MARCH 1961

RADIO Retailing

SERVICE ENGINEER

Radio, Television and Audio Servicing

SERVICE ENGINEER

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Edited by W. Norman Stevens

Issued as a special supplement with "Radio Retailing"

In this issue:

SERVICE DATA SHEETS

SI5: Peto Scott *Fanfare* tape recorder.

TV174: Sobell TPS710/McMichael MP20 series television receivers

TV175: Murphy V350 series television receivers.

Transient Surge Detector

from Portable Welders

Portable Welders Ltd., of Castle Mills, Buckingham, have introduced a transient voltage surge detector which, when connected to the circuit under test, will enable the actual surge to be seen on a c.r.o. as a fixed image. Differing capacitance values are then brought in until the surge is greatly reduced and then resistance is brought in until the surge is further reduced or completely disappears.

The values of C and R obtained become the suppression constants for the particular network. Frequencies and voltages used in the network under actual working conditions are immaterial, the transient surges having already been greatly reduced or completely eliminated. The whole time taken to establish the exact C and R values in a complex circuit is as little as ten minutes.

The detector is housed in a steel case, $6\times7\times9\frac{1}{4}$ in., and weighs 5 lb. Price is £30.

TRANSISTOR DATA BOOK

Published by Avo

We have received a copy of the Avo International Transistor Data Manual, published by Avo Ltd., Avocet House, 92–96 Vauxhall Bridge, London, S.W.1. at 35s. post paid.

Edited by C. E. Bull, the manual, although intended primarily for users of the Avo Transistor Analyser, is presented in such a way as to form a quick and convenient guide for general use where operating information on transistors is required.

Measuring $7\times9\frac{1}{2}$ in., the main body is printed on heavy paper and has a thick board cover, the inside back cover having a pocket for the Transistor Analyser operating instructions. Apart from introductory and miscellaneous pages the main work consists of 130 pages of transistor data listed according to type number. Information given consists of transistor connections, Vce, I'co, Ib, Ic, Beta, typical noise and maximum ratings.

Those who hoped that with the introduction of transistors the manufacturers would avoid the unnecessary duplications and complexities of valve types and bases may be in for a shock. For although this book includes the products of 90 manufacturers in Europe, America, Japan, and Australia, and although it covers obsolete, obsolescent, current, and prototype transistors, information is given on approximately 3,000 types with 68 different connections!

NEW CABY METER

30 RANGES

Household Electrix Ltd., 47 High Street, Kingston-on-Thames, Surrey, have introduced a new *Caby* multirange testmeter, the Model C100. This is a 20,000Ω/V d.c. instrument with the following ranges:

D.C. Voltage—0·5V, 2·5V, 10V, 50V, 500V, 1kV, 5kV.

D.C. Current—50μA, 1mA, 10mA, 50mA, 250mA (0·25V), 10A (0·25V).

A.C. Voltage (at 4kΩ/V)—2·5V, 10V, 50V, 250V, 1kV.

A.F. Voltage—2·5V, 10V, 50V, 250V.

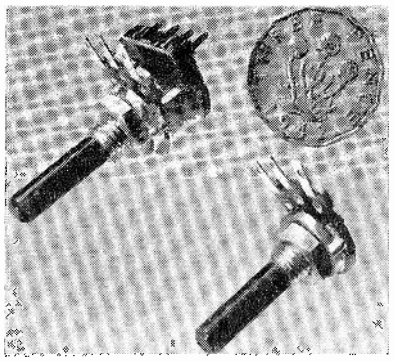
Ohms—34Ω centre scale, 3·4kΩ centre, 34kΩ centre, 340kΩ centre. Minimum reading 1Ω, maximum reading 40MΩ.

dB—Scale reads −10dB to +62dB.

Inductance—10H to 500H.

Capacitance: 0·001μF to 1μF.

The Model C100 measures $7\times5\frac{1}{4}\times3\frac{1}{4}$ in. and weighs $2\frac{1}{2}$ lb. Internal batteries are one at 22·5V and two at 1·5V. The price of the instrument is 15 gns., including test probes, instruction book and batteries.



EGEN POTENTIOMETERS

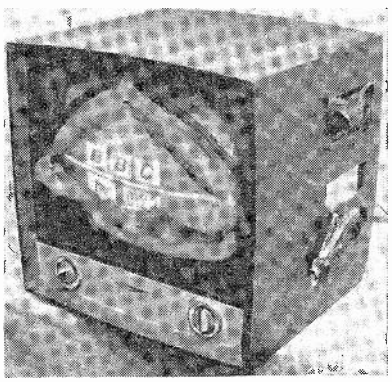
FOR TRANSISTOR CIRCUITS

Designed for use in transistor circuits, a new range of Egen potentiometers incorporates many features of interest in the field of miniaturisation. Constructed on a die-cast body of only $\frac{1}{2}$ in. diameter, the bush-mounted controls have a moulded spindle of $\frac{3}{16}$ in. maximum diameter and will be available with standard resistance values in the range 1kΩ to 3MΩ log. or linear law.

Two models will be manufactured initially, the Type 363 non-switch and the Type 365 with 50V 150mA d.p. switch, both with standard soldering tags. Other models for printed panel mounting are planned for the near future.

Blue Spot Distributors

Blue Spot radio and TV receivers are no longer handled by A. Prince Industrial Products Ltd. Sale and service of these sets is now handled by Bosch Ltd., 205–7 Great Portland Street, London, W.1.



DEFIANT!

This sorry-looking TV set was damaged in a fire in the home of a Woolwich viewer, and was supplied on rental. True to its trade name, the Defiant set was still in working order after being rescued.

Service Viewpoint

IF trade is stagnant, at least there is plenty of noise and activity among those joining battle for 405 or 625 lines, for or against colour and the rest. But if the G.P.O., the B.B.C., the I.T.A., the Government, the manufacturers and the trade organisations are having fun letting their hair down, the rank and file of the industry must be getting tired of the debate and the public, of course, are getting more confused with every successive outblast.

When the problems are finally resolved, the camps will still be unmollified because it seems obvious that to reach any decisions those celebrated British twins, Caution and Compromise, will be enlisted resulting in a scheme unlikely to please anyone.

Although it is easy to be wise after the event, it must be admitted that a glorious opportunity was missed in the immediate post-war years. With only a few receivers in use in the London area, the seeds of a modern TV system could have been sown and the present situation would not have arisen.

True we didn't have the know-how we have today, but the tremendous technological advances made during the war years pointed the way that electronics were accelerating and those responsible for planning must have had more than an inkling that 405 lines was a *pre-war* standard. The French saw this, and acted accordingly.

We have a feeling that another British characteristic played its part, one that it unhappily becoming widespread in all spheres of life—the Ostrich Mentality, or the art of not wanting to know.

Burying one's head in the sand is convenient at the time and avoids taking action and making tiresome decisions. But there eventually comes a time when putting things off till tomorrow is not effective, simply because "tomorrow" becomes "today" and something has to be done about it. And when the day of reckoning comes, the basic difficulties have multiplied to an enormous extent.

In our particular case, the domestic services were allowed to snowball at phenomenal rate so that now, instead of having an outdated system used by a handful of people, we have an outdated system used by most of the population.

TV Battlefield

However, the case for 625 lines, in Viewpoint's opinion, is not proved. It has been admitted that improvements in definition, all things being equal, would be "marginal" The theoretical improvement in definition means transmitting and receiving equipment capable of using it and the quality of some transmissions today, even on a good receiver, would only just flatter one of Baird's 30-line efforts!

As for colour, the B.B.C. are ready to provide a colour service on 405 lines, yet others block the path because they think colour and 625 lines should be launched together. True the immediate initiation of 405 colour, to be followed later by 625, would cause chaos, but any change in standards at this stage would do the same.

So, whatever way the rabbit jumps, there is bound to be large scale dislocation. True to the code of planners, the years have been allowed to tick by while the situation was getting progressively more difficult. And now that passions are stirred and strong men beat their breasts, there is bound to be a good deal more water passing the bridge while the adherents of rival policies pile up alternative plans, schemes and counter-schemes.

Taking into account the welter of suggestions so far propounded, it seems unlikely that yet another viewpoint could be aired. Yet with the application of another dose of compromise this is quite possible.

* * *

It would be fascinating to read that someone had suggested not only scrapping 405 lines, but also 625 lines! The argument could be that 625 is more or less an arbitrary figure since the differences in standards does not preclude international exchanges (*vide* Eurovision) and surely British manufacturers do not have to supply 625-line sets to the home market in order to sell 625-line sets abroad.

The new champion would suggest that by changing to 625 we would be merely following the new boys in the TV lark, thus destroying the British tradition of being the pioneering nation. After all, we were responsible for the first domestic TV service, even though this may be construed as a back-handed compliment in view of the ways things have gone.

If (he would continue) we should not follow but lead, and if not 405 or 625 what then? Answering his own rhetorical question he would argue that if we are to have dislocation and confusion anyway, and since even then we may have to wait many years for the fruition of any accepted scheme, why not do the job properly and plan now for a colour system on a line standard around 1,000? Then we *would* lead again—and have something worthwhile at the end of it.

Somehow, we feel this might really put the cat among the pigeons.

TRADE TOPICS *Letters to the Editor*

The Editor welcomes letters on subjects of technical or trade interest, but does not necessarily endorse the views or opinions expressed by correspondents.

Taylor Valve Tester 45C

THIS type of valve tester has always been found a valuable item of equipment in the service department but in the writer's opinion, two very worthwhile modifications can be carried out easily by the user.

1. It is deemed to be necessary to switch the Test selector switch to "cathode leak" position while all setting up is carried out as this will permit the valve heaters to reach their correct operating temperature during the setting of anode and screen, A, B, and C, and grid voltage positions.

This is far better than setting these positions with the meter switched off, as will be appreciated. The drawback to this is that when switching from the "cathode leak" position to test *mutual conductance* of the valve under test, very much flashing will be experienced due to the type of selector switch used.

