RADIO SERVICE ENGINEERS

Radio Service

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Registered Office:
2, STEVENSON STREET WEST,
ACCRINGTON, LANCS.

Editorial Office:
13, SHIP STREET,
HIGH WYCOMBE, BUCKS.

General Secretary: H. HILL

Honorary Treasurer: J. WREN

Scottish Office:
11 RINTOUL PLACE
EDINBURGH

Northern Ireland Office:
5 TIMBEY PARK,
ORMEAU ROAD, BELFAST

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Vol. 4 No. 23 **NOVEMBER, 1951**

TEST EQUIPMENT

ONCE MORE the subject of test gear comes up. It is evident, from letters received, that many engineers in all parts of the country are still being expected to carry out efficient T/V servicing without proper equipment.

The favourite, and obvious, excuse of all offending employers is that they cannot afford the outlay necessary to equip their Service Departments in a proper manner. The fact is—and if they were better business men they would know it for themselves—they cannot afford NOT to have proper equipment. In any case, it needs only a slight knowledge of the profits made per sale to-day for it to be obvious that the money is there—or should be.

Complaint cannot be made that the average engineer is "fussy" or "faddy." Go into any Service Department and you will find many pieces of equipment home-made by the engineer to save time and money—for the employer. Service engineering is, to a large extent, one of those happy trades where the employee often regards his job as a hobby and is thus prepared to bring to it a personal keenness and enthusiasm found in few other occupations. The fact remains, however, that the keenest enthusiasm can be damped down by lack of encouragement. It is also a fact that improvisation, though excellent in its place, can, if perpetuated, grow into second-rate methods and second-rate service.

It is thus in the name of the paying public, as well as in the name of every service engineer in the country, that all employers are appealed to to examine—and add to as necessary—the test equipment on which the success of their own business must, to a large extent, finally rest.

FROM THE EDITOR'S DESK

Technical Information

I am not receiving as much Technical Information from members as I would like. This is no doubt due to excessive T/V work and the end of the holidays. However, I look forward to more members sending in their faults, as this is a very popular item in the Journal. In any case it is up to all of us to help each other.

Manfacturers, Please Note

When are we to see the end of controls with several loops of wire beneath the solder? I am certain that if manufacturers had to replace as many of these as service engineers do there would soon be an alteration in their methods.

From Pye Radio Limited

The following Service Sheets have been received and are now added to the library:—

Model P43
„ P45/RG
„ P31/MBQ

That Little Extra Something

Many of T/V's coming in for service are two and three years old, and it is a good tip to check *all* smoothing condensers. A 32 mfd. down to 16 mfd. in one particular set can make a world of difference.

Some Service "Hates"

Some points raised by readers which could easily be rectified:—

Loud Speaker Leads too short to allow the chassis out of the cabinet, with sometimes hair-raising results.

Heavy T/V or Radio Sets without inspection panels.

So many different types of T/V Aerial Plugs. One firm has excelled itself with a plug which is really "too too exclusive."

Dials with a plastic reflector which curls when warm and fouls the drive pointer.

Makers of T/V's who do not allow for the easy fitting of a pre-stage amplifier.

Some all-dry portables where it is quicker to remove the chassis to change a valve.

I am sure there are many more of these things that members can think of. Why not let me have them, and perhaps some manufacturer will take notice.

★ ★ ★

FIRST RADIO SERVICE CROSSWORD

Here is the solution to the first crossword puzzle:—

Down			Across		
1.	Reg.	14	N.C.	2.	Bias.	16.	Centering.
2.	Bridge.	17.	Nepers.	5.	Hum.	21.	Pye.
3.	A.C.	18	In.	7.	Grid.	22.	Plate.
4.	E.M.I.	19.	G.A.	8.	A.H.I.	24.	Ratio.
5.	Ham.	20.	M.A.	10.	H.F.	27.	T.R.A.
6.	U.H.F.	22.	P.A.	12.	M.F.	29.	A.F.
9.	A.G.C.	23.	T.T.A.	13.	Gang.	30.	Phase.
10.	Hot.	25.	Tap.	15.	O.E.	31.	A.P.
11.	Feeder.	26.	I.F.				

The winner was D. T. Banham, of 4, Ladywood Road, Ipswich, Suffolk, who will be receiving his cheque very shortly. Better luck next time to all the unsuccessful competitors.

T.V. For Beginners . . . .

By E. H. JAGO

PART V.

THE Power supplies for T/V receivers designed for A.C. operation with a mains transformer differed but little from normal radio practice, although the needs of about twenty valves meant increased size and weight. Now the tendency is to use A.C./D.C. technique for television, presumably on the score of price. I have not noticed any advantage in the way of results and, from the angles of safety, service and heat problems, there are noticeable disadvantages, just as there are in sound radio—only more so!

Safety is a subject on which the writer holds some strong views, but this is not quite the place to air them, save to emphasise to engineers that T/V (and other) sets should never leave a workshop one whit less safe than the design allows and this should be regarded as a bare minimum.

