14"—£4-19-0

ALSO 12in. 5 CHANNEL TV's 39/-
14in. 5 CHANNEL TV's 59/-

Tubes

HIGHEST QUALITY—COMPARE OUR PRICES

Carr. & Ins. 12/6. **GUARANTEED**

MOST MULLARD, MAZDA, COSSOR, EMITRON, EMISCOPE, BRIMAR, FERRANTI TYPES. PROCESSED IN OUR OWN FACTORY.

	6 Months	12 Months	NEW TYPES
12in.	£2- 0-0	£3- 5-0	MW 31/74 £4-0-0
14in.	£2-10-0	£3-15-0	MW 36/24 £5-0-0
15/17in.	£3- 5-0	£4-10-0	CRM 172 MW 43/64
21in.	£3-15-0	£5-15-0	£6-0-0

UA20 AUTOCHANGERS

Latest B.S.R. 10 mixed records. Unrepeatable Pre-Budget opportunity. £6.19.0.

TRANSISTORS

Red Spot 3/6 each; White Spot 4/6 each; Yellow Spot 2/9 each; Green Spot 2/6 each.

GERMANIUM DIODES, general purpose, 9d. each 8/- doz.

CO-AX standard and low loss, 25 yds., 12/6. 50 yds., 22/6. 10 yds., 42/6.
Co-ax. Plugs 1/3. Wall outlet boxes 3/6.

100 RESISTORS 6/6

100 CONDENSERS 10/-

Miniature Ceramic and Silver Mica Condensers 3 pF to 10,000 pF. LIST VALUE OVER £5.

4-SPD. RECORD PLAYERS

Latest E.M.I. Turntable, together with lightweight Staar Galaxy dual sapphire crystal turnover pick-up head. Truly amazing value.

£3.10.0 Carr. 3/-.

RECTIFIERS

24 Volt. 4 amps., 12/6. 12 Volt 3 amp. 9/6. P.P. 1/6.

C.R. TUBES

V.C.R. 97, 12/6. P.P. 2/6.

AERIALS

B.B.C./I.T.A. 3 Channel Combined, 32/6. P.P. 2/6.

EY51 SHORT ENDS **4/6** **U25** SHORT ENDS **8/-**

RENEW YOUR PICK-UP

with the following CARTRIDGES. ACOS G.P. 65.3, 22/6; SONOTONE, 17/-; STEIG and REUTER 15/-; POWER POINT, 17/-. All the above complete with "STARR-GALAXY" Tone Arm, 3/- extra.

SILICONE DIODES, 125 v. 300 M.A. 2 in series make superior replacement for RM4, RM5, etc., 8/- each.

ISOLATION TRANSFORMERS

2v., 6.3 and 13v. with 25% Boost, 9/-. Post 1/6.

FOCUS MAGNETS

Standard Deflection Coils, low impedence, wide angle, 19/-.

TV MASKS

14in. Standard Quality 4/-, 17in. Standard Quality, 6/6. P.P. 1/6.

LINE OUTPUT TRANSFORMERS

Most Types Available from 19/-. S.A.E. for enquiries.

We are always pleased to answer your enquiries. S.A.E.

LOUDSPEAKERS

TOP MAKES—MANUFACTURER FRESH. 2½in. (Special) 13/; 5in. 16/-; 8in. 19/-; 10in. 22/6. 12in. Closed Field 27/6; 6 x 4 16/-; 7 x 4 18/-; 8 x 3 18/-; 8 x 8 19/6; 10 x 6 23/6; 8 x 13 35/-. 10in. Bronze Wharfedale 89/-. P. & P. 1/6.

PM SPEAKERS

3 ohms, top makes performance guaranteed.

8in. 6½in. **8/-** 5in. 7 x 4 **11/-** 10in. 10 x 6 **13/-**

EXTENSION LOUDSPEAKERS

Covered in attractive Rexine, Gold Medal Fret. Complete, size 8 x 6 x 3½in. **21/6**

Baffle type, polished wood front, with Gold Metal Fret. Shaped. Size 11¼ x 7½ x 3¼in. P. & P. 2/-. **22/6**

RECTIFIERS 12 volt 3½ amps., 9/6. 250 v. 80 mA., 5/-. RM1, 6/6; RM2 8/-; RM3 9/-; RM4 15/6; RM5 21/-. 14A86 17/-; 14A97 23/-; 14A100 25/-; 16RC1-1-16-1 7/9; 18RA1-1-1-16-1 7/9; 18RD2-2-8-1, 14/-; 14RA1-2-8-2 17/-; 14RA1-2-8-3, 20/-.

Anti-Static Screen Clearance	3/3 Tube
Switch Cleaner	4/3 Tin
Silicone Grease	13/6 Tube
Cellulose Cement	4/6 Tin

Post: 2 lbs. 2/-, 4 lbs. 2/6, 7 lbs. 3/6, 15 lbs. 4/-, etc. No C.O.D. ALL ITEMS LESS 5% & POST FREE IN DOZENS.

TECHNICAL TRADING CO.

(Callers always welcome). LIST OF 1000 SNIPS 6d.
350-352 FRATTON ROAD, PORTSMOUTH
P.O. BOX 21 (W)

LASKY'S RADIO

90° 17 in. TV CHASSIS

Complete with 13 valves and latest Fireball turret covering all Bands I and III channels. Valves: 3 PCF80, PCC84, 3 6BW7, PCL84, PCL82, PY82, PL81, PY83, EY51. Overall dim.: 8 x 15½ x 6in.

LASKY'S PRICE less C.R. Tube & line transformer 15 Gns Carr. & Ins. 7/6.

As above with new Brimar C17SM 17in. tube, 19 Gns. Carr. & Ins. 19/6.

Above Chassis less valves, C.R. tube and Line Output Transformer, 77/6. Post 7/6.

LASKY'S FOR NEW C.R. TUBES

All sizes in stock at lowest prices. 17in. from 79/6. Send for list.

FERRANTI 17in. type TR17/10, 6.3 v., 0.3 amp. heater. New and unused £5.19.6. Carr. & Ins., 12/6.

REGUNNED C.R. TUBES

GUARANTEED for 12 MONTHS

Type		Carr. & Ins.
12in. round	£5 10 0	12/6
14in. rect.	£5 10 0	12/6
15in. & 16 round	£5 19 6	12/6
17in. rect.	£5 19 6	12/6
21in. rect.	£7 19 6	21/-

GREAT TV OFFER

Don't neglect this final offer of well-known television products, all brand new, at clearance prices. Full data and instructions supplied. Call or post your order without delay.

110° SLIMLINE 17" TV CHASSIS

Complete with 14 valves and 12-channel turret covering all Bands I and III. Valves: 2 PY82, 2 PL81, EY52, 2 PCL82, 2 PCF80, PCL84, 3 BW6, PCL89. Uses 17in. C.R. tube type C17AF. Overall dim.: 19 x 12 x 6in.

LASKY'S PRICE less C.R. Tube & Line Transformer 16 Gns. Carr. & Ins. 7/6.

As above with C.R. tube, £21.10.0. Carr. & Ins. 19/6.

Above Chassis less valves, C.R. tube and Line Output Transformer, 99/6. Carr. 7/6.

C.R. TUBE type C17AF, separately, £6.19.6. Carr. & Ins. 19/6.

Line Output Transformers with EY51, not original type, 29/6. Post 2/6.

Sound & Vision Chassis. Printed circuit, all components wired, complete with valves: 3 6BW7, PCL84, 2 PCL82, PCF80. Overall size 4 x 16 x 5in. (including valves), £5.19.6. Carr. 7/6. Less valves, 59/6. Carr. 5/-.

PRESS BUTTON TURRET TUNER

Covers all channels Band I and III also VHF/FM. I.F. 33-38 Mc/s. Operated by 5 press buttons. Complete with valves 30L15 and 30C15. Overall measures: 5 x 4½ x 2½in.

LASKY'S PRICE 49/6 Post 2/6

Prices Slashed!

MAKER'S SURPLUS COMPONENT BARGAINS

WIDE ANGLE 38 m.m.

Line E.H.T. Trans. Ferrox-cube core, 9-16 kV	12/6
Scanning Coils. Low imp. line and frame	12/6
Ferrox-cube cored Scanning Coils and Line Output Trans., 10-15 kV EY51 winding Line Trans. with width and linearity controls, circuit dia., pair	25/-
Frame Output Transformer	5/-
Frame or line block osc. Transformer	3/6
Focus Magnets Ferrox-core	7/6
P.M. Focus Magnets, iron-cored	6/6
Duomag Focalisers	8/6
300 m/a Smoothing Chokes	7/6

STANDARD 35 m.m.

Line Output Transformers 6.9 kV E.H.T. and 6.3 v. winding, Ferrox-cube	12/6
Scanning Coils. Low imp. line and frame	5/6
Frame or line blocking Oscillator Transformer	3/6
Frame Output Transformer	5/-
Focus Magnets: Without Vernier	5/6
With Vernier	7/6
200 m/a Smoothing Chokes	6/6

207 EDGWARE ROAD, LONDON, W.2. *PADdington 3271/2.*

33 TOTTENHAM COURT ROAD, W.1. *MUSeum 2605.*

BOTH OPEN ALL DAY SAT. Early Closing Thurs. Mail Orders to Dept. P.T., Edgware Road.

Better, Brighter Picture Tubes

BRAND NEW THROUGHOUT

excepting glass.

12in.	£4.10.0	14in.	£5. 5.0
15-17in.	£5.15.0	21in.	£7.15.0

New Silver Screen and Aluminising. All makes Mullard, Mazda, Emiscope, Cossor, Brimar, Emitron, etc.

REBUILT MULLARD AND MAZDA TUBES

12in.	£3. 0.0	14in.	£4. 0.0
15-17in.	£4.10.0	21in.	£6.10.0

All Tubes Fully GUARANTEED 12 MONTHS. Dispatch same day. Cash with Order. Carriage and Insurance 10/-.

S.T.S. Ltd.

35 POUND STREET, CARSHALTON, SURREY

Telephone: WALLINGTON 9665

B. E. HAMPSHEIR

(RADIO - TELEVISION)

23 NORTHCROSS RD., LONDON, S.E.22

NEW BOXED VALVES

C.W.O. 1/- POSTAGE ON ALL ORDERS UNDER £1

B36	8/6	EL83	9/-	U403	10/-	1S5	7/6
B65	8/6	EY51	12/-	U404	10/-	6AL5	7/6
DAC32	10/-	EY86	12/-	UAF42	10/-	6AT6	7/6
DAF91	7/6	HD14	9/-	UBC41	10/-	6BA6	10/-
DF91	7/6	KT33C	8/-	UBF80	10/-	6BR7	12/-
DK91	8/6	KT36	8/-	UCH42	10/-	6D2	10/-
DK92	8/6	N17	7/6	UCH81	10/-	6F1	14/6
DK96	10/-	PCF80	11/-	UCL82	10/-	6P28	15/-
DL35	9/6	PCF82	9/-	UCL83	12/6	7K7	10/-
DL94	7/6	PCL82	9/-	UF41	8/6	7Y7	10/-
DL96	7/6	PCL83	12/-	UF42	7/6	9BW6	8/-
EB91	7/6	PENA4	18/-	UF85	10/-	10P13	14/-
ECC81	9/-	PL36	17/6	UF89	7/-	12AT6	9/6
ECC82	9/-	PL81	16/6	UL41	10/-	12AT7	10/-
ECC84	9/-	PL82	12/-	UL81	7/6	19BG6G	13/-
ECH21	11/6	PL83	12/-	UY41	10/-	20D1	8/6
ECH35	11/6	PY80	10/-	UY85	10/-	20F2	14/6
ECH81	11/6	PY81	10/-	W77	6/6	20L1	14/6
ECL80	12/-	PY82	10/-	Z77	6/6	20P1	14/6
EF50	7/6	PY83	12/-	1D5	9/-	20P5	13/-
EF80	7/6	R19	15/6	1FD9	8/6	30C1	10/-
EF91	7/6	RM4	15/-	1P11	8/6	35W4	6/6
EL33	11/6	U25	18/6				

TRACING TV FAULTS

(Continued from page 183 of the January issue)

CRT CIRCUITS

By G. J. King

LAST month's article concluded with a description of the test for a faulty EHT rectifier valve, which is confirmed by the fact that pulse voltage is present at the anode, but no EHT voltage is present at the cathode.

Amplifier Faults

If pulse voltage at the anode is not present, however, the fault lies somewhere in the line timebase circuits (see Fig. 6). If the normal 10kc/s whistle can be heard (this can sometimes be heard more clearly by altering the frequency with the line hold control), the line oscillator stage can be ruled out straight away and the fault must be in the line amplifier. A frequent cause of the trouble here is open-circuiting or increase in value of the screen feed resistor (R62 in Fig. 6). If a decoupling capacitor is also employed, this should be checked for insulation, preferably by substitution.

If all seems well, and in this section it is necessary to perform component checks, more so than in other stages, the line output transformer probably has shorting turns. Unfortunately, there is no simple method of checking for this trouble, and in obstinate cases it is necessary to substitute the suspect transformer with one known to be in good order. A short between adjacent turns is sufficient to render the transformer completely useless, but the resistance of the winding would remain almost unaltered, so a simple resistance check may not prove much.