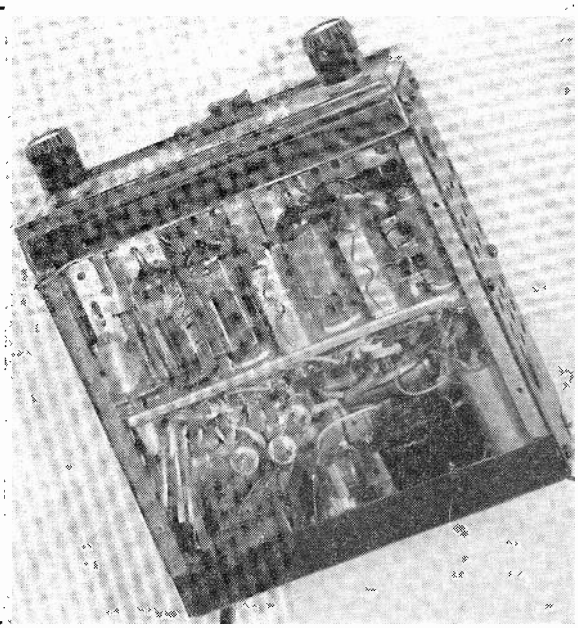
The reason is that the switch blade of the selector switch "makes" in the Cathode Leak position before "leaving" the Mutual Conductance portion of the switch contacts. This can be remedied by carefully filing a small portion of the blade away (third bank, front) so that before contact with the Cathode Leak position can be made, the Mutual Conductance (next move) is broken.

2. A further advantage will be obtained if the complete set of valve holders are unscrewed and mounted in an upright position as at present, if the instrument is placed in a position where the valves are easy to put into the holders, the operator will have to bend down to set up the selectors, whereas if the switches and valve holders are all perpendicular the meter is much easier to use.—**A. Rose,** Technical Director, A. Rose & Co. (Prestwich) Ltd., *Prestwich.*

(*Mr. E. Strauss, Director and General Manager of Taylor Electrical Instruments Ltd., comments: "One of Mr. Rose's points is perfectly legitimate in the older type Model 45C, but the new type incorporates special switches and no flashovers occur. We appreciate the suggestion of putting the valveholders in a perpendicular position and shall certainly see in our designs where we can incorporate this*").

notes on servicing

HYBRID CAR RADIOS



By R. N. REEDER

THE car radio production of all the large manufacturers in this country and abroad is now centred round the hybrid type of receiver, which, as its name implies, combines valve and transistor circuits.

The hybrid is, at present, more suitable for use with 12 volt car electrical systems as the valves employed are specially selected for use at this voltage, being of a type which is normally used at about 200V h.t. with 6·3V, 0·3A heaters. Changeover of polarity from positive to negative earth systems and vice versa is usually very simply carried out with the adjustment of a tag panel or carousel.

Operation of these valves with an h.t. of 12 volts considerably distorts their characteristics and to use them on 6 volts would give rise to further distortion and increase the effects to be described later.

To partially overcome these difficulties on the Continent, where 6 volt systems are in the majority, extra stages have to be included with lower stage gains. The low stage gains mean that a more linear characteristic can be obtained because of the small section of the slope employed.

No Vibrator

With this type of receiver, no vibrator or other type of power pack is, of course, necessary, the 12 volt l.t. being fed directly in via an elaborate choke-capacitor filter. The valve heaters are connected in series/parallel across this supply. Current consumption is generally in the order of 1·25 amps for sets with single-ended output.

In the majority of British hybrid car radios all stages are valve operated with the exception of the output stage, which uses a transistor or two transistors if of the push-pull type. Occasionally a transistor driver stage is employed, but generally the transistor output stage is valve driven.

Distortion of the valve characteristics due to the 12 volt h.t. and the resultant effect has made it necessary for designers to include an r.f. stage which has four advantages, from the users point of view:—increased sensitivity, better selectivity, improved signal-to-noise ratio and more efficient a.g.c.

SERVICING FEATURES PECULIAR TO THE HYBRID CAR RADIO

Interference Suppression

With the vibrator type of car radio, elaborate precautions were taken by the designer to prevent hash from the vibrator entering the radio section of the receiver by the use of a well screened radio compartment with sufficient screws holding the covers to create the effect of a completely sealed container. This method of construction besides keeping out hash from the vibrator also served to prevent ignition interference from entering the set, except through the aerial.

With the hybrid receiver these extreme precautions are not generally taken as, of course, there is no vibrator and also the user and serviceman invariably ask for the minimum number of fixings when taking off a removeable part.

The result is, that this together with the increased sensitivity of the receiver due to the r.f. stage, makes ignition interference rejection a large item for the serviceman to deal with.

When attempting to reduce interference, assuming standard suppression is fitted to the car as recommended by the setmakers, the investigation should be divided into three parts, as follows:

1. Aerial. It can easily be determined whether this interference is being picked up by the aerial by removal of the aerial plug and noting whether the interference ceases.

If the interference disappears, the earthing of the aerial to the car body and the earthing of the aerial coaxial cable to the aerial and aerial plug should first be checked. The maximum amount of unscreened inner cable at the aerial end should not exceed ½ in.

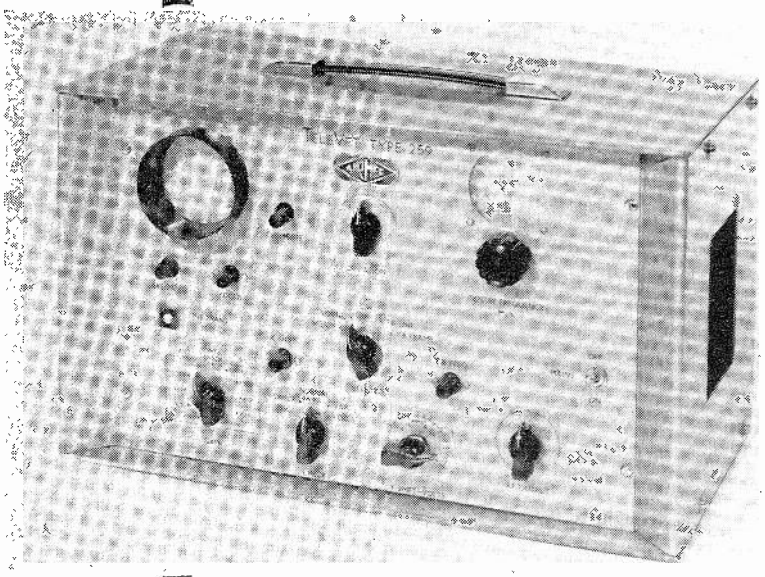
If no improvement is obtained, then bonding of the wings and bonnet to the bulkhead of the car, with flexible metal tape, should be carried out.

2. Supply Lead. Prevention is easier than cure when dealing with supply borne interference. If this type of inter-

(Continued on page 165)

The heading picture shows the Philips G82VT hybrid car radio with the top cover removed. The output transistor is mounted at the centre of the rear of the set.

The ONLY complete Television Tester...



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HYBRID CAR RADIOS

—continued

ference is suspected the first move must be to reroute the cable away from all possible radiating sources, such as the wiring behind the facia panel.

Next, further suppression by 1μF capacitor of electrical accessories such as petrol pump, clock, brake light switch, temperature transmitter, etc., must be carried out as necessary. The capacitor should be fitted between the l.t. supply terminal and earth of the offending equipment.

It may also be necessary to suppress the plug leads and distributor centre lead by means of the readily available suppressor resistors. Last but not least an examination of the supply filter in the receiver should be made and any faulty components replaced.

3. Radiated. This type of interference is induced directly into the receiver from various radiating sources. This can often be reduced by the measures described in the latter part of 2 above, i.e., suppressor capacitors and resistors.

A further important point to ascertain is that all covers are screwed securely down and that where two units are involved the interconnecting lead is screened and earthed satisfactorily to the case at each end. Internal receiver screens must also be examined and refixed if necessary.

Bonding of parts with metal tape will also help to reduce this type of interference pick-up, and a really substantial connection must be made between the case of the receiver and the car metal work, making sure that the metal work is not partially insulated from the main body.

The gear lever is often an efficient radiating source and to eliminate this, bonding of the gearbox to the engine or bulkhead would be necessary.

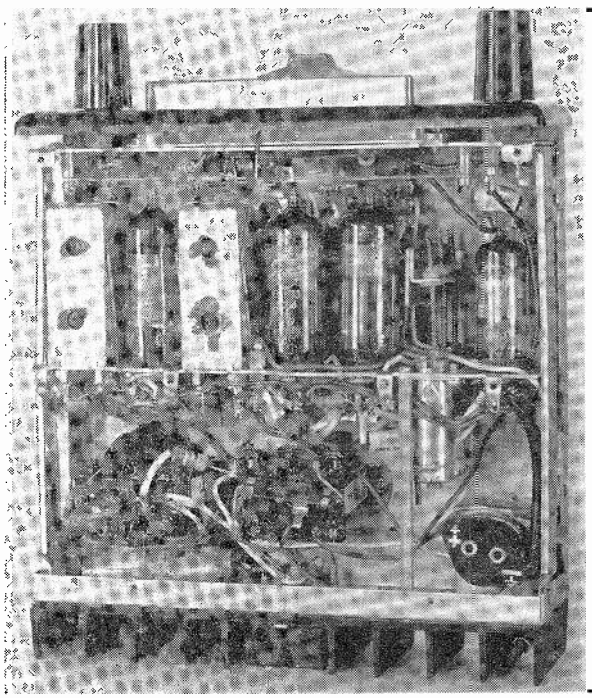
Tyre and Brake Static

Tyre and brake static are other well known causes of trouble but the former has now almost died out. One well-tried remedy for brake static is to clean the paint off the offending brake shoe with a wire brush and coat the shoe and sides of the lining with colloidal graphite. This treatment has a limited life and needs repeating at intervals.

Another method, although not so generally effective, is to earth the brake backplate with a flexible bonding to some convenient part of the chassis.

The idea of both measures is to discharge the static electricity built up by rotation of the wheels. This is recognised by a rhythmic rushing noise which increases in intensity after applying the brakes to a continuous roaring noise that in severe cases can completely drown all but the strongest signals.

Tyre static interference, which produces similar noises, can be located because of its disappearance in wet weather. As no permanent cure is known for this type of interference, the tyre manufacturer concerned should be informed.



A view of another hybrid car radio, the Ekco Model CR903, with the cover removed showing the easy access to all valves and components for the service engineer.

SPECIAL MECHANICAL POINTS

Fitting

Most manufacturers today are marketing models with and without push button station selection. The non-push button receivers are in a reasonably small and compact unit, but the push button types invariably have a separate output unit which is connected to the control unit with a screened multi-wire interconnecting cable which carries the filtered supply and signal from the driver stage to the output transistor. This lead is plug-and-socketed at one end to enable the units to be separated.

It is possible to obtain special front panels for mounting the main unit of the receiver to the facia board of most popular cars, the result being that the front of the set blends in with the car. The rear of the set in these cases is supported by brackets supplied by the car radio manufacturer or which are integral with the vehicle.

Difficult Cases

For special or difficult cases the universal bracketry supplied by most car radio manufacturers can be arranged to secure the set in the required position, usually under the bottom edge of the facia panel or under the glove pocket or parcel shelf. Brackets are invariably secured to the car with self tapping screws.

The separate output unit of the push-button type of car radio can either be fitted to the rear of the control unit, if space permits, or mounted separately with self-tapping screws, remembering that ignition interference can also be picked up in this unit if badly positioned.

(*N.B.* In all types of hybrid car radio the output transistor must be kept as far as possible from the hot air flow out of the car heater. The reason for this can be seen under *Transistor Output Stage*.)

Loudspeaker

When mounting the loudspeaker, if no prearranged position has been determined by the car manufacturer, where practicable it should be located in such a way that the sound waves are not directed straight into some absorbent damping material such as the floor covering or roof lining.

As has been mentioned under *Suppression*, the receiver should be

(Continued on page 166).

HYBRID CAR RADIOS

—continued

effectively bonded to the car metal work.

Push-Button Units

If mechanical trouble is experienced with a push-button unit it is advisable to replace the complete unit because of its complexity but in the case of coil trouble it is often possible to remove the coil, with the unit *in situ*, for replacement.

Internal Components

With the receiver open on the bench after servicing it is always advisable to check for unsoldered screens, loose screws and electrical components nearly touching. It must be obvious that if near faults or short circuits are left in the set when replaced in the car then further trouble will be experienced by the owner in a very short time, which will not help the reputation of the serviceman.

Another useful bench test along these lines is a crackle test with a fully cased set which should be carried out by tapping the case at various points with a small rubber-headed hammer and listening for crackles from the speaker denoting loose mechanical parts or near short circuits.

VALVE CIRCUITS

Facilities

The necessary facilities required for servicing a hybrid car radio are aerial, supplies, and speaker. The aerial should be of the normal car radio type, to simulate car conditions, complete with a standard length of coaxial feeder (5 ft.) and plug.

The feeder must be of the low capacity car radio type as otherwise there is a strong possibility that the receiver's aerial trimmer will not trim because of excessive capacitance. This is very important because an accurate assessment of the set's performance cannot be made unless it is working under its optimum conditions.

No particular difficulty should be experienced with the speaker installation, but it is advisable that the 12 volts supply be obtained from a previously charged battery because of the difficulty of smoothing a mains rectifier unit, with the resultant feeding of noise to the set.

The usual valve line-up of a hybrid receiver is r.f. amplifier: oscillator/mixer: i.f. amplifier/a.g.c./detector: a.f. amplifier and driver with the r.f. and a.f. amplifiers being in one envelope (a triode-pentode). Circuits are conventional, except of course, that electrode voltages will be related to the 12 volts h.t. available.

The serviceman will find that, because of the ability of the user to have the receivers' polarity changed to suit his car, the normal negative chassis, as used in domestic receivers, is not employed.

Two Systems

Two systems are used; in one the only connections returned to chassis are for earth decoupling purposes, the valve and transistor electrodes being wired to allow easy polarity changes and in the other the anodes and screens of the valves and the transistor emitter are connected to chassis.

In the latter case the changeover to negative earth operation is more complicated, but it must be remembered that the majority of British cars have positive earth systems.

Effect of low H.T.

As has been previously mentioned, the effect of the 12 volts h.t. on the characteristics of the valve is to create distortion. The low h.t. produces a curved characteristic, which, from fundamental radio theory, will be known to generate harmonics.

As a result, the r.f. and mixer stages will generate harmonics of the wanted signal, strong unwanted signals which break through the aerial circuits, the oscillator frequency and the intermediate frequency.

It will be realised from the above that spurious whistles are a problem for the designer of this type of receiver and that this type of interference must be expected to a greater extent than in the all-valve receiver.

The intermediate frequency to be used in a hybrid receiver is also very difficult for a designer to decide, as this has a large bearing on the whistle products, bearing in mind that the oscillator frequency depends on it.

Choice of I.F.

In the London area, for instance, the Home Service is 908 kc/s. If the second harmonic is produced (1816 kc/s) then this is almost the Home Service image frequency (Oscillator freq. + i.f.) and a strong whistle is possible quite near the Home Service tuning position. This has resulted in the i.f. of some makes of car radios being moved to 480 kc/s instead of the usual 470 kc/s.

The serviceman should therefore make certain of the intermediate frequency of the receiver he is dealing with before trimming the i.f. stages. In difficult cases of whistle trouble it is possible that valve selection by trial and error, would be the only cure.

R.F. Circuits

The permeability (variable inductance) tuner has been almost universally accepted as the best type for use in a car radio because of the high capacitance of a car radio aerial system, which with a variable capacitor tuning would either seriously restrict the aerial circuit frequency range, or gain, depending on the type of circuit.

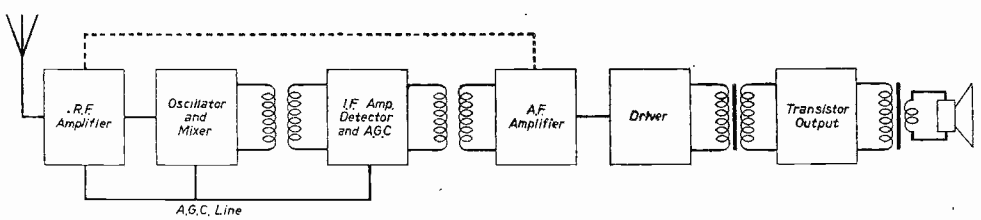
The gang type of variable capacitor, unless extremely well mounted on rubber or other type of flexible mounting, is also subject to variations in capacitance due to vibrations from the car which can give rise to a form of microphony.

If trouble is experienced with a coil in a permeability tuner it is generally advisable to replace the complete unit or, if possible, the coil assembly, rather than attempt to repair the fault unless this is external.

A.G.C.

An a.g.c. voltage is normally applied to the r.f., mixer and i.f. amplifier stages and is developed across the a.g.c. diode load. The level of this voltage depends on the stage to which it is supplied, the i.f. amplifier having the largest controlling voltage and the r.f. amplifier the smallest, because of the relative values of the signals on the control grids of these values.

A.g.c. is a very important part of the



Block diagram of a typical hybrid car radio.

circuit of a car radio because of the extreme variations of signal strength received by a moving car due to the screening effect of buildings and natural obstacles and the constantly changing distance of the car from the transmitter.

Instability

Problems of instability will be similar to those met in all-valve sets except where printed circuits are used. A great advantage of the printed circuit is that, if designed correctly, instability should at no stage in its life be possible.

Once a good design has been laid down, with possible feedback paths kept far apart, then by the very nature of the printed board these conditions cannot alter.

When servicing printed circuits care should be taken when removing components to prevent burning of the board with the soldering iron and creating a carbon conducting track between wires and also to prevent damage to the wiring, such as pulling off. It must also be remembered that the boards themselves are not very robust and may crack with rough handling.

The incidence of instability caused by faulty ceramic and electrolytic capacitors will possibly increase, again due to the low h.t. employed. Where in the case of a ceramic decoupling capacitor working at a high d.c. voltage, a high resistance lead to electrode joint would not necessarily be too important, at these low voltages this could easily mar the efficiency of the decoupling.

Electrolytics

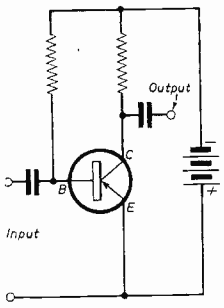
Special attention should be paid to electrolytics in this respect, because of the method of securing their terminating wires to the body, i.e., by means of a rivet.

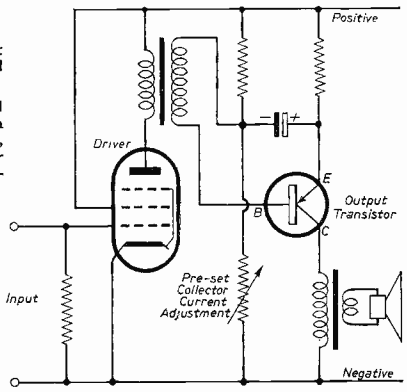
If an unsatisfactory joint developes here, due to poor rivetting, then the resulting resistance of the joint, if the capacitor is used for decoupling or as a feed, will be liable to cause instability or poor sensitivity as the case may be. Due to difficulties in producing these low voltage electrolytics, the capacitor element itself may have a high series resistance and so a replacement stock of these items is very necessary.

TRANSISTOR OUTPUT STAGE

Operating Conditions

The transistor is a current amplifying device, which under certain conditions of operation behaves similarly to a conventional triode valve amplifier. This condition is realised in the output stage we are concerned with, the method of connection being known as "grounded emitter".





Left: Basic circuit of a grounded emitter stage.

Right: Typical audio stages of a hybrid car radio, with valve driver and transistor output.

The emitter in this case can be likened to the cathode of a triode, the base to the control grid and the collector to the anode.

It can be seen that the transistor works with reverse polarities to the valve, the collector being negative and the emitter positive, with the base being at some potential between the two.

Input signals fed between the base and emitter modulate the current flowing between these two elements and affect the standing current through the base and collector. Current gain with the grounded emitter circuit can reach 50.

Output Stage

The output transistor is transformer coupled to the driver stage and the output, taken between collector and emitter, is transformer coupled to the speaker. This is necessary in both cases for correct impedance matching and also in the case of the former to obtain the necessary current to drive the transistor.

(With a transistor output stage it is vitally important that the speaker should not be disconnected when the set is in operation, as the resultant risein collector current will almost certainly have a serious affect on the transistor and transistors are not cheap!)