Tube Circuits

In the event of the blank screen being accompanied by EHT voltage, the trouble would lie either in the tube itself or in the tube biasing circuits, as already detailed. The ion trap magnet on the neck of the tube should be examined to make sure that it has not shifted. If it has, then it should be reset for maximum screen brightness, or if the clamp or clip is broken, the magnet should be replaced. Faulty tube biasing can be revealed by momentarily shorting the grid and cathode sockets on the picture tube base. If this action results in the return of a raster, then the trouble lies in the biasing arrangements.

A check should also be made on the first anode voltage before the tube is finally condemned. As this is usually fed from a high resistance circuit, a high resistance voltmeter will be required for measurement. A low resistance meter will load the circuit heavily and give either a very low reading or no reading at all. In Fig. 6 it will be seen that the first anode is fed from the boost H.T. line through R115.

Voltage checks should not normally be made at the anode of the line output valve and the cathode of the booster diode, for at these points a high pulse voltage exists which is superimposed upon the ordinary H.T. or boost H.T. voltage, when the line timebase is working correctly. The best plan is to take the measurement between chassis and the boost reservoir capacitor which, in Fig. 6, is C90.

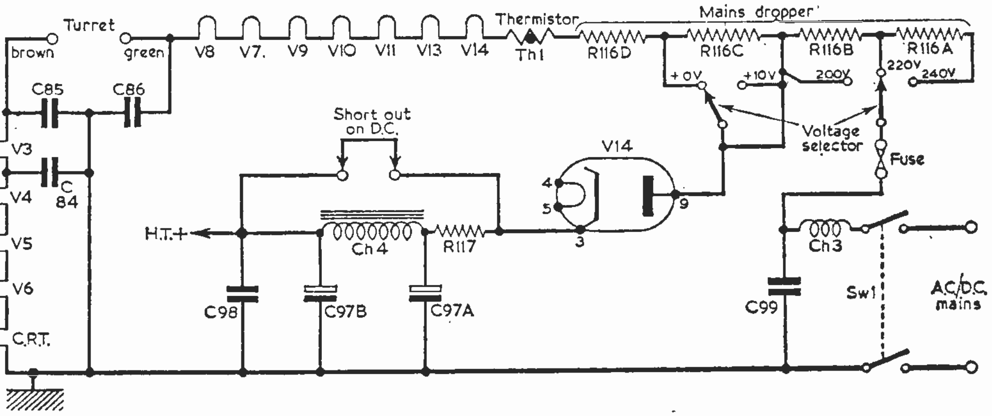


Fig. 8—The power supply circuits of a typical receiver, showing also the heater chain.

Low EHT voltage (sometimes accompanied by reduced width) can be caused by a low emission booster diode or a faulty booster capacitor. If the booster diode is completely open-circuited, in most sets, the line timebase will also fail as a result.

Lack of H.T. Voltage

The symptom of no sound or raster could mean either failure of the H.T. circuits or open-circuiting of the heater chain. The latter trouble can be observed from the valve heaters. If they are all out, then there is a break somewhere in the series-connected heater chain.

Circuit

H.T. trouble is not so obvious, and will usually require a voltage check on H.T. line or on the cathode of the H.T. rectifier valve. In Fig. 8 is shown a typical H.T. circuit and a series-connected heater chain. A.C. or D.C. mains is applied to the rectifier anode, either direct from the source or through sections A or B or both of the mains dropper resistor, depending on the setting of the mains voltage selector. Resistor R117, in the cathode circuit of V14, serves as a surge limiter, while Ch4 is the smoothing choke and C97A/B are the reservoir and smoothing capacitors respectively. C98 is an R.F. decoupler.

H.T. Short

If the heaters are alight, then one can be sure that the fuse, on/off switch, mains lead, power source and plugs, etc., are in good order. A short on the H.T. circuit would usually be revealed by flashing in the rectifier and the fuse blowing after the rectifier valve had warmed up. This should lead to a check of C97. If the fuse is over-rated, the surge limiter resistor may well become very hot and blow, but before this happens the rectifier may explode internally. If the voltage selector is set to the higher voltage ranges, sections A or B or both of the mains dropper will also overheat and possibly become red hot. Failure of rectifier emission, as distinct from a short-circuit, will show up by the rectifier valve remaining relatively cool.

Switch

If the valve heaters fail to light, the trouble could be pretty well anywhere in the mains input circuits, including the power source, plugs and sockets, mains lead, on/off switch, fuse, thermistor and heater chain. A break anywhere in the chain will, of course, produce the symptom. The first thing is to establish that mains voltage is, in fact, reaching the set. If an A.C. voltmeter is not available, an ordinary household test lamp can be used. The on/off switch can be tested by temporarily shorting out each pole with a screwdriver blade, making sure that the blade is not put between poles, which would blow the fuse and/or the switch. The fuse should be tested by substitution, and if the replacement blows, check for a short-circuit.

Thermistor

Failure of the thermistor can usually be detected by observation and prodding with a screwdriver blade. After a while these components become brittle and poor connections develop at the terminations. The component can be shorted out purely as a test, and if the heaters then light, a replacement thermistor must be fitted.

The valve heaters can be checked with an ohmmeter, or by a dealer, as also can the mains dropping resistor. ■

Servicing Data and Modifications

(Continued from page 224)

Viewers are similarly discouraged from fitting an extension speaker to A.C./D.C. equipment. Should the lead from the output transformer touch the "live" chassis there is a risk of a breakdown and of a high voltage being applied to the speaker itself.

Tube Replacement

The DM3, DM4, DM4/C and DM5 range of Decca models give correct results with both the Mullard MW43/69 and MW43/64 picture tubes. Best results, however, can only be obtained by the use of the correct line output transformer for the tube. Transformer with Part No. 56367/A is for the former tube, while transformer with Part No. 56308 is for the latter tube.

Poor Interlace—English Electric T40 Series

A common cause of poor interlace on these models is the screening cover being left off the line output transformer after a servicing operation. However, a further improvement was effected on later models of this series by using a PCL83 in place of the ECL80 for the sync separator (pentode section—see Fig. 4).

Therefore, where improved interlace is required on earlier models, the ECL80 should be replaced by a PCL83.

Improved Frame Sync

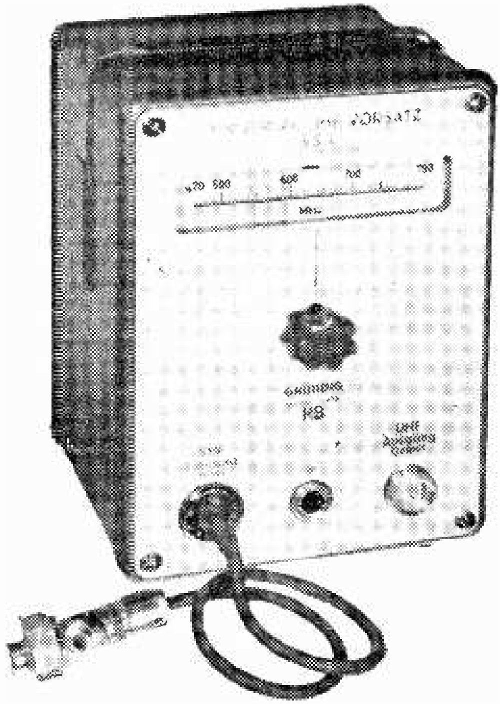
From serial number 21911 (English Electric T40 series), alterations were made to the sync separator stage to stabilise the performance of the frame circuit. The modified circuit is shown in Fig 4, and this should be incorporated in unmodified receivers having serial numbers below that given above.

Frame Jitter

This symptom on the T40 series is sometimes caused by variations in the frame blocking oscillator transformer, and whilst a replacement transformer may solve the problem it may be more easily overcome by adjusting the value of the resistor connected across the primary of the blocking oscillator transformer (across the red and yellow wires).

The resistor may be adjusted within the nominal values of 10k and 22k with great advantage to performance.

Trade News


This attachment is made by Grundig and is designed to adapt wobbulators for VHF work.

Remote Control TV Sets

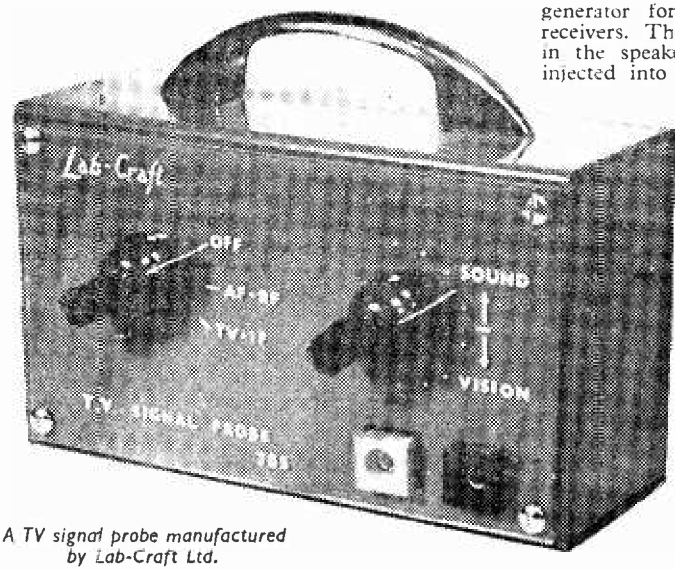
THE new Astra range of TV receivers, recently announced by Murphy Radio Limited, are capable of being operated from a remote control unit which changes the channel and alters the volume, by emitting ultrasonic signals which activate mechanisms inside the receiver.

The advantage of this form of remote control is that no trailing wires connect the unit to the television receiver.

Although the operating mechanism inside the set itself is electronic, the system can be operated manually.

The note emitted from the unit is not audible to those using the set. and is not loud enough to penetrate a room wall.

The new receivers and the remote control unit are made by *Murphy Radio Limited, Welwyn Garden City, Hertfordshire.*



A TV signal probe manufactured by Lab-Craft Ltd.

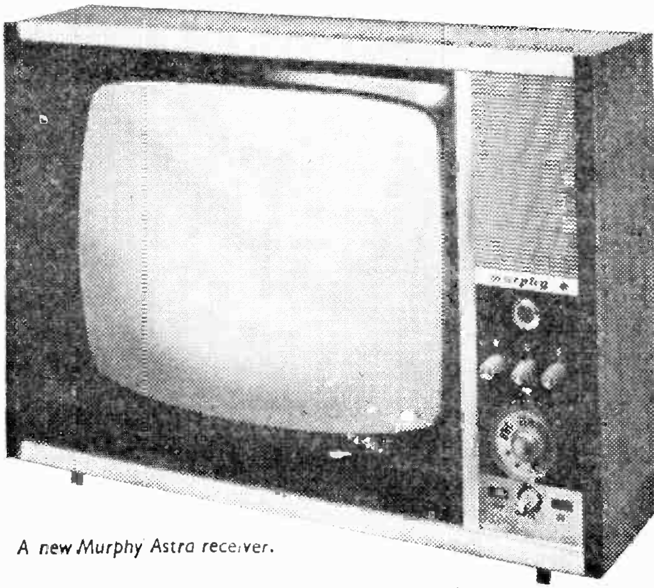
TV Signal Probe

THIS instrument is made by Lab-Craft and is one of the latest additions to their range of test equipment. It functions as a wide-band modulated signal generator for fault-finding with audio and radio circuits, and as tunable modulated signal generator for inspecting the I.F. stages of TV receivers. The signal probe produces a 2kc/s tone in the speaker of the receiver under test when injected into any circuit of a radio set and I.F. sound or A.F. circuit of a television. When injected into television I.F. vision circuits a horizontal pattern is produced on the screen.

Lab-Craft Ltd., 38 Ilford Lane, Ilford, Essex.

Wobbulator Attachment

THE advent of Bands IV and V as a transmission medium for television has already arrived on the continent of Europe and there is growing interest in transmission in these bands for this country. Hitherto the highest reception frequencies have been about 220Mc/s and so most wobbulators have been designed accordingly, that is to say, they cannot be used for ultra high frequency, over 220Mc/s, just as they are. Grundig have therefore produced an attachment that allows existing wobbulators to be used for UHF alignment work.



A new Murphy Astra receiver.

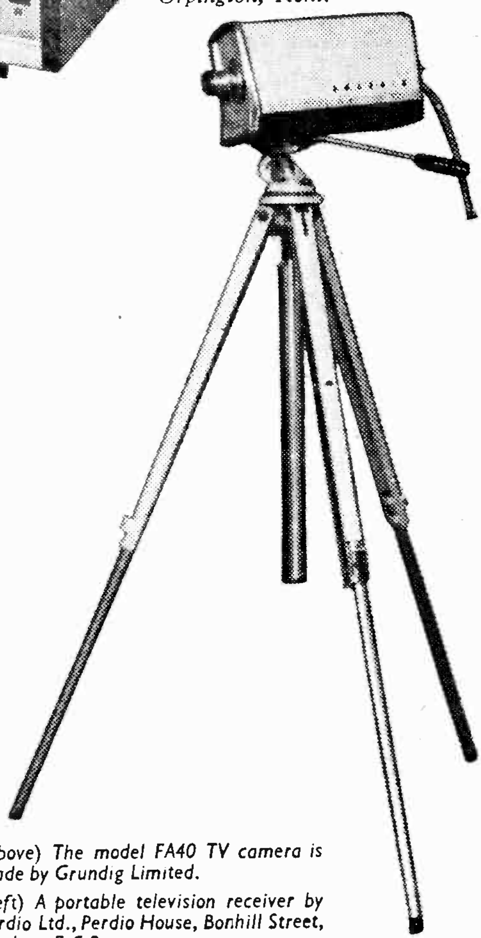
This appliance consists substantially of an ultra-high frequency generator and a mixing stage. The output centre frequency stretches over the range from 460-795Mc/s and is adjustable on the attachment. The input impedance is 60Ω and conversion loss is about 13dB, that is to say, with an input signal of 45mV VHF the output is 10mV UHF delivered into 60Ω external.