Heat Sink

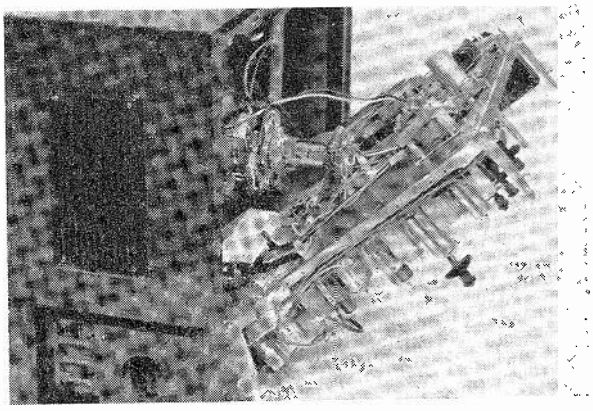
Another aspect of transistor operation that is not immediately obvious is the need for a metallic heat sink to dissipate the heat produced at the junctions of the transistor elements. A maximum temperature is stated by the manufacturers for these junctions and the car radio designer has to provide enough metal for dissipation to keep within this limit.

It can therefore be appreciated that the transistor must not be operated off its mounting, which forms part of the sink, and should not be subjected to other direct sources of heat.

The usual method for ascertaining that a transistor is working under its correct electrical conditions is to check the collector standing current. This information should be available from the set maker and provision is generally made for adjustment by means of a pre-set variable resistor.

When dealing with push-pull output stages the comments above still apply.

New Easy Service Models from Ekco



Almost complete service accessibility without removal of cabinet is given by the hinged chassis mounting of the new 19 in. Ekco models. The chassis is lowered by loosening two screws and removing tuner knobs. (For details see this month's *Brand New*).

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Price 1s. each

Ace "Astra" Mk. II Model 553 (TV52, May, 54).
Alba T655 TV (TV130, Dec., 58).
Baird P181/14/15 and C1815 (TV39, Apr., 53).
B.S.R. UA8 autochanger (S7, March, 57).
Bush T36 series TV receivers (TV83, Apr., 56).
Bush TV22 series TV receivers (TV67, Jun., 55).
Bush TV53 series TV receivers (TV101, Feb., 57).
Bush TV63 series TV (TV118, April, 58).
Cossor 927 television receiver (TV42, July, 53).
Cossor 930 series TV receivers (TV62, Feb., 55).
Cossor 937, 938 and 939 (TV90, July, 56).
Cossor 943 TV (TV127, Oct., 58).
Cossor 945 (TV112, Nov., 57).
Cossor 946 TV (TV104, May, 57).
Cossor 947 TV receiver (TV114, Jan., 58).
Cossor 948, 949 series (TV133, Jan., 59).
Decca DM35/45/55 (TV155, May, 60).
Ekco T330/331 series (TV154, April, 60).
Ekco T342/344/348 (TV157, June, 60).
Ekco T345 series (TV165, Oct., 60).
Ferranti 14T2 and 1225 (TV45, Nov., 53).
Ferranti T1002 series (TV154), April, 60).
Ferranti T1021, 1023, 1027 (TV157, June, 60).
Ferranti T1024 series (TV165, Oct., 60).
Ferguson 204T series TV receivers (TV87, June, 56).
Ferguson 306T/308T TV receivers (TV97, Nov., 56).
Ferguson 506T, 508T, 546T (TV171, Jan., 61)
Ferguson 516T series (TV173, Feb., 61).
G.E.C. BT1252 series TV receivers (TV96, Oct., 56).
G.E.C. BT1746 series TV (TV81, Mar., 56).
G.E.C. BT7092 and BT7094 (TV44, Oct., 53).
Grundig 500L and 700L/C (S3, Dec., 53).
H.M.V. 1840 series TV receivers (TV109, Sept., 57).
H.M.V 1890 and 1893 (TV171, Jan., 61).
H.M.V. 1892, 1896 (TV173, Feb., 61).
Invicta 538 series (TV168, Dec., 60).
Kolster-Brandes FV30, FV40, FV50 (TV23, Feb., 52).
Kolster-Brandes HF40 series TV (TV70, Aug., 55).
Kolster-Brandes MV30 and MV50 (TV91, Aug., 56).
Kolster-Brandes NV40 series (TV115, Feb., 58).
Kolster-Brandes OV30 series (TV148, Jan., 60).
Marconiphone VC/VT59DA (TV100, Jan., 57).
Marconiphone VC60DA (TV61, Jan., 55).
Marconiphone VT68DA/VT69DA. (TV84, May, 56).
Marconiphone VT163 (TV173, Feb., 61).
Marconiphone VT164 (TV171, Jan., 61).
McMichael 55 series TV receivers (TV79, Feb., 56).
Murphy V214/V216 TV receivers (TV78, Jan., 56).
Murphy V230 portable TV (TV103, April, 57).
Murphy V240/V250 TV (TV105, June, 57).
Murphy V270/V270C TV (TV120, May, 58).
Murphy V270A TV receiver (TV140, July, 59).
Murphy V280/V300C TV (TV124, Aug., 58).
Murphy V280A series (TV134, March, 59).
Murphy V310 TV receiver (TV145, Dec., 59).
Murphy, V320 series (TV159, July, 60).
Murphy V330 series (TV167, Nov., 60).
Pam 500 TV receiver (TV108, Aug., 57).
Pam 600S, 606S, 690 (TV144, Nov., 59).
Pam 800 series (TV168, Dec., 60).
Peto Scott TV 1411 series (TV65, Apr., 55).
Peto Scott 1412 and 1712 (TV54, July, 54).
Peto Scott 1418T receiver (TV106, July, 57).
Philco BT1412 and BT1551 (TV71, Sept., 55).
Philco 1000 *Slender Sevenieener* (TV139, June, 59).
Philco A1960/1, A2060/1 (TV137, May, 59).
Philco A1962M/A1967M (TV142, Oct., 59).
Philips 1458U series (TV129, Nov., 58).
Philips 1756U series TV (TV111, Oct., 57).
Philips 1768U/2168U (TV117, March, 58).
Philips 1796U/2196U (TV152, Mar., 60).
Pilot PT450 series (TV161, Aug., 60).
Pilot TV84/87 television series (TV59, Nov., 54).
Pye PTV portable TV (TV113, Dec., 57).
Pye CW17 series TV (TV122, June, 58).
Pye CTL58VS series (TV150, Feb., 60).
Pye CTM17S series (TV131, Feb., 59).
Pye V200/V400 series (TV163, Sept., 60).
Pye V210 series (TV168, Dec., 80).
Regentone "Big 15/5," T and C (TV48, Feb., 54).
R.G.D. 1455 and 1456 TV receivers (TV99 Dec., 56).
Ultra VA72, YA72/73 series (TV38, March, 58).
Ultra V84 and Y84 TV receivers (TV47, Jan., 54).
Ultra 81 series TV receivers (TV74, Nov., 55).
Ultra 915 and 917 TV receivers (TV93, Sept., 56).
Ultra 50 series TV (TV123, July, 58).
Ultra 52 series TV (TV135, April, 59).
Ultra 60 series TV (TV126, Sept., 58).
Ultra 62 series TV receivers (TV141, Sept., 59).
Ultra V1770 series (TV161, Aug., 60).
Vidor CN4217/8 TV receivers (TV57, Oct. 54).

Price 9d. each

Alba T717 and T721 (TV143, Nov., 59).
Alba T744FM TV series (TV121, June, 58).
Alba T766 TV receiver (TV166, Nov., 60).
Ambassador-Baird TV 19-20 (TV119, May, 58).
Ambassador TV4 and TV5 (TV32, Sept., 52).
Argosy 1412L/1412B (TV19, Aug., 51).
Argosy Model T2 TV receiver (TV53, June, 54).
Baird TV receivers, P/T 167 (TV35, Dec., 52).
Beethoven B94, 95, 98 and 99 (TV92, Aug., 56).
Bush BE15 battery radio (R51, Mar., 54).
Bush RC94 AC radiogram (R34, Nov., 52).
Bush VHF54/VHF55 receivers (R94, Jan., 57).
Bush VHF61 a.m.-f.m. radio (R134, Oct., 59).
Bush VHF64/RG66 radios (R116, July, 58).
Collaro RC54 record changer (S6, Oct., 55).
Cossor 500 series radios (R95, Feb., 57).
Cossor 522/523 a.m.-f.m. radio (R72, May, 55).
Cossor 524 *Melody Maker* (R85, Mar., 56).
Cossor TV Model 926 (TV37, Feb., 53).
Decca SG177/SG188 Stereograms (S12, Oct., 58).
Decca *Double Decca* Model 51 (R65 Dec., 54).
Deccalian radiograms 91 and 92 (R23, Dec., 51).
Deccalian Model 90, radiogram (R21, Nov., 51).
Dynatron TV38 series (TV151, Mar., 60).
Etronic ECS2231 projection TV (TV46, Dec., 53).
Etronic ETA632 radio receiver (R43, Aug., 53).
Ever Ready *Sky Monarch* (R104, July, 57).
Ever Ready *Sky King, Queen, Prince* (R106, Sept., 57)
Ferguson TV tuner units (TV85, May, 56).
Ferguson 300RG autogram (R78, Aug., 55).
Ferguson 382U series (R124, Jan., 59).
Ferguson 341BU portable radio (R67, Jan., 55).
Ferguson 968T series TV (TV60, Dec., 54).
Ferranti 005, 105 and 405 (R36, Jan., 53).
Ferranti 147 series radio receivers (R81, Nov., 55).
Ferranti 255, 355, 455, radios (R107, Oct., 57).
Ferranti 1325/1825 TV receivers (TV95, Oct., 56).
G.E.C. BT302-5 (TV160, Aug., 60).
G.C.E. BT1449/BT2448 (TV102, March, 57).
G.C.E. BT2155/8149 (TV156, June, 60).
Kolster-Brandes HG30 radiogram (R53, April, 54).
Kolster-Brandes QV20/1 series (TV162, Sept., 60).
Marconiphone T24A series (R98, April, 57).
Marconiphone T/C10A radio (R41, June, 53).
Marconiphone VT64/65DA (TV76, Dec., 55).
Masteradio D154 "Ripon" series (R84, Feb., 56).
Masteradio Model T853 (TV36, Jan., 53).
Masteradio TD4T and TD7T/C (TV58, Nov., 54).
Masteradio TE series (TV128, Nov., 58).
McMichael *Clubman* Model 535 (R62, Oct., 54).
McMichael FM55 a.m.-f.m. radio (R82, Dec., 55).
Murphy A146CM baffle radio (R75, June, 55).
Murphy V200 TV receiver (TV72, Sept., 55).
Pam 701, 702, 714, radios (R100, May, 57).
Peto Scott 16 series TV receivers (TV86, June, 56).
Peto Scott 19 series TV (TV116, March, 58).
Peto Scott 1722/1723 (TV149, Feb., 60).
Peto Scott 1730 and 2128 (TV158, July, 60).
Peto Scott 1731/2131 (TV164, Oct., 60).
Peto Scott 732 series (TV172, Feb., 61).
Philips 141U portable radio (R56, June, 54).
Philips 643 series a.m.-f.m. radio (R87, July, 56).
Philips G62A series (R131, July, 59).
Pilot TM/CM54 TV receiver (TV41, June, 53).
Pilot TV94 series TV receivers (TV107, Aug., 57).
Pilot VS9 console TV receiver (TV34, Nov., 52).
Pilot PT451, PT651 (TV170, Jan., 61).
Pye P23CR and P24CR (R48, Jan., 54).
Pye P29UBQ (R37, Feb., 53).
Pye *Fen Man* I and IRG (R109, Nov., 57).
Pye *Fen Man* II and IIRG (R112, Jan., 58).
Raymond F46 radio receiver (R69, Feb., 55).
Regentone TR177 series (TV132, Feb., 59).
Regentone ARG81 series (R127, March, 59).
Regentone RT50 tape recorder (S14, Sept., 59).
R.G.D. T14 transportable VT (TV138, June, 59).
Sobell 516AC/U radio (R57, July 54).
Sobell TS17 and T346 TV (TV94, Sept., 56).
Sobell 626 Series a.m.-f.m. radios (R102, June, 57).
Sound A20 tape recorder (S9, Feb., 58).
Stella ST151A radio (R66, Jan., 55).
Stella TV receiver ST1480U (TV25, Apr., 52).
Stella ST8314U TV receiver (TV55, Aug., 54).
StradModel 510 table receiver (R35, Dec., 52).
Taylor testmeter Type 171A (T16, Aug., 54).
Ultra ARG891 "Ultragram" (R83, Jan., 56).
Ultra "Troubadour" U696 (R44, Aug., 53).
Ultra "Twin" portable radio (R55, June, 54).
Ultra U930/U940 *Minstrels* (R119, Aug., 58).
Ultra V1763 TV receiver (TV 147, Jan., 60).
Ultra VP14/1753 series (TV153, April, 60).
Ultra 1771 series (TV170, Jan., 61).
Vidor CN4213 and CN4215 TV (TV28, June, 52).
Vidor CN4228/9 TV receivers (TV136, May, 59).
Vidor CN4230/1 TV receivers (TV125, Sept., 58).
Waveforms *Radar* 405D (T.I.7, Apr., 56).

Price 6d. each

Alba 69 series radiograms (R120, Sept., 58).
Alba 3211 series (R126, Feb., 59).
Baird baffle radio receiver (R61, Oct., 54).
Bush TC184 television tuner (TV75, Nov., 55).
Cossor Model 466 car radio (R71, Apr., 55).
Cossor radio Model 494U (R38, Mar., 53).
Cossor *Melody Portable* 543 (R92, Dec., 56).
Cossor 546 transistor portable (R115, May, 58).
Cossor 551/552 portables (R117, July, 58).
Cossor 575/579 (R142, June, 60).
Cossor 580 stereo player (S13, April, 59).
Cossor 581 and 569 portables (R137, Nov., 59).
Cossor CR1500A stereo radiogram (R147, Nov., 60)
Decca *Deccalian* 88 player (S10, March, 58).
Decca RG200 radiogram (R125, Jan., 59).
Deccalian Model 81 (R29, Apr., 52).
Defiant MSH953 AC radio (R40, May, 53).
Defiant RSGH89AC radio (R70, Mar., 55).
Dynatron TP11/TP12 (R141, May, 60).
Ekco BPT333 transistor portable (R143, July, 60).
Ekco BPT351 transistor portable (R145, Sept., 60)
English Electric *Rotamatic* TV tuner (TV82, Mar., 56).
Etronic EPZ4213 portable radio (R52, Mar., 54).
Etronic radio Model ETU5329 (R39, Apr., 53).
Ever Ready Model "C" radio (R50, Feb., 54).
Ever Ready *Sky Baby, Sky Princess* (R99, May, 57).
Ferranti 13-channel TV tuner (TV73, Oct., 55).
Ferranti 525 radio receiver (R58, Aug., 54).
Ferranti Model 546 radio (R45, Sept., 53).
Ferranti U1003/RP1008 (R123, Dec., 58).
Ferranti PT1010 transistor portable (R143, July, 60).
Ferranti PT1030 transistor portable (R145, Sept., 60).
G.E.C. BC501/BC502 portables (R146, Oct., 60).
G.E.C. BT306, BT308 (TV169, Jan., 61).
H.M.V. radio Model 1122 (R54, May, 54).
H.M.V. radio Model 1356 (R42, July, 53).
H.M.V. 1252 f.m. adaptor (R111, Jan., 58).
Invicta 26 "Vicki" portable (R93, Jan., 57).
Invicta 33 series radio receivers (R89, Sept., 56).
Invicta Models 37 and 59RG (R86, May, 56).
Invicta Model 55 portable (R46, Oct., 53).
Kolster-Brandes TV converter (TV77, Jan., 56).
Kolster-Brandes FB10 portable (R32, Sept., 52).
Kolster-Brandes MP151/2, PP251 (R135 Oct., 59).
Kolster-Brandes NG20/NR30 (R113, Feb., 58).
Kolster-Brandes OP21 (R122, Nov., 58).
Kolster-Brandes PP11, PP21, PP31 (R130, June, 59).
Marconiphone P17B portable (R49, Jan., 54).
Marconiphone T221 converter (TV30, Feb., 56).
Marconiphone T24DAB (R77, Aug., 55).
McMichael 153 table radio (R75, July, 55).
McMichael 493 portable radio (R47, Nov., 53).
McMichael 554 radiogram (R96, Feb., 57).
McMichael 855 table radio (R91, Nov., 56).
McMichael MT102 portable (R149, Feb., 61).
Masteradio D155 series (R108, Nov., 57).
Murphy V310 modifications (TV146, Jan., 60).
Pam 111 transistor portable (R140, April, 60).
Pam 706 *Pixie* portable (R97, March, 57).
Pam 710 portable (R90, Oct., 56).
Pam 955 series radios (R103, July, 57).
Pam TB59 (R138, Feb., 60).
Portogram "Junior 8" reproducer (S5, July, 54).
Portogram "Preil 20" amplifier (S4, May, 54).
Philco A 536 W/M radio receivers (R68, Feb., 55).
Philips television tuners (TV88, June, 56).
Philips G77B, G81U, G83B (R137, Dec., 59).
Philips 301T and 395T (R148, Dec., 60)
Pilot television tuners (TV89, July, 56).
Pilot PR251 transistor portable (R144, Aug., 60).
Pye HF25/25A hi-fi amplifiers (S11, June, 58).
Pye P131MBQ portable (R121, Oct., 58).
Pye P43 radio receiver (R63, Nov., 54).
Pye 13-channel tuner unit (TV66, May, 55).
Pye *Pipers* P115U/P116U (R110, Dec., 57).
Pye *Black Box* record reproducers (S8, Sept., 57).
Pye 841130 series TV tuners (TV110, Oct., 57).
Raymond F55 table radio (R74, June, 55).
Regentone PRG1 and Five-18 (R139, Mar., 60).
R.G.D. B56 portable radio (R132, July, 59).
Roberts CR portable radio (R80, Oct., 55).
Roberts "Junior" portable (R26, Reb., 52).
Roberts P5A portable radio (R73, May, 55).
Roberts R66 portable radio (R88, Aug., 56).
Roberts R77 portable (R105, Aug., 57).
Roberts RT1 transistor portable (R118, Aug., 58).
Sobell FMG57/FMG708 radios (R114, April, 58).
Sobell ST301 portable (R149, Feb., 61).
Taylor Model 20B (T.I.5, Sept., 52).
Ultra 101 transistor portable (R144, Aug., 60).
Ultra FM950 f.m. radio (R129, May, 59).
Ultra TR100 portable (R128, March, 59).
Ultra U960 portable radio (R133, Sept., 59).
Vidor Model CN414 portable (R28, Apr., 52).
Vidor CN420A portable radio (R64, Dec., 54).
Vidor CN421 portable radio (R79, Sept, 55).

TECHNICAL GEN for SERVICING MEN

RADIO, TELEVISION and AUDIO FAULT FINDING

PRESENTING DETAILS OF FAULTS ENCOUNTERED, DIAGNOSED AND CURED BY SERVICE ENGINEERS ON RADIO, TELEVISION AND AUDIO EQUIPMENT, TOGETHER WITH HINTS AND TIPS OF USE TO OTHER SERVICEMEN IN DEALING WITH DAY-TO-DAY SERVICE WORK.

Alba T641/644

Picture Grows Dim

This range of receivers is getting on a bit, and pictures tend to grow dim. But before sporting a new tube, it may be as well to check the operating voltages. On several sets we have discovered the first anode volts to be rather low—only slightly more than normal h.t. in fact.

The trouble often turns out to be the 1MΩ resistor from the boost line to the first anode, which is decoupled to the h.t. line via another 1MΩ resistor.

After changing this resistor and restoring correct voltages (it may be necessary to reduce its value if the tube is drawing more first anode current than it should) remember to reset the ion trap.—H.W.H., Bargoed (907).

Ultra V17-63

Weak Sound, Vision

This receiver was brought into the workshop with a complaint of weak sound and weak vision. It was also noticed that the contrast action was by no means pronounced. The fact that both sections were low led to a check of the tuner and common i.f. valves.