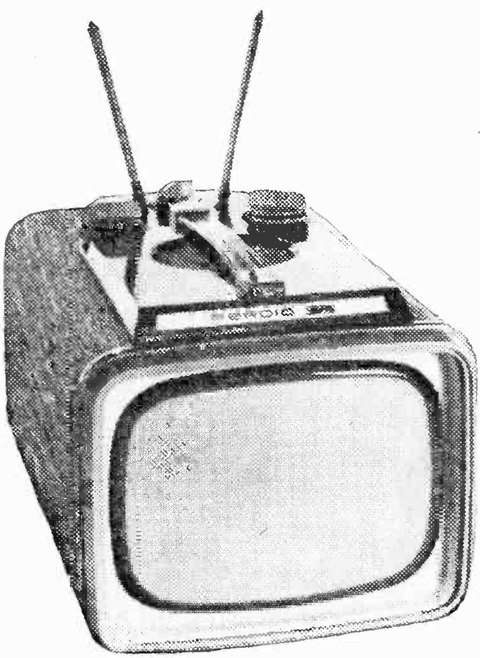
The attachment thus extends the usefulness of existing television Band I wobbulators by making them capable of alignment work in the ultra-high frequency range in a very convenient and rapid way.

Consequently the addition of a UHF attachment for wobbulators (type VS.2) has been manufactured by Grundig, and is now available from Wolsey Electronics Limited, who are the distributors for the British Isles. This instrument is an essential component in the investigation of circuitry in Bands IV and V. It can be fitted to most wobbulators and provides this additional function for a nett price of £30.

The current consumption of the instrument is approximately 7W. A three-core cable with three-way plug connects the casing with the earthy conductor.

Wolsey Electronics Limited, Cray Avenue, St. Mary Cray, Orpington, Kent.





(Above) The model FA40 TV camera is made by Grundig Limited.

(Left) A portable television receiver by Perdio Ltd., Perdio House, Bonhill Street, London, E.C.2.

ALL TUBES
GUARANTEED 12 MONTHS
Carriage Free
Speedy Passenger Train despatch.

NEW

12"	MW 31-74 etc.	£5.5.0
14"	MW 36-24/44 Limited quantity	£6.6.0
17"	MW 43-69 (limited) CRM 171, 172	£7.7.0

COMPLETELY REPROCESSED

TO MAKERS' SPECIFICATIONS !

REBUILT, RESCREENED, REALUMINISED TUBES OF THE HIGHEST QUALITY

14"	£5.5.0
15"—17"	£5.10.0
21"	£8.0.0

TRANSISTOR INTERCOM

- 2 way. ● Size 4½ x 3 x 1in.
- Sens. more than 55dB.
- Call system included.
- Nil current, awaiting call.

For : Home—Office Relay 'Phone or Radio. Complete with 60 ft. lead and battery.

ONLY 8 Gns. Post 3/-.

TRADE ENQUIRIES INVITED

LINE OUTPUT TRANSFORMERS

Direct Replacements for 500 sets.

Baird, T29, T163 .. .. 53/-
T164, T167, T172, 2014, 1712 .. .. 60/-
Bush. TV 11A, B; 12A, B; TVF 12A,
TUG12A, B; TRG 12A, B 45/-
TV12AM; TV22, 24; TRG24, TUG24 .. 60/-
Cossor, 930, 931, 933, 934, 948, etc. .. 58/-
Ekco. TS146; TS113-114; T161 .. .. 47/6
T221, 231; TSC311, etc. 55/-
Ferguson. 841, 2, 3; 941 to 945 .. .. 55/-
990T-998T; 103-145T; 203-246T 66/6
Ferranti. 14T3, 14T4, 17K3, 17T3-4 .. 45/-
14T2, T1205, T1215, T1225, T1325,
T1405, T1415, T1425, T1505, T1825 .. 65/-
G.E.C. and H.M.V. mostly 55/- to .. 60/-
Invicta. T101-104; T108-110 .. .. 52/-
T114-126; T133-142 .. .. .. 60/-
Murphy. V114C, V116C, V118C 45/-
V120C, V180, V178, V200, V202C .. 57/6
V240, 250 .. 62/6: V214, 216 .. 69/-
Philips. 114 UF/UM, 1115 U, 1437 U,
1446 U, 1726 U, 1746 U, 1747 U 65/-
383A, 463A, 563A, 663A 60/-
Pye. LV30, 16T, CS17, VT17 .. .. 60/-
CTM4, V4, VT4, V7, VT7 .. .. 52/6
Ultra. 814, 815, 817, 915, 917, VW80,
Y/YA730, YVW84, VWY720, V710
(complete assembly with U25) .. 85/-
14/53, 15/60, 17/50, 17/53, 17/60, 17/63-4,
17/70-1-2, 21/50, 21/60, 21/70-1-2 .. .. 60/-
All Ultra Frame O.P.T.'s 26/6

Add post 2/6.

100 mixed resistors, ¼W-2W—7/6 post 1s.

SKANTEST

Tests Line Output Transformers:—Deflector Coils—Blocking Oscillator Transformers, etc. for shorting turns and open circuit. SKANTEST is a fraction of the cost of any similar tester available in this country.

SKANTEST ● Saves hours of work. ● Is portable. ● Easy to use. ● Increases good will.

No TV Serviceman should be without SKANTEST. SAVE TIME! SAVE MONEY! Free Leaflet available. £7.10.0. post etc. 5/-.

WESTWAY RADIO

S.A.E. with enquiries please.
5 Westward Way
Preston Road, Harrow, Middx.
Tel: WOR 2663

"THREE STAR"

RE-BUILT TELEVISION TUBES

★ **Manufacturer's Own Make of Gun**
★ **Re-screened for Greater Contrast**
★ **Aluminised for Better Brightness**

TWO WAY TESTED

Free carriage and insurance.

ALL TYPES AND SIZES

12" - £4.10	14" - £4.15
15" - £5. 0	17" - £5.10
21" - £7. 0	

C.O.D. or Cash with order.

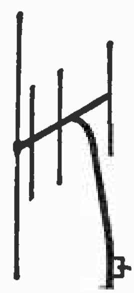
DARLING ELECTRONICS

Dept. TV, 62 High Street, Croydon, Surrey

MAIL ORDER ONLY—NO CALLERS

AERIALS

BAND I BAND II BAND III



Combined Arrays I and III
1+3 Element Loft Mounting .. 38/3
1+5 Element Loft Mounting .. 46/9
1+3 Element Wall Mounting .. 45/3
1+5 Element Wall Mounting .. 61/-
1+3 Element Chimney M'ting .. 57/10
1+5 Element Chimney M'ting .. 66/9

Band I
Single Dipole Wall Mounting .. 24/7
Single Dipole Chimney M'ting .. 40/2
X Aerial Chimney Mounting .. 62/3
H Aerial Chimney Mounting .. 67/7

Band III
3 Element Yagi Wall Mounting 33/-
6 Element Yagi Wall Mounting 43/-
9 Element Yagi Wall Mounting 56/-
Chimney Lashing Mounting add 10/-
Double 6 Array, only with clamp 83/-

Band II
Single Dipole Wall Mounting .. 20/5
Single Dipole Chimney M'ting .. 29/9
H Array Chimney Mounting .. 52/4

REPAIR KITS

Band III Folded Dipole With Insulator, Complete .. 9/3
Band I Insulator With Two ½ inch Dipoles For 1 or ¾ inch Booms, Complete 19/5
6 inch Lashing Kit, 12/11. 7½ inch Lashing Kit .. 14/8
6 inch Wall Bracket With U Bolts 7/10
1-¾; 1-1 inch Clamps, 3/10, 1-2 inch Clamps Universal 5/4
Bracket Repair Kit, J Bolts; U Bolts; 20ft Lashing Wire; Thimbles; Corner Plates 6/-
Insulators, All Types .. .. (Enquire)
Co-Ax. Semi Air Spaced, 7d. yd. .. .. .. Plugs 1/2
Send 6d. for Lists. Please state Channel when ordering.
Cash with Order. Post and Packing 3/- extra.

SATISFACTION OR MONEY BACK GUARANTEE

WALKER & SQUIRES

PINNOX STREET, TUNSTALL, STOKE-ON-TRENT
Phone: Stoke-on-Trent 88767

TV TEST POINTS

(Continued from page 200 of the January issue)

By L. E. Higgs

The reader should refer to Figs. 1 and 2, and Table 1, which were given in last month's issue, when test points are dealt with in the following text.

Sound Tests

Point J: Output Valve Grid (Sound)

Touching this grid will produce a low hum in the speaker. Often this valve will be part of a multiple triode/pentode and the grid must be identified from valve data or by trial and error. Be wary of pins that may have H.T. voltage on them when testing. Sometimes it is quicker to omit this test and go to point K first as it is easily identified.

Point K: Volume Control Live Tag

This point is easy to find and touching the tag with a screwdriver will cause a loud hum. The volume control knob must be turned up for this test. No results here, but results from Test J indicate that the first audio amplifier stage at fault. If a multiple sound output and A.F. valve is employed, then failure of this valve renders both stages "dead". To test the sound I.F. stages, make a test on point F, or the grid of sound I.F. valve, to produce crackles from the loudspeaker.

Timebase Tests (Multivibrators excepted)

Point L: Frame Oscillator Grid

When doubt exists whether the frame oscillator is operating, in the absence of vertical scan, a quick test can be made by linking a 100pF capacitor between the frame oscillator grid and the volume control live tag (Fig. 4). A regular 50c/s tick should be heard in the sound that will vary in pitch as the vertical hold control is altered. This result indicates that the oscillator is operating and that only the output amplifier need be investigated. Remove the aerial for this test as the sync pulses can be confusing.

Point M: Line Oscillator Grid

In a similar way to Test L, the grid of the line timebase oscillator is capacitively linked to the volume control tag when a 10kc/s whistle should be heard from the loudspeaker. Changing the line hold setting should cause whistle to alter in pitch. This proves the line oscillator to be operating and any fault causing lack of line scan must exist in the circuit which follows the line oscillator. Lack of a whistle shows the oscillator to be defective and there is no point in checking the output circuits until the oscillator has been repaired. Lack of flyback EHT can often be traced back to the line oscillator.

Ancillary circuits such as sync separators, spot limiters, noise limiters, and flywheel sync circuitry have been omitted because their defect-symptoms can often be deduced by picture/sound effects and tests on these parts need individual detailed attention.

To illustrate the application of these listed hints and the employment of a logical approach the following examples are given:

Example 1:

No picture or sound but normal unmodulated raster.

The presence of a raster proves the H.T. and timebases to be in order. No sound or picture suggests that the fault is in stages common to vision and sound. Make tests at F; if normal result is obtained, the fault lies between F and H. Make Test G to isolate the turret tuner from the common I.F. stage. If there is no result from Test F, test sound and vision each completely from D and J.

Example 2:

No raster or sound or whistle but valves alight. That the valves are alight shows the mains input to be in order. Lack of whistle makes EHT tests unnecessary. The common link to all circuits is the H.T.; therefore, make test A. If there is no H.T. check back to the rectifier. Test also for a short on the H.T. line.

Example 3:

Normal picture but no sound.

Only sound checks need be made; try Tests J, K and F.