These, and associated components, were checked without revealing any faults and it was then decided to check each section starting from the back end. Working on the sound circuits soon revealed a faulty 6D2 detector/limiter valve. Attention was then turned to the vision section and sure enough the crystal diode detector was faulty, although it tested O.K.

Replacement of both detectors restored normal gain and contrast action. Never jump to conclusions!—J.R.A., Peterhead (917).

R.G.D. Deep-17

Line Wiring Trouble

The fault on this set was given as "no picture—weak sound". A quick check revealed low h.t. and this was cured by replacement of the PY32 h.t. rectifier.

The line oscillation in this set is by feedback from the PL81 line output valve to the triode section of a PCF80. No line oscillation was present. The PY81 reclaim rectifier was replaced and the line output stage became operative and a raster appeared, but within a minute the screen was filled with flashes of decaying line oscillations which suddenly ceased.

The line output valve proved to be O.K., but before removing the line o.p. transformer a careful check was made of the feedback circuit and the culprit was ultimately found to be a break in the insulation of the lead to the grid of the triode section (pin 9) being cut into by the earthing wire crossing it from pin 8 on the base. The removal of this s/c restored normal operation.—F.H., Brighton (910).

Grundig TK5

Crackle on Playback

On this tape recorder, the complaint was of intermittent loud crackle only on recording made with the microphone. First of all, C35 and C1 were checked for leakage (a common fault on this model) but substitution did not effect a cure.

With the machine on mike/record, using headphones as a monitor, and with monitor volume control and record gain control at maximum, the fault was traced by disturbance testing.

It was caused by the alloy support bracket for the tag panel carrying C35, R45, etc., associated with the microphone input circuitry. This bracket is secured to the chassis by passing the end through a slot in the chassis, the bracket then being given a half-twist to secure it.

Due to corrosion, the bracket was making a poor chassis contact, and removal and cleaning cleared the trouble. The tag panel is situated underneath the chassis, next to the selector switch.—G.C., Boroughbridge (927).

H.M.V. 1380

Noisy Volume Control

This radio came in for a faulty volume control. On test it was found that there was noise on one section of the control. A routine check on the general performance of the receiver before a new control was fitted revealed that the fault only occurred on long wave; on the medium waveband the control was perfectly noiseless. A more careful listen to the noise confirmed that it was really instability.

The i.f. filter capacitors and several other decoupling components were checked and then the receiver was removed from the cabinet. The fault had cleared but refitting brought it back. It was soon noticed that the output transformer was fitted to the speaker which meant that the speaker leads were high impedance.

These had been positioned too near the volume control and repositioning them cleared the trouble. Why this a.f. instability should only take place on the long waveband is still something of a mystery.—V.D.C., Bristol (914).

Murphy V280

Unstable Frame Hold

On this receiver we have experienced trouble with touchy and unstable frame hold. Replacement of the 6/30L2 (V12) may appear to restore a firm lock, but this only lasts for a few days after which the drift returns when the new valve has seen very little use.

A permanent cure, however, can be effected by replacing C64 on the long panel, 13th tag, from rear of chassis. It is advisable to scrap the existing

(Continued on page 171)

Items for publication

in this feature are welcome, particulary in regard to the more unusual type of faults. All contributions used will be paid for at our usual rates.

When sending in items for Technical Gen, please write (or type) on one side of paper only, adding rough sketches (where considered necessary) on a separate sheet of paper. Correspondence should be addressed to — RR Service Engineer, 46 Chancery Lane, London, W.C.2.

The Editor does not necessarily endorse the views expressed by contributors to this feature

TECHNICAL GEN continued

470pF capacitor regardless of test as some of these have tested normal but have in fact been faulty. We replace C64 with a 500pF ceramic disc type.—T.B., Bradford (899).

Pye G63

Stereo Gram Fault The complaint with this gram was intermittent volume variation. On soak test it was some while before the fault showed itself and then it was found that the left hand channel dropped while the right hand channel remained constant. Another plug-in pick-up head was available and tried but with the same result. A sensitivity test with an audio generator and output meter revealed that the drop was to a quarter of the previous level.

A signal was injected to the two wipers of the ganged volume controls and a lengthy run under these conditions failed to produce the fault, thus apparently clearing the amplifiers. To confirm this the connections to the wipers of the two controls were changed over, and when the fault re-appeared after a further test with records, it was the right hand channel that was now defective.

This indicated that the trouble was either in the pick-up wiring or the volume controls as the pickup leads are brought straight to the top end of the controls.

It was then noticed that there was nestling under each control an r.c. network for tone compensation, connected from the top end of the control to a tap. No manual was available and these had not previously been noticed. Changing the 0·005μF capacitor on the left hand control network cured the fault.—V.D.C., Bristol (911).

RECEIVER SPOT CHECKS

No. 67: EKCO T283 and T284

No Sound or Vision: Check R6 for o/c and C10 for s/c; R8 for o/c, C12 for s/c; R12 for o/c, C17 for s/c; R59 for o/c, C13 or C26 for s/c. Check C16 or C19 for leakage.

No Sound: Check R27 for o/c, C37 for s/c; R33 for o/c, C40 for s/c; R37 for o/c, C41 for s/c.

No Vision: Check R23 and R24 for o/c and C33 for s/c; R38 for o/c, C43 for s/c. Check for o/c L24 or L25. Check for faulty crystal diode.

Frame Timebase Inoperative: Check R108 or T2 primary for o/c. Check C101 or C104 for fault and C109 for s/c.

Line Timebase Inoperative: Check C98 for o/c or s/c; R103 for o/c, C103 for s/c; R110 for o/c, C107 for s/c. Check T6 for o/c primary; check for faulty C105, C106, C111; check L32 for leakage to the core.

No Raster: Check C93 e.h.t. smoothing or R79 metrosil for leakage. Check C108 for s/c and R86 for o/c.

Poor Frame Sync: Check C122 for s/c, C112 for leakage or MR1 for fault.—E.L., Long Eaton (779B).

R.G.D. 610

Vision Fades Out Complaint was that when first switched on, picture was perfect, but after about two hours the picture became darker and darker until after about three hours it could only just be seen with full brightness and contrast.

On test, the customer's description of fault was found to be absolutely correct (for a change!) but we found that the brightness control was inoperative when the fault occurred and on checking the c.r.t. grid, no reading could be obtained.

Disconnecting the grid lead, the voltage on the slider of the brightness control was checked and again there was no reading even with the slider at the h.t. end of the track. On dismantling the control, the track was seen to have broken away from its rivet at the h.t. end; it was connecting with the rivet when cold and gradually expanding away from it as the receiver warmed up.—G.C., Boroughbridge (929).

Ekco T162

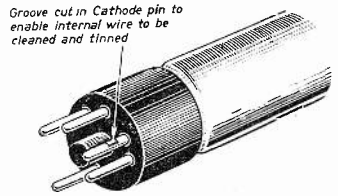
Trouble with Tube-pin Although this fault occurred on an Ekco T162, it could well apply to any receiver. It displayed itself as the displacement of a few lines only, similar in nature to the type of interference caused by some types of electrical lamps. The displaced lines always occurred at the same position on the raster at approximately two-thirds from the top.

The sync pulses observed on an oscilloscope appeared clean, but this is understandable since it is impossible to look at an individual pulse without specialised equipment. Infiltration of a.c. into the sync circuit was next suspected but checks made at likely places in the circuit yielded no results. Heater-to-cathode insulation on tube and associated valves proved to be good.

Brainless Bertie

'Lack of Width? Line o/p valve,'
Said Bertie without looking;
Changed it, but the set came back
With screen resistor cooking.
Feste

However, gentle tapping of components increased the tendency to break up the line structure and this was most apparent when the tube neck was tapped. A check on potentials while tapping was in progress eliminated intermittent interelectrode shorts. And since heater-cathode potential had previously been checked there was only one further possibility, that of an intermittent internal open circuit between one of the tube electrodes and its pin. The logical choice was the cathode.



To effect a repair, a small groove was carefully filed into the cathode pin at a position approximately one third of the length from the tube end. This exposed the internal connecting wire, which was carefully cleaned and the complete groove filled in with solder and finally cleaned to the original pin diameter. This effected a complete cure.—J.E.R., Nottingham (921).

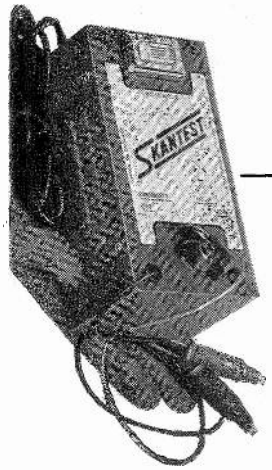
Philips 1768U

Picture Size Varies Erratic width and height were the complaints. The picture size was varying by about a quarter of an inch in width and height every few seconds. The h.t. line was checked and the voltage found to be steady.

Noting that part of the frame h.t. is derived from the boosted h.t. of the line output stage, the drive to the PL36 was checked and was found to be varying. The 0·01μF ceramic coupling capacitor C54 was leaking. After replacement, the width was steady but the height was insufficient to fill the screen.

Voltage checks in the frame circuit showed that the feed from the boost line to the PCL82 triode anode (one

(Continued on page 173)



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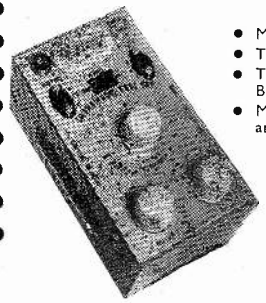

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DC/μA.	50μA						
DC/mA.	1mA	10mA	50mA	250mA (0·25V)			
DC/A.	10A (0·25V)						
db.	−10db ~ +62db						
Ohm.	Range	10,000R	1,000R	100R	1R		
	Centre	340KΩ	34KΩ	3·4KΩ	34Ω		
	(Min. 1Ω — Max. 40MΩ)						
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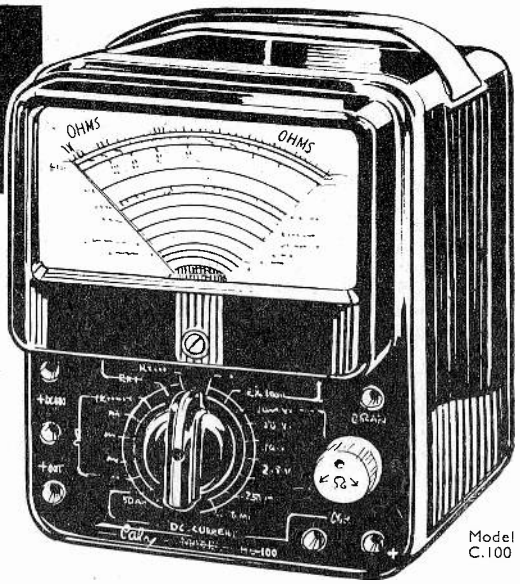

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TECHNICAL GEN continued

half of the multivibrator) via the height control was about 400V as against 480V quoted in the service manual.

The 0·018μF ceramic decoupling capacitor C63, between boost and h.t. lines, was found to be leaking, thus reducing effective boost volts. Replacing this component restored the height to normal, the width seemed unaffected.—J.P., Enfield (922).

Ferguson 4606

Severe Vision Smear The complaint with this receiver was that severe smearing of the picture took place together with loss of line sync. The fault was intermittent, only coming on some time after the set had warmed up.

It was obviously a fault in the video amplifier circuit and the valve, a PCL84, was first substituted with no effect on the symptoms. The 50μF cathode bias bypass capacitor was suspected and a replacement "hung" in, but again the fault persisted. All the d.c. voltages on the video valve pins were carefully taken with the fault on and off and compared, but there was very little difference. It was found that when the meter was connected to the grid pin, the fault would clear.

A resistance check from the grid to chassis with the fault on, showed infinity. The grid leak resistor was checked but found to be O.K. The grid coil, L40, in series with the grid leak was eventually found to be open circuit. Actually, it had never been soldered at its terminal tag. Soldering effected the cure.—V.D.C., Bristol (913).

Sobell SC34

Poor Sound, Vision Symptoms were very distorted sound, poor vision and sync. The sound distortion was found to be due to the earthy end of the bias resistor to the PCL82 a.f. amplifier V4A not being tied down to chassis.

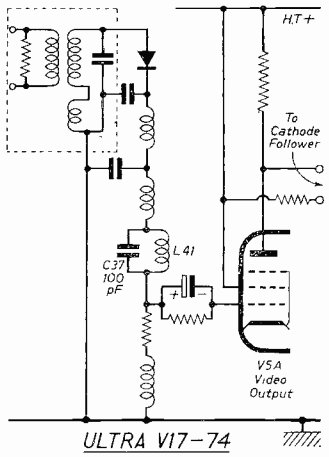
It was soldered to the spigot of V4A which is taken to chassis via a screened lead up to the volume control and finally through socket 2 on the r.f. panel to chassis. The distortion was caused by an open-circuit of the screened lead on socket 2.

The poor vision and sync was found to be due to a short circuit in the 1,000μF cathode decoupling capacitor C40 of the video output valve.—E.T.E., Fleet (923).

Ultra V17-74

Weak, Negative Picture This receiver, which is of the flywheel sync, valve controlled a.p.c., type, came into the workshop with the following symptoms: the picture was negative and, if anything, the contrast control was inclined to operate in reverse. Also, picture lock (both horizontal and vertical) was too weak to obtain a steady picture.

It was decided to concentrate firstly on the picture lock and therefore



ULTRA V17-74

checking was started at the sync separator stage, back through the video output stage and thence to the vision detector. The fault was eventually found in the "hot" end of the detector circuit.

The actual culprit was L41, which was open circuit. This coil was, as usual, wound on a resistor and therefore the circuit was not entirely broken but was sufficiently so to cause the symptoms.—J.R.A., Peterhead (918).

H.M.V. 1910

Weak, Tearing Picture Weak picture and line tearing, which were the symptoms on this receiver, seemed to indicate poor r.f. gain. However, on examining the picture, no valve noise could be seen and there were no highlights, even interference appearing grey. This was obviously a video fault.

A preliminary substitution of the PCL84 video amplifier brought no improvement. A check on the valve voltages revealed that the anode voltage was only in the region of 40V and the anode load resistor was overheating. Cathode bias voltage was checked and found to be absent.

In this model, there are two cathode bypass capacitors which are selected by a flying lead to give optimum video response. One of these, C54 (2,600pF) was found to be short circuit.—V.D.C., Bristol (912).

SERVICE BRIEFS

R.G.D. Mk 104: On this tape recorder, when the volume was turned down even slightly from the fully off position there was a very loud screeching noise, both on record and playback. The tone control had no effect on this. This was all because the V1A cathode capacitor C1 was wired up wrong, the negative lead not being connected to earth but to h.t. positive, this tag being adjacent to the earth tag.—G.R., Barnsley (763).

Garrard RC120: Although this was fitted to a Regentone radiogram the fault could apply to any set. It was a new model which, when unpacked, was playing slow on all speeds. Motor was checked O.K. but we were surprised to find that the jockey pulley was not a 50 c/s one but a 60 c/s version. We can only assume that we got an export model by mistake.—G.R., Barnsley (764)

Ultra 17-74C: A common fault on this receiver which causes over contrasting has been C47 going leaky. This is the coupling capacitor from the cathode follower and the sync separator to the a.p.c. rectifier. Another fault of a very similar nature is when the i.f. filter choke has been found to be shorting to the connecting pillar of R51 and C47 on top of the receiver chassis.—A.A.S., Mansfield (824).

Pilot PT450: Intermittent operation of the a.g.c. circuit has been encountered on two of these sets, both new. Symptoms are that after days of perfect operation the a.g.c. control voltage disappears with overloading on vision and sound and loss of sync. After a while the fault vanishes, usually before you can get much work done on the set. The trouble was finally traced to C39, the coupling capacitor between the video amplifier and sync separator, this being intermittently open-circuit.—G.R., Barnsley (762).

Perth AM35: Fault was quite a loud mains hum on all bands and on gram. Smoothing capacitors checked O.K. as did all valves and the smoothing resistor. Trouble was traced to a fault in the wiring from the factory. R10, the anode load of the a.f. amplifier, was connected to the wrong side of the smoothing resistor R12.—G.R., Barnsley (760).

Philips 1796U: On one of these sets the line was running too fast, and after checking the line oscillator circuit the fault was traced to C69, the anode decoupling for the oscillator valve V11B, which was o/c. An unusual fault on this receiver, which was causing loss of sync on line was traced to R87 which was o/c. This resistor is part of the biasing circuit for the reactance valve V13.—A.A.S., Mansfield (823).

New Books

★ *SERVICE ENGINEER REVIEWS OF THE LATEST TECHNICAL LITERATURE*

Practical Auto Radio Service & Installation, by Jack Greenfield. Published by Gernsback Library Inc. (U.K. Agents: Modern Book Company, 19 Praed Street, London, W.2). Size 8¼×5¼ in., 160 pages. Price 23s.

ANOTHER addition to the growing list of publications on the popular subject of car radio. This time aimed unashamedly at the technician, with the emphasis on installation. Which seems ironic when one considers the way car radio manufacturers have carefully designed their fixing kits for most of the current and recent past models, and the way the car manufacturer allows for the incorporation of a radio as part of the fitments of the car.

This book is written for the American reader, and much of the information will be of interest only, not directly helpful for British technicians. That is not to say the information therein is wasted, for Mr. Greenfield has taken care not to leave anything unsaid. His nine chapters are packed full of useful facts, profusely illustrated with line drawings and several photographs. A number of typical circuits are given and a good deal of space is devoted to transistorised and hybrid receivers.

British readers will no doubt find something of interest in the section dealing with f.m. radio, with derived stereophony and Hi-Fi phono systems. The author can certainly not be accused of being out-of-date.—*M.A.Q.*

★

Using Transistors, by D. J. W. Sjobbema. Published by Philips Technical Library. (U.K. Distributors: Cleaver-Hume Press Ltd., 31 Wright's Lane, Kensington, London, W.8.) Size 8×6 in. 118 pages, 121 figures. Price 15s.

IN the eleven years that transistors have been with us, enough books have been written on and around the subject to stock a respectable library.

On the upper shelf is the elaborate disquisition that appears to be a cross between a treatise on astronomy and a mathematical thesis. On the lower, a do-it-yourself strip cartoon, with transistors like blocks of a well-known chocolate—filled with nourishing holes. Laymen put it down, burping with mental indigestion, vaguely unsatisfied.

More technical readers reserve their appetite for books such as this under review. Mr. Sjobbema has neatly prepared a satisfying meal, garnished with illustrations that are neither unnecessary nor an insult to the intelligence. Praise is due to the translator, Mr. P. J. Arthern, who has provided sufficient flavouring to make the repast digestible.

The trick seems to be to keep within a strict framework of reference, neither wasting space on too much physical groundwork, nor digressing at length on experimental circuits and little-used applications. That way, the reader is kept within bounds, his interest contained and directed.

The physical groundwork is not entirely absent, however. After dealing with the construction of the junction transistor and comparing transistors with the thermionic valve, Mr. Sjobbema devotes chapters to the basic ideas and characteristics and to the influence of temperature changes on transistors.

At Chapter Five, the nature of the book changes, and we are given a steady development of circuit techniques. Here it can be seen that the preliminary theory was chosen with care, for the discussion builds up steadily and there is little need for the less informed student to indulge in frantic leafing for his references.

This long and meaty chapter, is followed by two shorter, practical chapters on servicing and measurements, leading to Chapter Eight, where fourteen practical circuits are given and the particular features explained. This is a gift to the experimenter, for each of these is a circuit that has been proven in practice. Many will be familiar to the technician.

Full details are given of components, etc., hints on construction where needed and winding and lamination dimensions of those transformers that are specially designed.

In this, the chapter differs from those preceding. There is a distressing tendency in modern technical writing to cloak a circuit in mystery, numbering components but not stating values. Mr. Sjobbema is not alone in being an offender, but it is the one small defect that spoils an excellent book.

For example, on Page 53 we are asked to compare Figs. 59 and 53. The comparison is between a voltage amplifier and an energy amplifier (output stage). Whilst the text makes it plain that there is a good deal of difference in characteristics and working point, the inclusion of component values on each of these figures would have assisted the explanation considerably.