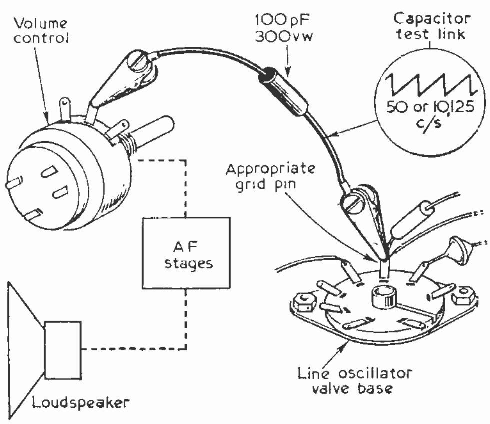


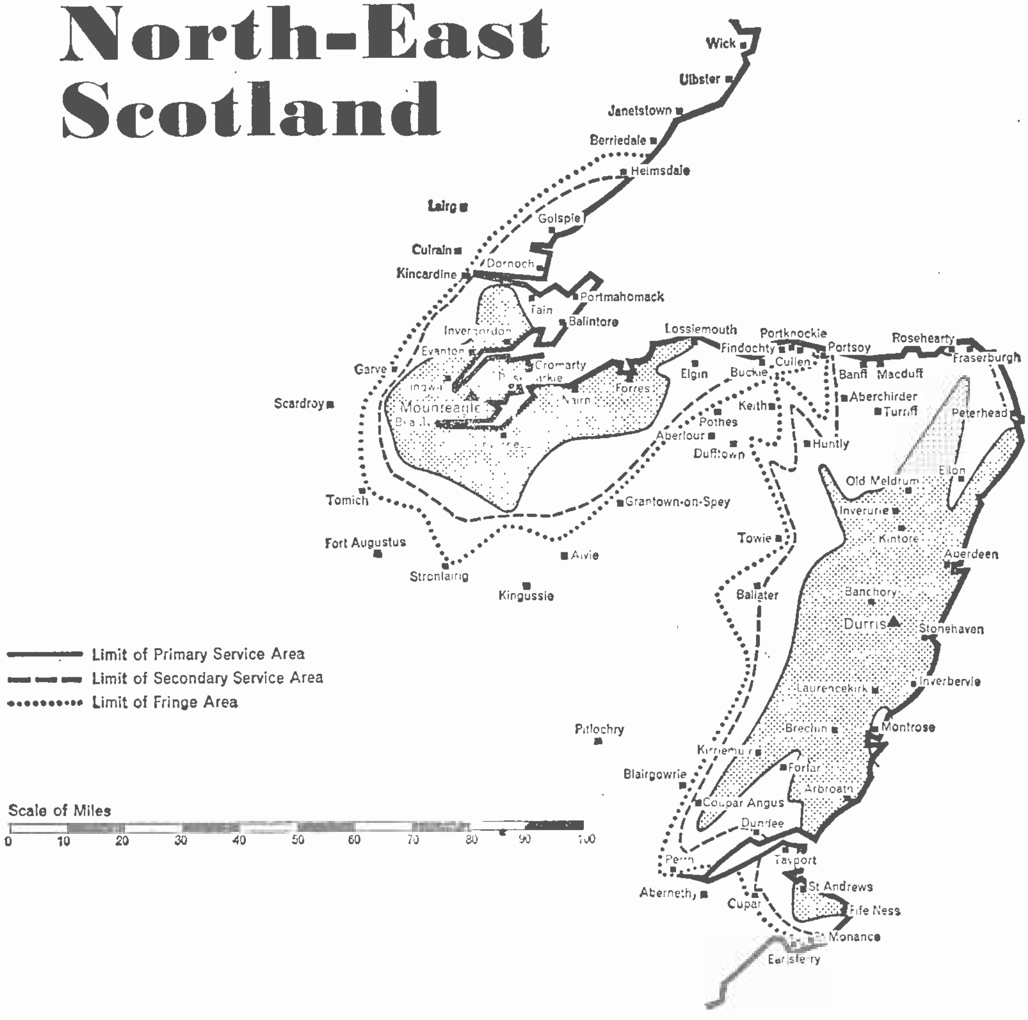
Fig. 4—A quick test to check that the line or frame oscillator is operating.

Example 4:

Normal sound and raster but no picture.

H.T. and EHT must be present to produce a normal raster. The sound is functioning normally and therefore only vision tests need be made from CRT grid to common I.F. stage (points D, E, and F). ■

ITA Stations in North-East Scotland



The estimated coverage of the masts.

TWO new transmitters have been constructed for the Independent Television Authority, bringing Independent Television to 872,000 people living in North-East Scotland. The estimated coverage areas of these two stations are shown by this map.

The Durris station, near Aberdeen, broadcasts on Channel 9 and the signal is horizontally polarized. The directional aerial radiates a power of 400kW to the North and South-West and 15kW to the East and West. The population living within the coverage area of this station is estimated to be 730,000.

The Mounteagle station, near Inverness, radiates a horizontally polarized signal on Channel 12. The directional aerial radiates 50kW to the North-East and South-East, 35kW to the East and 10kW to the West. The station serves some 142,000 people.

Trade test transmissions commenced from the Durris and Mounteagle stations early in September. As already announced, the Authority has appointed Grampian Television Ltd. as its programme contractor for North-East Scotland.

The vision frequency of the Durris station is 194·75675Mc/s; the sound frequency being 191·27 Mc/s. The vision frequency of the Mounteagle station is 209·75Mc/s and the sound, 206·25Mc/s.

Letters to the Editor

The Editor does not necessarily agree with the opinions expressed by his correspondents.

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

TV AS A HOBBY

SIR,—How right T. Young is (Letters to the Editor January). I, too, was always apprehensive about tackling any work to do with television. I was afraid that half way through I would lose my interest and abandon the job, but after repairing several receivers and making an attenuator, I was encouraged and convinced that this was the absorbing hobby I had always wanted. Second-hand receivers are so cheap and easy to obtain nowadays, that it seems no waste of money to buy one, and get it working, just for the pleasure involved. I'm glad I found making and mending TV receivers for a hobby and I'm glad I found PRACTICAL TELEVISION to help me.—T. R. RAYMONDS (Brighton).

A READER'S THANKS

SIR,—Thank you for your prompt reply; I changed the condenser as suggested and was rewarded by normal working of the receiver.

As you may have guessed, I originally spent some time on tracing the fault, and had subsequently discussed it with some television-servicing friends, but their only advice was to change the line-output transformer—an expensive remedy that would have been!

I should like to take this opportunity of saying what an interesting and helpful magazine I find PRACTICAL TELEVISION. I have always read " Your Problems Solved " and found it fascinating; I would imagine that if everyone else gets such quick and correct answers, as I did, you will soon be overwhelmed with queries.—N. S. MELDEUR (Ipswich).

COLOUR TELEVISION

SIR,—I agree whole heartedly with Mr. F. W. Westbury's letter (August '61), which points out the inadequacy of our manufacturers to produce a suitable colour CRT on a mass produced and commercial scale.

I would also like to refer to Mr. D. J. Atkin's letter—" on something for the home constructor ", in this field of experimental colour receivers, I would suggest that a committee is made up of amateurs, and this committee would, I hope be able to keep up to date with trends regarding colour television, and perhaps be helpful in some way to the manufacturers. I would agree that more information could be supplied to those interested.

I would also like to mention that I am one of the thousands of people who have been waiting patiently for the Pilkington Committee interim report on line and colour standards for the British television. Many of us, so far, have understood that this report was to be available in November 1961, and in my opinion, the decisions could have been made long before. No doubt those mainly responsible for these delays, and this needn't only apply for the above named body, think that we, the ever enthusiastic amateurs, will forget all about colour if no further statements are made, but I for one would like to remind those concerned that this matter *will not* be lightly brushed to one side.—K. R. CRASKE (Lincoln).

ALTERNATIVE PROGRAMMES

SIR,—Although I know that it is not really anything to do with you, I do feel that you should make the voice of the people heard in regard to the programme material which is offered to us by the two existing companies. Far too often one finds that both transmitters are giving the same type of programme, and in most cases these are plays or westerns. There is very little of the alternative which the ITV were supposed to offer. I know that the two companies are rivals, but I believe that they are "friendly rivals", and I would have thought that it was actually in their interests to try and get together when arranging programmes to see that completely contrasting items are on each station. In this way I am sure their viewing figures would rise as, at the moment, many viewers switch off in disgust when they find that two similar types of programme are offered, and fail to switch on again during the evening. — F. PETERSEN (Rugby).

NUVISTOR PRE-AMP

SIR,—I should like to offer my thanks for the neat little pre-amp which was described by you some time ago. I had a relative who lived in a bad area and needed Band III more than Band I signals, and could never resolve a really good picture. I had told them several times to fit a pre-amp but they thought it too dear. When your design came out I made one up—it was easy with the comprehensive details provided in your article. The pre-amp has made all the difference.—F. R. WIDGEN (Derby).

MAINS LOCKING FREQUENCY

SIR,—I saw R. Meadow's letter in the August copy and think that I can offer an explanation. In his letter Mr. Meadows speaks of " line " lock, where he obviously means frame lock. The fault is caused by poor mains smoothing, allowing some hum to reach the frame time base. When the frame hold control is adjusted so that the picture just goes out of sync, the time base will lock to the hum and the true sync pulse and blanking level appear in the centre of the screen. Very often the picture jumps from the locked to unlocked position every few seconds.—G. POWELL (Marden).

Your PROBLEMS Solved

Whilst we are always pleased to assist readers with their technical difficulties, we regret that we are unable to supply diagrams or provide instructions for modifying surplus equipment. We cannot supply alternative details for constructional articles which appear in these pages. WE CANNOT UNDERTAKE TO ANSWER QUERIES OVER THE TELEPHONE. The coupon from p. 260 must be attached to all Queries, and if a postal reply is required a stamped and addressed envelope must be enclosed.

ENGLISH ELECTRIC 16T18

I recently bought this second-hand receiver, which has a 16in. metal cone tube. Would it be possible to convert it to a 17in. tube? I would be obliged if you would let me know the type of tube needed, and also the necessary alterations to the set.—R. J. Bradley (Rugeley).

It is possible to fit a 17in. tube, such as the MW43-69, but we cannot supply details of the mechanical alterations as this will depend to a large extent on your own resources. Briefly you will have to modify the front support, remake the EHT connection and connect a lead from pin 7 of the base to either pin 10 or pin 11.

BUSH TUG58

This set has developed a fault on BBC only. I am unable to tune in the sound and vision together. As the fine tuner is rotated, a loud buzz is heard, then the picture appears, and soon after the picture has gone leaving the sound only. Can this fault be rectified by adjusting the tuner unit? Could you also advise me which components to check? — J Carpenter (Colwyn Bay).

You should check the PCF80 valve by replacement and the 22pF capacitor wired across L13.

DECCA DM45

Could you please give me any information which would enable me to cure the following fault in my TV set? The set is a 17in. model, with VHF/FM radio, and on both BBC and ITA quite a pronounced snowstorm effect covers the entire screen. Otherwise the picture is good, with clear, defined details. The set is fed from an efficient BBC/ITV and VHF aerial system, through in indoor triplexer. I have put new valves in the R.F. amplifier and frequency changer and these cut down the snowstorm effect, but have not eliminated it. Careful adjustment of all controls will not cut this trouble out. Could the triplexer be the cause of this?—J. C. Parker (Kendal).

We presume the R.F. gain control is fully advanced and the contrast set down to reduce the noise as much as possible. It would appear that the input signal is insufficient, possibly due to an inefficient triplexer or to the fact that the available signal strength is poor. You could alleviate the trouble to an extent by fitting a Mazda 30L15 valve in the V1 position and screwing down C8 and C12.

ULTRA V720

Would you please advise me as to the remedy of three faults on my receiver? When first switched on, the picture is only one third the height of the screen with no picture appearing at the top and bottom. After a few minutes the picture becomes normal. The volume control has to be turned right off during the first 20 minutes, as the set is liable to burst into full volume which lasts for about 10 seconds. This trouble clears up after 15 to 30 minutes. A black space slowly appears on the bottom of the picture and after an hour or so reaches about $\frac{3}{4}$in. wide and stays that width.—W. Vaughan (North Acton).

We should advise you to change the front right side UL46 valve, next to the 6K25. This should stop the irregular height trouble. The 6K25 could be partially at fault. The faulty volume could be due to a faulty winding (feedback) on the sound output transformer, a faulty volume control or component associated with it.

PETO SCOTT TV1412T

The picture of this receiver has a small fold-over at the bottom which I would like to put right. Also, a few months ago two parts came loose in the line section near the line oscillator transformer. I replaced these somewhere to enable me to get a picture, but I do not think they are in the correct place, as since then I have had shadows coming in on the left hand side of the tubes. Could you help me with these faults and could you let me know the I.F. of the set?—W.D. (Swansea).

There are three valves on the rear centre. You should replace the right-hand one which is an ECL80 the frame oscillator-output valve. This should restore normal frame scan. If it doesn't, check the capacitors, etc, associated with its base socket.

The I.F. is 9·3Mc/s sound, 12·8Mc/s vision. Your remarks regarding the line timebase parts are too vague to enable us to suggest what they could be, but it would appear that the line phasing has been reversed.

PYE V14

Would you be good enough to help with the following fault with my receiver? The picture can only be held with difficulty by the horizontal hold control. It is then distorted vertically. The PCF80 valves have been changed with no effect. Full picture depth has been lacking for some time, even after a dealer's attention.—K. F. Ward (Aylesbury).

We suggest that you try replacing the D321Y discriminator diode in the line oscillator circuit. Also check the earthing of adjacent tagstrips and try the

(Continued on page 259)

COYNE'S NEW PIN-POINT TV TROUBLES

TAKES HEADACHES OUT OF ALL SERVICING PROBLEMS

Your most useful on-the-job "tool"! Quickly and easily pin-points the exact trouble in any TV set. Covers 70 symptoms, 700 trouble spots. Over 340 cross-indexed pages; 50 time-saving Check-Charts; 290 diagrams and photos; explanation of circuits and designs.

SIMPLE CHECK-CHART SYSTEM SAVES TIME!

This amazingly practical handbook shows you how to find the trouble in any TV circuit FAST! Simple cross-index tells you in what section you'll find cause of trouble. Handy Check-Charts then help you accurately locate the EXACT trouble spot. Cut waste time, eliminate hours of aggravation, get right to the heart of the trouble in minutes.

USE THIS BOOK RIGHT ON THE JOB—NO NEED TO MEMORIZE!

This Pin-Point Book was designed especially for on-the-job trouble-shooting. You simply turn to the indexed section, locate the circuit description and Check-Chart, and in minutes you have the trouble spot located and ready for repair. No complicated theory or mathematics. Down-to-earth practical circuit description, service methods and trouble-shooting techniques. Published by the famous Coyne Electrical School and approved by leading authorities in the field.

J. E. C. Grover of Streatham says:
"Immediately I glanced through this book I was convinced that your claims concerning the merits of this work were justified, for it is, without a doubt, the finest book of its kind that I have ever come across. It is not only unique in its presentation but it is also superbly produced."

G. Axam of London S.E.9, says:
"I have spent nearly £50 on technical books over the past 5 years all of which I feel has now been wasted as your book is the best I have yet had the pleasure of examining, it is practical, to the point, with just the right amount of technical information needed, covering almost every aspect of TV servicing."

FREE TRIAL OFFER!

Mail Coupon now for fast return service! To SIM-TECH TECHNICAL BOOKS, Dept. P.6, Gater's Mill, West End, Southampton, Hants.

☐ RUSH TV Troubles for free seven day trial. If not satisfied I may return book and owe nothing. If I keep the book I will send full amount of 33/- including postage within 7 days *OR* two payments of 17/- within 30 days.

☐ SAVE! Send only 31/6 if paying cash with order. (We pay postage.) Same 7-day-money-back guarantee.

Name ____________________

Address ____________________

____

City __________ County __________

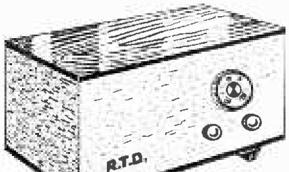
D. & B. TELEVISION

Phone: Cherrywood 3955
Dept. B2

131 & 131a KINGSTON ROAD, South Wimbledon, London, SW19

"Compare our prices with any others"

For the **FINEST, FASTEST SERVICE in the COUNTRY.** We are open from 10 a.m. Until Midnight. (1 p.m. Wednesday.) For any information or problems you have, Call or Phone, we are always pleased to help.



ONLY **£5.19.6**

Postage and Insurance FREE

Only R.T.D. could "Do it Again"

Undoubtedly the finest ★

★ *RADIO bargain this year*

This long/medium wave, 4 valve superhet, mains radio incorporates a ferrite rod aerial and has a very attractive cabinet covered in grey vynair with a veneered walnut top. Knobs are gold and white. Size approx. 13½ x 9 x 6 in. deep.

NEW!

SEND FOR OUR COMPREHENSIVE L.O.P.T. Scan Coil L.B.O., F.B.O., F.O.P.T. LIST. Prices of nearly all makes and models, 2/6, post 6d. Invaluable as a service aid. The finest list ever compiled.

HUGE PURCHASE ENABLES US TO SELL TRANSISTORS AT THIS ASTONISHING PRICE

Mullard: OC44, 9/-; OC45, 8/-; OC70, 6/-; OC71, 5/-; *OC72, 6/-; OC76, 7/-; OC78, 7/-; *OC81, 7/-; OC81D, 6/-. **G.E.C.:** GET874, 8/-; GET873, 7/6; *GET114, 5/-.
* Available in matched pairs at 1/- extra.

Mullard Diodes: OA70, 2/9; OA79, 2/9; OA81, 2/9; OA91, 3/6. **G.E.C.:** GEX34, 3/3.

TURRET TUNERS, Various Makes: 10, 16, 38 Mc/s, 40/-.

EXAMPLE OF TRANSFORMER LIST

	L.O.T.		SCAN COILS	
FERGUSON:	(New)	(Used)	(New)	(Used)
103T, 105T	69/9	35/-	60/-	35/-
992/4/6/8	69/9	35/-	60/-	35/-
PYE:	(New)	(Used)	(New)	(Used)
V4, VT4, V7	55/-	35/-	55/-	35/-
VT7, CTM4	55/-	35/-	55/-	35/-
MURPHY:	(New)	(Used)	(Used only)	
V214, V240, V250	68/6	35/-	45/-	

REGUNNED CATHODE RAY TUBES all with 12 months' Guarantee

ALL MAKES: 12in., £3.15.0; 14in., £4.5.0; 17in., £4.15.0. ADD: 10/- for 90°, 15/- for 110°, 5/- for Electrostatic Types.

SECONDS, with 12-month Guarantee—ALL MAKES: 12in., **£2.15.0**; 14in., **£3.5.0**; 17in., **£3.15.0.**

SECONDS. No Guarantee—ALL MAKES: 12in., **£1.5.0**; 14in., **£1.15.0**; 17in., **£2.15.0.**
10/- allowance on old tube if in good condition.

HUGE PURCHASE ! Again passed on to you

T/V or coffee tables, veneered in walnut. Complete with 4 screw-on legs. Many other uses. Size: 15 x 18½in. Amazing offer at only 14/6. P.P. 3/-.
SPECIALLY made cabinets for the REPANCO JOURNEYMAN KIT, complete with 3 ohm speaker, dial and knobs. Well made in wood and covered in Vynide. Colours: Yellow, White, Red. State second choice. 30/- each. P.P. 3/-.
HURRY WHILE STOCKS LAST!

ALL VALVES ARE SOLD SUBJECT TO FULL GUARANTEE—CURRENT VALVE LIST

AZ31	8/6	EBC41	7/6	EL33	7/6	PCF80	7/-	SP41	2/3	UCH21	12/3	6BW6	7/6	10P13	8/9
B36	5/6	EBF80	7/6	EL38	12/-	PCF82	7/9	SP61	2/3	UCH42	7/-	6CD6	25/6	10P14	8/9
CBL31	19/-	EBF89	8/3	EL41	7/9	PCF86	14/6	U22	6/6	UCH81	8/3	6D2	3/-	12AT6	7/3
CCH33	12/6	EBL31	20/-	EL84	6/9	PCL82	7/-	U24	10/-	UCL83	12/6	6F1	4/6	12AT7	4/6
CL33	10/-	ECC81	4/6	EM80	8/6	PCL83	9/9	U25	12/-	UF42	3/9	6F12	3/-	12AU7	5/6
D77	3/-	ECC82	5/6	EM81	8/6	PCL84	7/-	U26	9/6	UL41	7/-	6F13	6/6	12AX7	6/3
DAF91	4/6	ECC83	6/3	EM84	9/6	PCL85	15/-	U31	7/-	UL46	7/-	6F14	9/-	19BG6	14/6
DAF96	6/6	ECC84	7/9	EY51	7/9	PL33	8/-	U37	18/9	UL44	10/9	6F15	9/-	20F2	8/3
DF91	3/3	ECC85	7/6	EY86	7/6	PL36	9/9	U50	5/6	UL84	7/3	6F33	6/3	20L1	12/6
DF96	6/9	ECH21	12/3	EZ40	6/3	PL38	14/6	U52	5/-	UU8	14/6	6L1	12/-	20P1	9/6
DH63	6/-	ECH35	9/-	EZ41	6/9	PL81	8/6	U191	9/-	UU9	6/3	6L6	9/9	20P3	12/-
DH77	4/6	ECH42	7/6	EZ80	6/-	PL82	6/6	U281	9/-	UY41	6/-	6V6	5/-	20P4	16/6
DK91	5/6	ECH81	7/6	GZ32	8/9	PL83	6/6	U282	14/6	UY85	6/6	6L18	8/-	20P5	14/6
DK92	7/-	ECL80	6/9	GZ34	12/6	PL84	8/9	U301	17/6	W77	4/-	6L19	12/-	27SU	14/-
DK96	6/9	ECL82	9/3	KT33C	6/-	PY31	7/-	U801	22/-	Z77	3/-	6SN7	4/6	30C1	7/-
DL91	7/9	ECL83	11/9	KT36	8/6	PY32	10/-	UABC80	8/6	5U4	4/9	6U4	10/-	30FL1	9/3
DL92	5/9	EF39	4/3	KT61	8/3	PY80	6/-	UAF42	8/-	5V4	8/9	7C5	6/9	30L1	7/-
DL94	6/6	EF50	1/3	KT63	6/3	PY81	6/-	UB41	7/9	5Y3	5/9	7C6	7/-	30P4	10/9
DL96	6/6	EF80	4/6	KTW61	5/9	PY82	6/-	UBC41	7/9	5Z4	10/-	7S7	8/9	30P12	7/6
EABC80	7/3	EF91	3/-	KTW63	5/9	PY83	8/-	UBF89	7/9	6AL5	3/-	7Y4	6/9	52KU	10/-
EAF42	7/9	EF92	4/-	L63	2/9	PY88	12/-	UCC84	12/6	6AM6	3/-	10F1	4/6	53KU	10/-
EB41	6/6	EF85	6/3	PCC84	7/-	PZ30	8/-	UCC85	7/9	6AT6	5/3	10C1	10/-	54KU	8/6
EB91	3/-	EF86	8/9	PCC89	8/9	R18	10/-	UCF80	14/6	6BG6	12/-	10C2	13/-	185BT	14/-
EBC33	4/6	EF89	6/6												

These are only examples of our valves; if you do not see what you require send stamped addressed envelope for special quotation.

We pride ourselves that we can obtain and supply any TV spare, OUR GIGANTIC STOCKS INCLUDE: Line, Frame and Sound Output, Line and Frame Blocking Osc., Trans., and Scan Coils for any make or model Television.
Please ask us for ANY components you may require we are almost certain to have them.
TERMS: S.A.E. all enquiries. C.W.O. or C.O.D. 3/- extra. Postage on Valves, 6d. each C.R.T.s 12/6 inc. insurance. SATISFACTION ASSURED. RETURN POST SERVICE

(Continued from page 256)

main smoothing condensers. The lack of height indicates a faulty PL83 frame output valve.

BUSH TUG24

I would like your help on two problems I have with the above set. The vertical hold control no longer holds one complete picture on the screen. Instead the bottom half of the picture occupies the top half of the screen, and the top half occupies the lower half of the screen. This is the only stationary position of the picture. A few hours after this fault developed both raster and picture disappeared. On removing the back of the set, it was found that the EY51 was not lit and the PL38 was glowing purple.—T. D. Weston (Congleton, Cheshire).

If the PL38 glows purple it should be replaced. If it is blue, it is merely exhibiting the normal oscillation hue. Check the PZ30 if necessary, $2\mu F$ boost capacitor, etc.

Check resistors associated with frame hold circuit and the left side of the ECL80 valve to improve the frame hold trouble.

STELLA ST8514U

The raster is present but there is no picture or sound. I have checked the aerial and replaced the tuner valves (PCC84 and PCF80), also the PCL82 and the four EF80's.—W. J. (Reston, Berwickshire).

You should remove the turret from the tuner unit and replace the 6·8k 1W resistor, wired under the front, to pin 1 of the PCF80. We assume the aerial is in order.

PHILIPS 1446U

I would like some advice on the above set. When first switched on, the picture is dim and barely visible with the contrast on full, it is also slow in filling the screen. After about three quarters of an hour the picture becomes normal and clear when I can turn back the contrast control and it remains all right for the rest of the time it is on. I have replaced both PY81 and PL81 valves with no change. Interchange of other valves also makes no change.—A. Slack (Mansfield).

The tube is failing and is in need of replacement (Mullard MW36-24).

ULTRA VT9

There is a fault on the picture of this set on which I would like your help and advice. The top half of the picture can be adjusted without distortion, but the lower half shrinks rapidly, terminating in a bright line. From there downwards it is completely black. Using the height adjustment the screen can be filled with a badly distorted picture, but the lower half folds back on itself. —S. A. Cooper (Goodmays, Essex).

You should replace the Mazda 20P3 valve situated on the right front side. If necessary check the bias resistor (470Ω) and electrolytic capacitor ($250\mu F$) associated with pin 8 of its base socket.

COSSOR 937K

I have had trouble in obtaining channel 12 coils for this receiver. I have spare biscuits of channel 9 and would like to rewind them for channel 12. Could you please let me know how this can be done?—J. Heydrich (Inverness).

You should take one complete turn off the aerial biscuit, one turn off the R.F. winding (end of oscillator biscuit), two from the mixer grid winding (centre) and space out the turns of the oscillator coil if the core will not tune.

PYE RTL

Until recently this set gave quite a good picture, but now a 2in. black line has appeared across the bottom of the screen obscuring the bottom part of the picture. Could you please let me know what may be causing it?—W. Lomas (Bucknall).

We suggest you suspect a faulty PCL82 frame output valve. This is the tall valve at the back of the set on the right.

MURPHY V209

Could I replace the 14A97 metal rectifier in my receiver with one of larger current output, or use one of the new miniature silicon rectifiers? If so, what alterations are necessary.—W. Parry (Hemel Hempstead).

We have not tried silicon diodes in the V204, but have been advised that they are not really suitable. Try an Automat TV5, which is a more reliable type with a higher output than the 14A97.

FERGUSON C06T

After about eight months free of trouble, I am getting interference on sound. Channel 10 is all right, but on the BBC the sound is only about half volume and there is a continuous loud noise in the background all the time.—J. A. Moonie (Glasgow).

Since the ITA is unaffected, the trouble must lie either in the turret tuner or in the BBC aerial. If the fine tuning control requires to be set to one end of its travel to receive BBC, the core in the BBC oscillator coil in the tuner should be adjusted for maximum sound, when the fine tuning control is set to the centre of its travel.

However, if maximum sound on BBC is obtained when the fine tuning control is set to some definite point within its range, then the trouble most likely lies in the BBC aerial system. Check the aerial, the feeder and diplexer if fitted.

PHILIPS 1100U

The fault on this set is frame tear; an extended picture at the top, and compressed at the bottom. When I change the two ECL80s over the scan is correct at the bottom, but the picture is still compressed at the top. I have renewed one ECL80 frame output valve, but the effect is the same. The frame output valve gets very hot. I do not know if this is natural? I have also changed C60, $100\mu F$ electrolytic associated with V13A.— F. Griffiths (Greenford).

If the vision definition is smeared and the frame structure is paired according to the picture content, change the $10\mu F$ decoupling capacitor of the video amplifier. If the definition is not impaired, and you are sure the ECL80 on the left hand chassis is good, check the 390k and 680k resistors, 8,200pF; 33,000pF and $0{\cdot}47\mu F$ capacitors in the oscillator coupling to the height control.