Despite this, *Using Transistors* is an excellent addition to the Philips Technical Library, and to be recommended.

This is a well-planned, balanced work, not over-ambitious nor insultingly simple. To quote the inanity of the Juke Box Jury: "It may not reach the Top Ten, but—well, I like it!"—*G.L.M.*

★

Tubes and Circuits, by George J. Christ. Published by Gernsback Library Inc. (U.K. Agents: Modern Book Company, 19 Praed Street, London, W.2). Size 8¼×5¼ in., 192 pages. Price 30s.

THE hard-pressed reviewer must occasionally feel that the radio and electronic field in technical literature has been thoroughly worked. Of late there have been many—too many—books on transistors and their applications, and an equally heavy load of works on the various aspects of Hi-Fi. It comes as something of a welcome change to see a book devoted unequivocally to "the valve".

Whether the book will be as welcome an addition to our technical library is another matter, however. The author breaks no new ground and does not dig very deeply into his chosen patch. His avowed intention is to "*help a technician at any level upgrade his knowledge and performance.*"

To achieve this commendable aim he devotes his first chapter to electron theory, without in any way straining the reader's wits, his second chapter to valve characteristics and chapters 3, 4, and 5 to the diode, valve amplifiers and valve oscillators, successively.

Then follows a chapter on miscellaneous applications, which could profitably have been expanded both in explanation and illustration. Chapter 7 deals with multi-purpose valves and chapter 8 with gas-filled valves.

The last two chapters are also tantalisingly incomplete, skating only lightly over photo-electric emission, tubes and colour developments and finally Industrial Applications. As the author is both Assistant Professor of Applied Science at New York University and Transmission Engineer to the New York Telephone Company, the reader must grudgingly admire the way he has kept his undoubted erudition in check. The overall impression to be gained is that he has sat at his desk and said: "*What shall I write about?*" then come up with the answer, "*valves!*"

The result is an unsatisfying rehash of textbook information, neither deep enough for the student nor sufficiently applied to be of interest to the technician. Some day a writer of this author's calibre is going to come up with a book on "Interesting valve circuits" or "The things a valve can do!" and find himself paying tax on his royalties. Unfortunately, those that write such could-be-best-sellers are seldom such masters of their subject.—*D.C.*

SERVICE WITH A GRIN

by H. W. HELLYER

Honour without Profit

ENDLESS amusement can be gained from the financial columns of any newspaper. Here, the City Editor throws out tips as blatantly as his less elegant colleagues on the sports pages. Here we find Bunterish denials (*We shall not be bought out—it's a dirty rumour*) followed by the news of another merger.

Now that man can no longer put his trust in princes, he puts his sovereigns in Trusts. You can see them any day on the 8.10 to Town, black-clad, leaning on their furled umbrellas, bowler-hatted like a row of Acker Bilks, studying those mysterious signs that resemble mad tolerances beside the stock market closing prices.

It would be funny if it was not occasionally tragic. The deliberations of these gentlemen may make the difference, ultimately, between changing the tube in Mrs. Fussit's set or fiddling with a cheap boost transformer.

Please do not fret, dear reader. I am not about to embark on another bout of December Doldrums. My present spiel was inspired by a conversation in the shop on the controversial subject of "making Service pay".

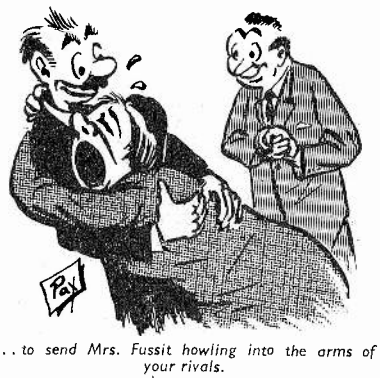
After a decent pause to allow the hollow laughter to die away, I shall go on to observe that there may be a service department, somewhere, that is honestly making a profit. There are, undoubtedly, a number that dishonestly make—well—less of a loss than the rest of us. But, on the whole, is it reasonable to expect good service and still be in the black?

Joe gives an unequivocal, "No!" Good service means instant attention to Mrs. Fussit's complaint. Big job or small, local or distant, the lads jump to it with the alacrity of a housewife going to the Spring Sales.

Good service also means on-the-spot repair that will bring the set back to new condition. It means a minimum of replacements, coupled with scrupulous testing to avoid a short-term breakdown. Finally, it requires a service charge that will not be so prohibitive as to send Mrs. Fussit howling into the arms of your rivals.

Bowler-hatted, like a row of Acker Bilks.

All this demands a very well-equipped workshop, comprehensive stocks, inside and on the vans, a large staff and enough spare sets to provide stop-gap entertainment when a "dog" unavoidably has to be brought to heel at the bench.



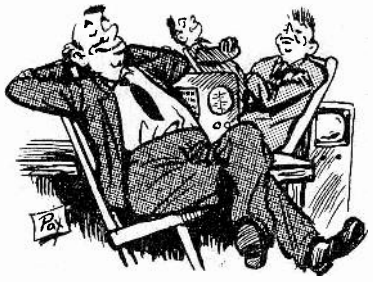
. . . to send Mrs. Fussit howling into the arms of your rivals.

This can be costly—to the firm. Joe's dictum is that good service can and should be given, regardless of cost. The service department should be subsidised by sales.

That sounds fine—a counsel of perfection. But d'you see where the argument is leading us? Quite so, what happens when sales fall off? The service department is the first to feel the draught.

Then comes the other side of "good service", that comes under the heading of "efficiency". Efficiency means that jobs will be organised in an economic route, to fit in an engineer's day. So Mrs. Fussit, who has the misfortune to live at the lower end of the town, has to wait until several of her neighbours complain before she receives attention.

Efficiency also means the employment of semi-skilled labour on the vans, less work done on the spot. This has the added advantage that a set brought to workshops can have the bill as well as the tube boosted with less likelihood of criticism.



It's better to sit down and do nothing all day.

Replacements, too, are a source of greater profit. One can always, without being exactly dishonest, find a valve or two that could be changed to effect some small improvement. There is always the manager who is ready to stick a bit on the bill—like some bridge players I know, always ready to call a spade two spades.

Which brings us to the service charge—and the way it is presented. There has grown up a modern art of compiling incomprehensible invoices. The radio trade is not alone in this: any householder will attest to the prescriptive ingenuity of the average jobbing builder. Indeed, in the aforementioned conversation, it was said that service could be "made to pay" by assessing the overheads and uplifting the service charge to show a working profit.

For the benefit of the innocent I might explain that this is normal sales technique. The shop manager takes an old set in part exchange, gets it refurbished by a reluctant Joe, then adds what is necessary to the amount to make his calculated profit. And, by Jove, he sells it.

The factor that is so often overlooked is that radio service is—just that—a *service*. The aim should be to foster goodwill. To make Mrs Fussit return when the battery in her torch runs down or the bulb in the pantry pops off again.

As for service under maintenance, the least said the better. Except to quote Joe, whose ultra-logic carried him to the point where, "*It's better for the engineers to sit down and do nothing all day, because every job they do knocks another hole in the kitty.*"

Perhaps it was merely wishful thinking. You, dear reader, and I, know well that we shall be called upon to look lively for little reward. We may have the honour; it is the bowler-hatted gentry who will share such profits as may accrue if we can make the department pay.

And then we shall probably be taken over by Mr. Clore, Mr. Rank or Mr. Woolfson anyway and become an item on a share index to give another reader a laugh.

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VOL. 2

Radio Receivers and Radiograms

Volume One has 142 pages of information on TV receivers, of immediate practical value to the television service engineer, both in the workshop and in the field. Details are given of valve complement, c.r.t., i.f.'s, controls, electrolytics, metal rectifiers and diodes, thermistors, surge limiters and mains droppers, mains input, fuses, e.h.t., aerial inputs, together with servicing notes or special remarks. A special section deals in detail with Band III converters and conversion.

Valves: 1 ECH35; 1 [illegible]; 1 EB34; 1 U37.
Inter. Freq.: 460kc/s.
Pilot Bulb: 6.5V 0.3A M.E.S.
SPECIAL REMARKS: The radio section has its own power pack, but uses the a.f. amplifier of the TV sound channel.

T141 (12*in. table model*), **TC138** (12*in. console model*), **TRC139** (12*in. console with pre-set radio*)
Valves: 5 6F1; 2 6D2; 4 SP61; 1 6P28; 1 U24; 1 PY31; 1 6P25; 1 6K25; 1 PZ30.
C.R.T.: Mazda CRM121B.
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Channels: All in Band I—lower sideband.
Band III Tuner: Type TT234.
Controls: Contrast 5k w/w; Brightness 100k DP switch; Volume 20k w/w.
Electrolytics: 100+50μF 350V kwg. common negative.
Aerial: 70–80 ohms unbalanced.
Mains: 200–250V a.c. only live chassis.
Fuses: Two 1.5 amp.
E.H.T.: 7kV (line flyback).
SPECIAL REMARKS: For fringe areas a single-valve pre-amplifier is available, and a slot is provided to hold it on the back of the cabinet. The amplifier is powered from a socket on the back of the chassis. SP41s may be found in place of the SP61s; and one PY1 may be replaced by a 6C9.

—osc. high.
Channels: All fiv
Band III Tuner 1 TD258.
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Controls: Volur

Extract from Vol. 1 showing typical entry.

Volume Two has 190 pages of information on radio receivers and radiograms of equal value to the field engineer and the man at the bench. Details are given of valve complement, mains input, i.f.'s, electrolytics, pilot lamps, controls, mains droppers, waveband coverage, speaker, fuses, and in the case of radiograms or record player unit, pick-up. Notes on aerial inputs, and provision of extension speaker and pick-up sockets are also given. There are also sections on tuners and notes on transistors and printed circuits.

Volume I covers the basic circuit specifications of the vast majority of post-war TV receivers and includes a section on Band III converters. Volume 2 deals similarly with radio receivers and radiograms and includes a section on tuners. Both volumes are packed with data, invaluable in the service workshop, essential to the outside engineer.

Vol. 1—(Television Receivers) **10/6** post paid

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