FERGUSON MODEL 984.T

I would be grateful if you could help me with the following query. I would like to know the procedure for changing the C.R. tube.—J. T. Martin-Ross (London, N.W.7).

The picture tube is supported at the screen end in a cradle, to which it is clamped, and at the neck end by the focusing and deflecting assembly. The tube socket and anode connections should be removed, also the ion trap magnet. The bolts securing the clamping ring should be slackened sufficiently to allow it to be lifted out of the channel in the "tyre". It will now be possible, upon lifting the tube clear of the cradle, to withdraw it completely from the focusing and deflecting assembly. Great care should be taken when handling the tube as a sharp knock, even though it may not cause immediate fracture, may set up stresses in the glass that may lead to subsequent breakage. When replacing, make sure that the flared portion of the tube is as close as possible to the deflector coils. The ion trap magnet must also be adjusted for maximum brightness.

BUSH TV53

I would be most grateful if you could help me with the following fault on my receiver. The trouble is a white line which appears across the face of the tube about ¼in. width. It begins at about 3in. from the top of the screen then slowly moves down to just about the half-way mark and then stays there. Apart from this the picture and sound are good. I fitted a reconditioned tube about three months ago.—M. Guest (Leigh, Lancashire).

The effect is not so uncommon as you may think and is due to a faulty PCL83 frame oscillator-output valve.

PETO SCOTT TV 1724

The mains dropper was burnt out on this set and the fuse blown. I replaced these, and found the 23Ω wire wound resistor to the PY32 rectifier open circuited. I replaced this with a wire wound 25Ω, 5W resistor, but it is heating up enough to melt the solder joints. The PY81, PY32, PL36 and EY86 valves have all been tested. There is not much volume. There is no raster and no EHT and the EHT rectifier does not light up. —M. T. Irving (Northumberland).

It would appear that the line output stage is passing excessive current and if this is so the PL36 and/or PY81 should appear overheated. If they are, check the ECC82 and associated components.

G.E.C. BT5446

This set works well, with an excellent picture, but the line hold requires adjusting every 10 to 20 minutes. This control, when set, will move the picture sideways either way and appears correct in every way but will not remain set. I have changed all the valves without any difference but the N339 valves has had to be changed since. —J.H.S. (West Bridgford).

Low H.T. may be the cause of this trouble in which case suspect the metal rectifier. Also check R63-100Ω which goes to the screen of the N339 valve.

FERGUSON T988

The picture on this receiver has become dark, on both ITV and BBC. After the brightness and contrast controls have been adjusted, the picture can only be seen with the light off. Adjustment of the fine tuner and ion trap magnet does not improve it any.—R. J. Jordan (London, E.7).

If the brightness of the raster fluctuates (test by removing the aerial and turning up the brightness control to obtain unmodulated raster on the screen), the trouble could lie in the tube. If the brightness gradually fades and gradually returns to normal again, an intermittent partial short in the tube heater may be responsible. This can be proved by measuring the tube heater voltage on an A.C. voltmeter. The correct reading should be 6.3V. If below that value, and if there is a further reduction when the picture dims, the tube heater is almost certainly faulty as mentioned.

PILOT TW 54

The picture on this set is very dim. The contrast and brilliance controls have to be reset before a clear picture is obtained. Increasing either of these controls distorts and defocuses the picture. —T. J. Moore (Warwickshire).

Whilst the indications are of a failing tube which almost certainly requires replacement, you should check the setting of the ion trap magnet on the rear neck of the tube and change the EY51 EHT rectifier valve mounted on the line output transformer.

BUSH TV43

As I would like to increase the gain of this set by using the latest frame grid valves e.g. EF183, EF189s, could you advise me which valves in the vision and sound I.F. channels can be replaced? Also, would any modifications to the circuit be necessary.—A. Crookes (Bristol).

It is not wise to use frame grid valves in the I.F. stages without the advised (November issue) circuit modifications. A considerable increase in gain may be obtained by using a Mazda 30L15 in place of the PCC84 and by adjusting the coil cores of the I.F. transformer behind the tune unit (either side—top and bottom of the first EF80 I.F. stage).

QUERIES COUPON

This coupon is available until FEBRUARY 22nd, 1962, and must accompany all Queries sent in accordance with the notice on page 256.

PRACTICAL TELEVISION, FEBRUARY, 1962.

Published on the 22nd of each month by GEORGE NEWNES, LIMITED, Tower House, Southampton Street, London, W.C.2, and printed in England by WATMOUGHS LIMITED, Idle, Bradford; and London. Sole Agents for Australia and New Zealand: GORDON & GOTCH (A/sia), Ltd. South Africa and Rhodesia: CENTRAL NEWS AGENCY, LTD. Subscription rate including postage for one year: Inland £1.5.0, Abroad £1.3.6 (Canada £1.2.0). Registered at the General Post Office for the Canadian Magazine Post.

SETS & COMPONENTS

C. EDWARDS

1070 Harrow Rd., London N.W.10
Ladbroke 1734

500 S/H TV Sets must be cleared as taken part exchange. Condition unknown.

ALL SETS COMPLETE

12in. BBC	**25/-**	13 Channel	**50/-**
14in. ,,	**50/-**	,, ,,	**75/-**
17in. ,,	**85/-**	,, ,,	**125/-**

Plus 15/- carriage

Guaranteed Valves

10C2 **10/-**, 20D1 **6/-**, 6K25 **8/-**, PL38 **10/-**, PL81 **8/-**, PY81 **8/6**, PY80 **7/6**, PZ30 **10/-**.

SURPLUS, AND NEW VALVES, guaranteed. S.A.E. for list. Also reclaimed Valves. tested. perfect; 5/- maximum. plus 6d. postage each. Genuine Valve bargains. Valves bought. LEWIS, 46 Woodford Avenue, Ilford, Essex.

DARLING . . . I coult sit and admire it all day long now I've a Prime Electrics TV tube. Carriage free. year's guarantee. 12in., 14in. **95/-**; 15in., 17in. **£5**; 21in. **£7/10/-**. S.A.E. 38 Queensdale Road, London, W11.

TUBES - VALVES - SPARES

TUBES 6 mon. Guar. FITTED FREE 9-10-12in. **30/-**, 14in. **40/**. 17in. **50/-**.
VALVES. 50,000 in stock. 1,000 types. All set tested before despatch.
Examples:

5UA	4/6	EBC41	6/-	N37	4/6
5V4	4/6	EBC90	4/6	N108	10/-
5Z4	4/6	EBF80	6/-	PCC84	4/6
6AF6	6/-	EB91	2/-	PCF80	4/6
6AQ5	4/6	ECC81	3/-	PCL83	7/6
6BA6	4/6	ECC82	4/6	PenA4	5/-
6BE6	4/6	ECC83	4/6	PL38	10/-
6BG6	10/-	ECC84	4/6	PL81	4/6
6BW6	4/6	ECC91	4/6	PL82	4/6
6DC6	17/6	ECH35	6/-	PL83	4/6
6CH6	4/6	ECH42	6/-	PY31	4/6
6C9	6/-	ECF80	4/6	PY80	4/6
6K25	7/6	ECL80	4/6	PY81	4/6
6L18	4/6	EK90	4/6	PY82	4/6
6P25	4/-	EF80	2/-	PZ30	4/6
6V6	4/6	EF92	4/6	R19	7/6
6X4	4/6	EF95	4/6	MU14	5/-
7S7	4/6	EL38	4/6	SP61	2/-
7C5	4/6	EL81	4/6	U22	4/6
10C2	6/-	EL90	4/6	U24	7/6
10F1	3/-	EY51	4/6	U25	10/-
10P13	6/-	EY86	4/6	U37	12/6
12BH7	6/-	FC4	5/-	U31	4/6
20L1	6/-	FC13	4/6	U35	4/6
20P1	4/6	KT36	4/6	U191	7/6
20P3	6/-	KT66	7/6	U281	6/-
185BT	12/6	KT81	4/6	UL41	4/6
B36	4/6	KT67	7/6	UL44	6/-
DDT4	5/-			UU8	10/-

Most Pre-war 4, 5, 7 and 9 pin valves of British, European and American manufacture, 5/- each. Postage and packing 6d. per valve. Orders over £1—free.
NEW TRANSISTORS. Red Spot **2/6**. OC45, OC72, OC76, **7/6**. OC35 (1 watt power), OC201 (Silicon) **20/-**. Postage 3d. each.
SPEAKERS: 6in. 5/-. Postage 2/-.
LINE OUTPUT TRANSF. from **20/-**.
CONSTRUCTOR'S PARCEL. 2lbs. assorted components from TV Sets, resistors, condensers, pots, electrolytics, valve-holders, etc., **7/6**. Postage 2/6.
VALVE PARCEL. 12 valves, all different, as taken out of TV sets, ideal spares. **8/6**. Post and Packing 1/6.
Send stamp with enquiries or for full list of 1000 valves, tubes, transistors, etc., to: **"ST. JOHN'S RADIO,"** 3 Jews Row, London SW18. *Phone*: VAN 8822

RATES: 4/- per line or part thereof, average five words to line, minimum 2 lines. Box No. 1/- extra. Advertisements must be prepaid and addressed to Advertisement Manager, "Practical Television" Tower House, Southampton St., London, W.C.2.

"HEATHKITS" can now be seen in London and purchased on H.P. Free brochure. DIRECT TV REPLACEMENTS LTD., 138 Lewisham Way, SE14. TID 6666.

13 CHANNEL Turret Tuners less valves **17/6**. P. and P. 2/6. CAPITAL TELEVISION, 382 Brockley Road, Crofton Park, SE4.

TV SPARES

LINE OUTPUT TRANSFORMERS

A few examples from our extensive range.

TELEPHONE ORDERS SENT SAME DAY C.O.D.

Alba T301, 304, 394, 484, 494, **42/6**.
Alba T321, 324, 424, 524, **39/6**.
Baird 164/5/7, 172/5, 1812/15, **62/6**.
Baird P2014/7, P2114/7, **58/6**.
Banner B112/4/7, 124, 412, 436, **65/-**.
Beethoven B77, 80, 94-9, 106-9, **65/-**.
Bush TV53, **69/6**; TV24C, **89/6**; TUG34, **5 gns.**
Cossor 930-9, **58/6**; (new), **30/-** (used).
Decca C14/17, **58/6**; DM14/17, **55/-**.
Ekco T221, 231, 311, 284, 330, **55/-**.
Ekco T161, TC162, TC166, TU169, **30/-** (used).
Ferguson 992/6/8 **66/9**; (new) **30/-** (used).
Ferguson 205-246; **66/9**; 306/8, **58/6**.
Ferranti 14T3/4/5, **47/6**; 14T2/T1225, **62/6**.
Ferranti T1002/5, **55/-**; T129-138, **47/6**.
G.E.C. BT, 1251/2 1746/8, 2250, **50/-**.
H.M.V. 1824/9, 1840-8, 2805-5902, **69/6**.
K.B. NF 70/FM, MV/OF 100, PVP20, **75/-**.
Masteradio T917, TE7T, T409/12, etc, **58/6**.
McMichael TM/C/CR 51-2, **55/-**; C/R 53 **75/-**.
Murphy V 240/250/280, **65/-**; V200, **49/6**.
Pye/Pam/Invicta V4/7, VT4/7, LV30, FV1 908-958, T118-120. **55/-**. CS17, etc., **75/-**.
New Scan Coils on all above 65/-.
Peto-Scott TV122/4/6, **67/6**; TV1411, **72/6**.
Philco 1457-67, 1717-47, 1753-77, **87/6**.
Philips 1114U, 1115, 1437, 1446, **89/6**.
Pilot CV76, 77, 84, 87, etc. **65/-**. TV94, **89/6**.
Portadyne TA 17, T237, T417, used, **39/6**.
R.G.D. C55, 1455/6, 1755/6/7, etc. **89/6**.
Ultra VT9/17, etc. with U25 **5 gns.**
Vidor CN4206-12, **59/6**; CN4217-31, **65/-**.
We stock or can obtain most L.O.T.'s Scan Coils, Frame O.P.'s and spares.
PLEASE SEND S.A.E. FOR IMMEDIATE QUOTE.
Callers welcome. Open all day Saturday. Terms C.W.O. or C.O.D. Add **2/6** P. & P.

NEW TV BARGAINS

We have a limited number of 1962, Slim line Television Receivers by Famous Makers at special prices. For example 17 inch, List **57 gns. Our Price 44 gns.,** plus **25/-** Carr. & Ins., 110 Tube, Printed Circuit. Contemporary Styling. All Channels. Full guarantee. All in sealed boxes. Immediate despatch on your order.

TELEVISION CONSUMER SERVICES LTD.

112 CAMBERWELL RD., S.E.5.
RODney 7917

SETS & COMPONENTS
(continued)

TV TUBES

12 MONTHS' GUARANTEE

12in. and 14in.	**£5.0.0**
15in. and 17in.	**£5.10.0**
21in.	**£7.10.0**

7/6 allowance on old glass

All fitted new American Guns.

Phone or Call only NUN 3946

FELMARC LTD.

15 Kingsway, Nuneaton, Warks.

Callers to Works:

R/O 15 Marlborough Road

VALVES EX-TV sets **10/-** doz. Lists free. 14 Cricklade Road, Swindon.

TUBES! BRAND NEW, 12in., 14in., **£3-£4**. One year guarantee. Also most rebuilds. Finest value! 3 Pank Avenue, New Barnet. BAR 1934.

REBUILT TUBES with 13 months' written guarantee. New Gun Mounts. 12in **£4/17/6**; 14in. **£5/7/6**; 17in. **£5/17/6**; 21in. **£7/10/-**. 110° Tubes 5/ extra. Carriage free. Terms C.W.O. ALLAN TUBES.49 Barnehurst Avenue. Barnehurst. Kent.

Television Tube Shop

now stock

Tubes for every make of set

OVER 600 TUBES IN STOCK

12 inch Mullard type ...	£4. 5.0
12 inch Mazda type ...	£4.15.0
14 inch Mullard type ...	£5. 5.0
14 inch Mazda type ...	£5.10.0
15 inch Mazda type ...	£5.15.0
16 inch G.E.C. & Mullard type	£6.12.6
17 inch Mazda & Mullard type	£6.10.0
17 inch G.E.C. & Brimar type	£6.15.0
21 inch Mullard type ...	£8. 0.0

Add 10/- for insured carriage to your door within 48 hours, or 5/- via B.R.S.
Terms £2 down (plus carriage).
All tubes tested before despatch and guaranteed for 12 months. Guarantee cards enclosed with each tube.
New Purchase of 110°, 17 inch tubes—
Slight mark, Guaranteed for 12 months. Mazda CME 1703, GEC 7405A replace AW43-88, **£5.**
Shop Soiled Tubes.
(Slight scratches or marks) Guaranteed 12 months. Ideal for second set. 12in. 3/18, 3/31 **37/6**. MW31-74 **50/-**, 14in. MW 36-44 **52/6**. CRM141 **55/-**. 17in. CRM171, MW 43-64 **60/-**.
Others available from time to time. Please enquire. Old bulb required.
Service Engineers
Our Rebate Scheme shows real savings —send for details.

Television Tube Shop

48 Battersea Bridge Road, S.W.11

BAT 6859
Just South of the Bridge. Open Saturdays.

LINE OUTPUT TRANSFORMERS

SCAN COILS SPECIALISTS

See End Column

Make	Models	L.O.Tx. Prices
ALBA:	T301, T304, T394, T484, T494, etc.	47/6
BUSH:	TV11A, 11B, 12A, 12B, TVG12A, 12B, TRG12A, 12B	45/-
	TVG26, TV32, TV33, TVG34, TVG34A, T36, TV36, TVG36, TV36C, TVG36C, TV43	89/6
	TV53, TV56, T57, TV57 ... TVG58, TV62, TV63, TV66, TV67, etc.	95/-
	TV80 with EY51	110/-
COSSOR:	930 & T, 931, 933-4-5, 937, 938A & F, 939 & A & F ...	62/6
	943T, 940-946, 945, 945B,	59/6
	945F, 947, 949	69/6
DECCA:	D17 & C	69/6
	DM1, DM2C, DM3, DM4/C	75/-
	DM5, DM14, DM17, 444 555	75/-
DEFIANT:	TR1453, TR1753	59/6
DYNATRON:		
EKCO:	TS93, TC8102, TS105, TS114, TRC124, TC138, TS188, TS193	55/-
	TRC139, TC140, T141, TV 142	79/6
	T161, TC162, Y164, T165, etc.	79/6
	TC208, TV209, T231, T221 T231F, T248, T283, T284, T293, etc.	59/6
FERGUSON:	103T, 105T, 113T, 135T, 145T	66/6
	941T-953T inclusive ...	59/6
	991T-997T inclusive ...	69/6
	203T-246T inclusive ...	69/6
	306T, 308T	65/-
FERRANTI:	14T3, 14T3F, 14T4 ...	48/6
	17K3 & F. 17T3 & F. ...	48/6
	17K4 & F, 178K4 & F. ...	48/6
	17T4 & F.	48/6
	14T5, 17SK5, 17K5 ...	48/6
G.E.C.:	BT1251, BT1252, BT1746, BT1748, BT4743	49/6
	BT4643, BT5147, BT5246-48	89/6
	BT5348-BT5643R inclusive	49/6 and 89/6

Scancoils, Osc. and Output Txs. for all above makes available.

Post and Packing 3/6. All Enquiries S.A.E.

See End Column

WYNDSOR TELEVISION
Dept. P.T.
ST. ALBANS RD., BARNET, HERTS.
BAR 1769

SETS & COMPONENTS
(continued)

NOW AVAILABLE ! !
REDWATT
Replacement Picture Tubes
Fully Guaranteed and Incorporating all the Latest Developments
Introductory offer:

12in. Types	£4.17.6
14in. Types	£5.2.6
15-17in. Types	£5.7.6
21in. Types	£7.15.0

AW43/88, 89, 110 deg. Types £6.10.0
Carr./Ins. 10/-
C.W.O. to:
REDWATT TUBE DISTRIBUTORS
41 Denmark Street, Wakefield, Yorks.

BRAND NEW VALVES AND TUBES!
12/14 in. £3. Also others, Mullard EM1, etc. U25 and PY32, 9/11, PL81 7/11, U801 17/6, ECC82 5/-.
Numerous other bargains
P. BEARMAN
3 PANK AVENUE, NEW BARNET
Tel: Bar 1934
(& Ansaphone Service)

TUBES-AERIALS-VALVES

Regunned tubes, guaranteed one year, full range of aerials and fittings. I.T.V. boosters, valves, brayhead tuners, T.V. sets, transistor radios and all electrical appliances. Co-axial cables and house wiring cables, fluorescent fittings.
All quotations without obligation. Special terms to the trade and Home Engineers. S.A.E. for Catalogue.
G. A. STRANGE
BROADFIELD, NORTH WRAXHALL,
Nr. Chippenham, Wilts. Tel. Marshfield 236

Television Picture Tubes

Twelve Months
Manufacturers' Guarantee

12 inch	ALL Types	£5. 0. 0
14 inch	„ „	£5. 10. 0
15 inch	„ „	£7. 0. 0
16 inch	„ „	£7. 0. 0
17 inch	„ „	£7. 0 0.
21 inch	„ „	£8. 15. 0

Deposit 20/- plus 12/6 carriage.
Tubes for ALL H.M.V. and Marconi sets at reduced prices.
A few shop-soiled tubes at £4.

Cathode Ray Tube Service
35 Broomwood Road
St. Paul's Cray, Kent
Orpington 21285

LINE OUTPUT TRANSFORMERS

SCAN COILS SPECIALISTS

See First Column

Make	Models	L.O.Tx. Prices
H.M.V.:	1824 & A to 1831 inclusive	67/6
	1840, 1841, 1842-1848 ...	67/6
	All models available.	
INVICTA:	T118, T119, T120 ...	55/-
	All other models available.	
K.B.:	LFT50, LVT50, LFT60, MV60	107/6
	All models available.	
MARCONI:	All models available.	
MASTERADIO:	Most models in stock.	
McMICHAEL:	Most models in stock.	
MURPHY:	V200, V202C	57/6
	V240, V250	95/-
PETO SCOTT, PHILCO:	Most models in stock.	
PAM:	908, 909, 952, 953, 958 ...	55/-
PHILIPS:	1768U, 2168U	105/-
	1100V, 1200V	75/-
	122GU, 1236V, 1238V ...	75/-
	114UF, 114UM, 115U ...	75/-
	1437U, 1446U	75/-
	Most models in stock.	
PILOT:	Most models in stock.	
PYE:	CTM4, FV4C, FV4COL ...	55/-
	V4, VT4, V7, VT7	55/-
	LV30, FV1, FV1C	69/6
	C817F, CTM17F, CW17 ...	69/6
	CW17C, CW17CF, CW17F, etc.	69/6
	Most models in stock.	
RAYMOND:	Most models in stock.	
REGENTONE:	All models available.	
R.G.D.:	6017T, 7017, C54, etc. ...	59/6
	Most models in stock.	
SOBELL:	TS17, T346	65/-
	Most models in stock.	
STELLA:	ST5721U	105/-
	ST8617U, ST8621U ...	105/-
	ST8917U	105/-
	ST6414U, ST6417U ...	75/-
	ST8314U	75/-
ULTRA:	86 series, 815 series, with U25, etc., complete ...	79/6
	Most models in stock.	
VIDOR:	CN4217-CN4231 inclusive	65/-

Scancoils, Osc. and Output Txs. for all above makes available.

Post and Packing 3/6. All Enquiries S.A.E.

SEE FIRST COLUMN

WYNDSOR TELEVISION
Dept. P.T.
ST. ALBANS RD., BARNET, HERTS.
BAR 1769

FOR SALE

ALUMINIUM LADDERS/STEPS. Gigantic offer, 400 models. SANCO LTD., 17 (P.T.) Boundary Rd., Hove.

100 BAYS of Brand New adjustable Steel shelving, 73in. high by 34in. wide by 12in. deep, stove enamelled dark green. Sent unassembled. Six shelf bay—**£3/15/-.** Sample delivered free. Quantity discounts. N. C. BROWN LTD., Eagle Steelworks, Heywood, Lancs. Tel.: 69018.

Television Tubes Rebuilt. Please note we have appointed M/S R. S. Strudwick, 17 Hollingdean Road, Brighton 7, as Sole Agent for our Genuine Rebuilt Television Tubes for the South Coast. For details of prices, etc., please refer to our advertisement in the inside front cover.

MARSHALL'S for TELEVISION LIMITED

131 St. Ann's Road, Tottenham, London, N.15.
Stamford Hill 3267 & 5555

1,000 TELEVISIONS, all makes, from £3 working, 10/- not. Callers only. 9 till 6 including Sats. 39 Whitehorse Lane, Stepney, London.

Star TV Tubes

70/-

all sizes up to and including 17in. includes old glass or plus 7/6 without

C.W.O. Carriage 7/6

WHY PAY MORE

new guns, 12 months' guarantee

also 20/- each

12in. 14in., Part Exchange Televisions.

Callers only.

ARTHUR SLARK

43-45 Thicketford Road, Tonge Moor, Bolton

Phone: 26684

VALVE CARTONS at keen prices. Send 1/- for sample and list. J. & A. BOXMAKERS, 75a Godwin Street, Bradford, 1.

GARRARD 210 £9/8/6; B.R.S. UA14 £7/15/-; T.U.9 £4/2/6. Set of 7 Transistors, standard quality, 32/6. Full list from:—H. F JAMES, 21 Claremont Road, Twickenham, Mdx.

METAL RECTIFIERS

RECTIFIERS—CONTACT COOLED.
14RA1282 (FC101) type 250 v., 250 mA, 13/6; 14RA1283 (FC31) type 250 v., 300 mA, 17/6; 350 mA, 19/6.
RECTIFIERS—FIN TYPES
Equivs. for RM4 250 v., 250 mA, 13/6; RM5 250 v., 300 mA, 17/6; 14A989 400 mA, 18/6; 14A86 16/6; 14A97 19/-; 14A100 22/6; 14A124 19/6; LW7 17/6.

CABY MULTIMETERS

A10 - 16 ranges, £4.17.6; B20 - 20 ranges, £6.10.0. S.A.E. for full details.
ARMCHAIR EXTENSION VOLUME CONTROL unit for TV Radio Amplifiers, etc. Easily fitted, perfectly safe, 14/6.

TRANSISTORS ALL 1st GRADE

OC81 6/-, OC44 9/6, OC45 8/6. Set of 6 + Diode, 40/-. OC170 9/6, OC28 16/-.
Under £1 P. & P. 6d., over £1 Post Free. C.O.D. 2/6.

DURHAM SUPPLIES

175 Durham Road, Bradford 8, Yorkshire.

SALVAGED VALVES TESTED ON A MULLARD HIGH SPEED VALVE TESTER

AC/P	2/6
B36	2/6
B65	4/-
D1	2/6
D63	2/6
D77	2/6
DAF91	4/-
DD4	2/6
DD41	2/6
DDL4	2/6
DF91	4/-
DH77	4/-
DK91	4/-
EA50	1/3
EB34	1/3
EB41	1/3
EBC33	2/6
EBC41	4/-
ECC32	2/6
ECC34	2/6
ECC81	4/-
ECC82	4/-
ECL80	4/-
EF50	1/3
EF80	2/6
EF91	1/3
KT33C	1/3
KT42	2/6
KT61	2/6
KTZ41	2/6
L63	2/6
MPT4	2/6
P41	2/6
P61	2/6
PCC84	4/-
PCF80	4/-
PCL82	4/-
PCL83	4/-
PCL84	4/-
PEN45	2/6
PEN46	2/9
PL33	4/-
PL81	4/-
PL82	4/-
PL83	4/-
PL84	4/-
PY31	4/-
PY32	4/-
PZ30	4/-
SP41	1/3
SP42	2/6
SP61	1/3
U31	4/-
U251	4/-
UF42	2/6
VP4	4/-
VP4B	4/-
W77	2/6
X81	4/-
Z63	2/6
Z66	2/6
Z90	1/3
Z719	2/6
4TPB	2/6
6AL5	2/6
6AM6	1/3
6BW7	4/-
6BX6	2/6
6C6	4/-
6D6	4/-
6F12	1/3
6F13	1/3
6J5	2/6
6J7	2/6
6P25	2/6
6P28	2/6
8D3	1/3
9D6	2/6
9D7	4/-
10C1	4/-
10C2	4/-
10F1	4/-
10LD11	4/-
20F2	4/-
20L1	4/-
20P1	2/6
20P3	4/-
20P4	4/-
20P5	4/-
25L6	2/6
30C1	4/-
30L1	4/-
30PL13	4/-
32	2/6
42	2/6
43	2/6
807	4/-

EXAMPLES

FULL CATALOGUE 9d.

VALVE HOLDERS
American Octal .. .. ..5/-doz.
Noval .. .. .. 9d. ea.

RESISTORS
Card of ½W Resistors, 72 valves covering complete 10% range. 24/- per card.
Full range of separate Resistors, Condensers, etc.

VARIABLE CONDENSERS
3-50pf concentric trimmers 3/- doz.
Banks of six compression trimmers, 3-30pf.. .. 6d. ea.

GEC CRT'S (SALVAGED)
SPECIAL OFFER
16in. G.E.C. 6901 .. ..30/-ea.
12in. G.E.C. 7102 .. ..10/-ea.
Personal Callers Only

35M/cs and 16M/cs TURRET TUNERS, less valves
(Ex receivers) 12/6
We can often supply for the actual set you want to fit the tuner in.

TRANSFORMERS
CRT Boost Transformers. 2V, 4V, 6V, 10V, 13V
State which required ..12/6 ea.
Heavy Duty Output Transformers, 6 ratios from 13 : 1 to 43 : 1 .. .. ..25/-ea.
Miniature Output Trans. .. 3/9ea.
Standard Output Transformers, Multi-match ..10/-ea.
Transistor Drives: 1-1 CT 10/-ea. 3.6-1 CT 12/6 ea.
Transistor Output: 6.6-1 CT 10/-ea. 9.2-1 CT 10/-ea.
Microphone Transformers, ratio 65 : 1 .. ..35/-ea.

I.F. TRANSFORMERS
Standard 465kc/s .. 12/6 per pair
Midget 465 kc/s .. 16/- per pair

AUTO TRANSFORMERS

250W	67/6 ea.
100W	27/6 ea.
50W	20/- ea.

TRANSISTORISED FAULT FINDER
Enables faults to be located quickly. Consists of a two-transistor, multi-vibrator in a box. Complete with battery. 32/6

CRYSTALS
GENUINE MULLARD. Boxed

OA5	6/-	OA81	3/-
OA70	3/-	OA85	3/-
OA79	3/-	OA91	3/6

TRANSISTORS

OC16W	48/-	OC75	8/-
OC19	48/-	OC72	8/-
OC26	25/-	OC76	8/-
OC44	11/-	OC78	8/-
OC45	10/-	OC81	8/-
OC70	6/6	OC82	18/-
OC71	6/6	OC170	17/6

TERMS: C.W.O. or C.O.D.
Orders under £1, P. & P. 1/3.
Open till 11 p.m. most days.

3d. stamp for list or 9d. for full catalogue

Arion Television

4 Maxted Road, S.E.15 NEWX 7152

WANTED

WANTED NEW VALVES and Transistors, any quantity. S. N. WILLETTS, 43 Spon Lane, West Bromwich, Staffs. Tel.: WES 2392.

A PROMPT CASH OFFER for your surplus brand new Valves, Speakers, Components, Test Instruments, etc. R.H.S., Beverley House, Mannville Terrace, Bradford 7.

NEW VALVES WANTED — EY51, ECL80, PCC84, PCF80, PCL93, PL81, PCL82, PY81, R19, U801, 30P4, etc. Best cash prices by return. DURHAM SUPPLIES, 175 Durham Road, Bradford 8, Yorks.

SERVICE SHEETS

SERVICE SHEETS. Television 4/3; Radio 2/9. DARWINS, 19 George St., St. Helens, Lancs.

SERVICE SHEETS, Radio, TV, 5,000 models. List 1/-. S.A.E. enquiries: TELRAY, 11 Maudland Bk., Preston.

SERVICE SHEETS. Radio and TV 4/- each. List 1/-. All orders dispatched on day received. Also Manuals for sale and hire. S.A.E. please. SULTAN RADIO, 29 Church Road, Tunbridge Wells, Kent.

SERVICE SHEETS

For all makes of Radio and Television—1930-1962. Prices from 1/-.
Free fault-finding guide with all Service Sheets. Please send S.A.E. with enquiries. Catalogue of 6000 models, 1/6.

Special offer of 125 Radio/TV Sheets covering 370 popular models, 20/-.

HAMILTON RADIO
Western Road, St. Leonards, Sussex

SERVICE SHEETS; also Current and Obsolete Valves for sale. JOHN GILBERT RADIO, 20 Extension, Shepherd's Bush Market, London W12 (Phone: SHE 3052).

GENUINE SERVICE SHEETS. Radio/TV 5/- each, post paid. REDWATT TUBE DISTRIBUTORS, 41 Denmark Street, Wakefield, Yorks.

SERVICE SHEETS. Radio and Television 4/- each, list 1/-. All old and modern receiver sheets available. Faultfinder files 2/- each. List now available 1/-. KAYBRO PUBLICATIONS, 44 Old Bond Street, London W1.

SERVICE DATA LIBRARY: All Models—TV, Radio, Tape Recorders, Amplifiers, etc.
ADVISORY SERVICE: Send for specially developed Fault Diagnosis Questionnaire.
PRACTICAL BOOKS: TV, Radio Tape Recorders, Hi-Fi, Test Instruments, Servicing, etc.
IMMEDIATE SERVICE: S.A.E. to

GORDON J. KING

"KINGSFORD", SOUTH FURZEHAM ROAD, BRIXHAM DEVON. Tel: Brixham 2304

(Continued on next page)

SITUATIONS VACANT

UNITED KINGDOM ATOMIC ENERGY AUTHORITY ATOMIC ENERGY ESTABLISHMENT, WINFRITH

Vacancies exist at the A.E.E., Winfrith, for

ELECTRONIC and INSTRUMENT MECHANICS

Applicants should have experience of electronic equipment and industrial process control instruments, and of work involving fault diagnosis, repair and calibration for a wide range of instruments used in nuclear reactors and associated experiments. The work requires a good knowledge of instruments for measuring and automatically controlling flow pressures and temperatures of liquids and gases, as well as pulse techniques, wide band and D.C. amplifiers, counting circuits and associated test equipment.

Excellent working conditions including sick pay and pension scheme. Housing may be available to the successful applicants, but this would be determined at time of interview.

Further details and an application form may be obtained on request from

THE LABOUR DEPARTMENT, A.E.E., WINFRITH, Dorchester, Dorset, quoting ref. IM/JAN.

EDUCATIONAL

$$X = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

DON'T FUMBLE with Formulae. Master Mathematics quickly and easily the Understandable Way.

1st lesson and details FREE

The Dryden School of **UNDERSTANDABLE MATHEMATICS**
11v Dryden Chambers, Oxford St. London, W.1.
Name.........................
Address.........................
....
....

ELECTRONICS

Key to YOUR Future?

An exciting career—A new Hobby—Your own spare- or full-time BUSINESS?

New experimental course includes big kits for building test gear and a complete AM/VHF receiver.

FREE brochure from

RADIOSTRUCTOR
DEPT. E78, READING, BERKS.

EDUCATIONAL
(continued)

THE INCORPORATED Practitioners in Radio and Electronics (I.P.R.E.) Ltd. Membership Conditions booklet 1/-. Sample copy of I.P.R.E. official Journal 2/- post free. Secretary, 20 Fairfield Road, London N8.

"HOW AND WHY" of Radio and Electronics made easy by a new non-maths practical way. Postal instructions based on hosts of experiments and equipment building carried out at home. New courses bring enjoyment as well as knowledge of this fascinating subject. Free brochure from Dept. 12, P.T. RADIOSTRUCTOR, Reading.

Radio Television & Electronics

Learn at home with the world's largest home study organisation, Brit. I.R.E.; City & Guilds; R.T.E.B., etc. Also Practical Courses with equipment. No books to buy.

Write for FREE prospectus stating subject to

Dept. 516 I.C.S.
Intertext House, Parkgate Road, London, S.W.11.

BOOKS & PUBLICATIONS

FIND TV SET TROUBLES in minutes from that great book. "The Principles of TV Receiver Servicing". **10/6** all book houses and radio wholesalers. If not in stock, from Secretary I.P.R.E., 20 Fairfield Rd., London N8.

RES/CAP. BRIDGE 38/-
p. & p. 2/6

Checks all types of resistors, condensers 6 RANGES

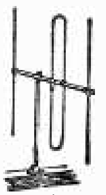
Built in 1 hour. Direct reading

READY CALIBRATED

Stamp for details of this and other kits.

RADIO MAIL (Dept. UV)
Raleigh Mews, Raleigh Street, Nottingham

BBC - ITV - F.M. AERIALS



B.B.C. (BAND 1). Telescopic loft, **19/6**. External, S/D, **26/3**.
I.T.V. (BAND 3). 3 Element loft array, **24/-**. 5 Element, **32/6**. Wall mounting, 3 Element, **33/9**. 5 Element, **41/3**.
COMBINED B.B.C. + I.T.V. Loft 1+3 Element, **41/3**. 1+5 Element, **48/9**. Wall mounting, 1+3 Element, **56/3**. 1+5 Element, **63/9**. Chimney and mast mounting units also available.
F.M. (BAND 2). Loft "H", **28/-**. 3 Element loft, **52/6**. S/D loft, **12/6**. External S/D, **26/3**. State channel when ordering. C.W.O. or C.O.D. P.P. 2/6. Coaxial cable, 8d. yd. Coaxial plugs, **1/3**. Send **6d.** stamps for illustrated lists.

K.V.A. ELECTRONICS (Dept. P.T.)
3B Godstone Road, Kenley, Surrey

FIRST-CLASS TELEVISION and RADIO COURSES

GET A CERTIFICATE!

After brief, intensely interesting study—undertaken at home in your spare time—**YOU** can secure your professional qualification or learn Servicing and Theory. Let us show you how.

FREE GUIDE

The New Free Guide contains 132 pages of information of the greatest importance to those seeking such success-compelling qualifications as **A.M.Brit.I.R.E., City and Guilds Final Radio, P.M.G. Radio Amateurs' Exams., Gen. Cert. of Educ. London B.Sc. (Eng.), A.M.I.P.E. A.M.I.Mech.E., Draughtsmanship (all branches)** etc., together with particulars of our remarkable Guarantee of

SUCCESS OR NO FEE

Write now for your copy of this invaluable publication. It may well prove to be the turning point in your career

FOUNDED 1885—OVER 150,000 SUCCESSES

NATIONAL INSTITUTE OF ENGINEERING
(Dept. 462), 148 HOLBORN LONDON, E.C.1

S. Africa: P.O. Box 8417, Jo'burg.
Australia: P.O. Box 4570, Melbourne.

NEW VALVES!

Guaranteed Set Tested

24-HOUR SERVICE

1R5, 1S5, 1T4, 3S4, 3V4, DAF91, DF91, DK91, DL92, DL94, SET of 4, 18/6.
DAF96, DF96, DK96, DL96, SET of 4 **26/-**.

1D5	7/-	DL35	9/6	PCC89	9/-
1R5	6/-	DL92	5/11	PCF80	7/9
1S5	4/6	DL94	6/9	PCF82	7/6
1T4	3/3	DL96	6/9	PCL82	8/3
3S4	5/11	EB91	3/-	PCL83	11/6
3V4	6/9	EBC41	7/6	PCL84	9/9
5U4G	4/6	EBF80	7/9	PL36	10/9
5Y3GT	5/9	EBL21	12/6	PL81	8/6
5Z4G	8/6	ECC40	14/6	PL82	6/6
6AM6	2/9	ECC81	4/9	PL83	6/6
6K7G	1/9	ECC82	5/9	PL84	8/-
6K8G	4/9	ECC83	6/9	PY32	11/-
6Q7G	5/6	ECC84	8/-	PY80	7/-
6V6G	4/-	ECC85	7/6	PY81	7/-
6V6GT	6/6	ECF80	7/3	PY82	6/-
6X5GT	4/6	ECF82	8/3	PY83	7/3
12K7GT	4/3	ECH21	12/6	U25	11/6
12K8GT	9/-	ECH42	7/9	UABC80	6/-
12Q7GT	4/6	ECL80	6/9	UAF42	8/-
12SN7GT	7/9	EF40	12/3	UBC41	7/-
35L6GT	8/-	EF41	7/6	UBF80	8/-
35Z4GT	5/-	EF80	4/3	UCC85	7/-
AZ31	8/9	EF85	4/6	UCH21	12/6
CL33	11/9	EF86	8/9	UCH42	7/6
DAC32	8/6	EF89	6/9	UCH81	7/6
DAF91	4/6	EF91	2/9	UCL82	9/3
DAF96	6/9	EL41	9/-	UCL83	13/-
DF33	8/6	EL84	6/3	UF41	6/6
DF91	3/3	EY51	7/3	UF89	6/9
DF96	6/9	EY86	7/6	UL41	7/6
DH77	6/-	EZ40	6/-	UL84	6/6
DK32	10/6	EZ41	6/9	UY21	13/-
DK91	6/-	EZ80	5/9	UY41	5/6
DK92	7/3	EZ81	6/-	UY85	6/3
DK96	7/3	MU14	6/-	VP4B	8/6
DL33	7/6	PCG84	7/-	Z77	2/9

Postage 6d. per valve extra. Any Parcel Insured Against Damage in Transit 6d. extra. Any C.O.D. Parcel 3/- extra. Office address, no callers.

GERALD BERNARD
(Note new address—formerly of Leeds)
83 OSBALDESTON ROAD, STOKE NEWINGTON, LONDON, N.16