Service engineers will soon decide whether they prefer the weight of a mains transformer or the multiplicity of odd voltage valves in series parallel with a few resistors (and maybe condensers) thrown in, switching off whilst any valve is taken out, working with a live chassis and removing. by-passing and reinstating the safety devices. You should guess which, in one! (no prizes!) The use of special regulator resistors is growing for these circuits and these may be tricky to test since their value in ohms is very largely dependent on their temperature and hence, of course, on the current flowing in them. A comparative test against a new component will usually provide a useful guide, otherwise indirect methods must be used. Often it is convenient to ascertain what voltage drop should be present under working conditions and check this against a reading. The danger of damage to other heaters caused by a failure in series-parallel circuits is well known and as one heater is that of an expensive CRT the need for care should require no emphasis. In some otherwise A.C./D.C. circuits an A.C. tranformer is used for the CRT and for other critical heaters. Old valves with intact heaters can provide useful dummies for test purposes if the cathode pins and any others capable of causing trouble are cut off—best perhaps with all pins save the heaters removed. At least one engineer I know marks these dummies with the types they will replace and it is surprising how to many types one heater is common.

The HT circuits follow conventional practice with a tendency to load rectifiers very fully. So fully that very little extra leakage on the H.T. line or a set of parts with tolerances all in the direction of higher consumption can cause a receiver to consume rectifier valves in a most expensive fashion. The remedy is obvious but requires

pains and patience. The somewhat low value of H.T. available from rectified mains is countered by the use of valves designed specially and by occasional additions in the form of rectifiers fed from such sources as time base outputs. Diode and small 'dry' rectifiers are commonly in service to provide extra volts this way either as H.T. or in the form of negative bias thus allowing the use of all available volts on the H.T. line as H.T. The efficiency diode of the line time base is a special case of this, dealt with elsewhere in this series.

The E.H.T. supply has had its own section but the supply at some 25,000 volts for projection tubes has been neglected up to now. The usual supply scheme for these is from an RF oscillator and amplifier feeding a voltage tripler circuit using high voltage diodes heated from secondaries on the amplifier output transformer. Since air spacing is no longer a practical form of insulation at 25kV it is usual for all the final circuits to be oil immersed even to the valves and any failure here means a complete replacement unit. The early stages producing 8,500 volts at 1,000 e.p.s. may be treated as a normal E.H.T. supply of the oscillator type described earlier. Although the final very high voltage needs treating with great respect the makers claim that it is not capable of a fatal shock to a healthy adult. The writer has not made, nor does he recommend, personal experiments regarding this. It will, however, ruin the tube coating should either time base fail whilst the tube is operating and only needs a fraction of a second to do this. To guard against this a safety circuit is incorporated, the general action of which is as follows. The tube grid is connected to a brightness control potentiometer (the cathode being the modulated electrode) which is fed with a negative supply from a diode rectifier at its earth end. At this stage the control is inoperative and the tube is blacked out. The top end of the potentiometer is fed from another diode which rectifies the supply from a secondary winding on the line time base output transformer and this opposing positive voltage allows the normal control of brightness to be obtained. (Incidentally a projector tube has a normal E.H.T. current of 100 microamperes with a peak value up to about three times this.) Before the line time base can work, however, a further section of the safety circuit must operate. The line output valve screen is held negative by a connection to the first-mentioned diode until backed off by a positive supply from a third diode rectifier fed from a secondary winding on the frame output transformer. Thus the frame time base output must first enable the line time base to work and the line time base in its turn enable the brightness control to release the tube emission. Whilst this circuitry does protect the tube in a large measure, failure of the secondaries of the time base transformer, the deflector coils or the first diode providing negative supply (and the connections and components associated with them) can still allow damage to occur and if a tube should suffer in this way a check must be made before a new tube is fitted. A resistance test of the secondaries and deflector coils for continuity and isolation from each other

and earth is the first check. After this the E.H.T. supply should be cut off (by disconnecting the H.T. supply to the 1,000 cycle oscillator) and the voltage on the tube grid measured with a valve-voltmeter. If the negative diode supply is in good order a reading of minus 125 volts with respect to chassis should be obtained when the time base(s) are not operating and a reading of from minus 140 volts to 150 volts positive, dependent on the brightness control, should appear when the time bases are operating. Until this last reading is obtained a tube should not be fitted and for extra safety a check for scanning supply with an oscilloscope on the tube coils may be made.

Since any time base failure thus results in no picture, the above voltage test is a key service check on any projector model of this type with no raster. It settles at once whether the time bases are working and in case of failure a reading of the screen voltage of the line output valve will indicate whether a start is to be made at the frame or line time base (assuming the safety circuit to be in order). If all is well the tube and E.H.T. must be checked next together with heater and cathode voltages.

While we are on the subject of projection, a brief consideration of the usual optical system may be useful. After its originator this is called the Schmidt mirror lens system and figure X shows it in simple form.

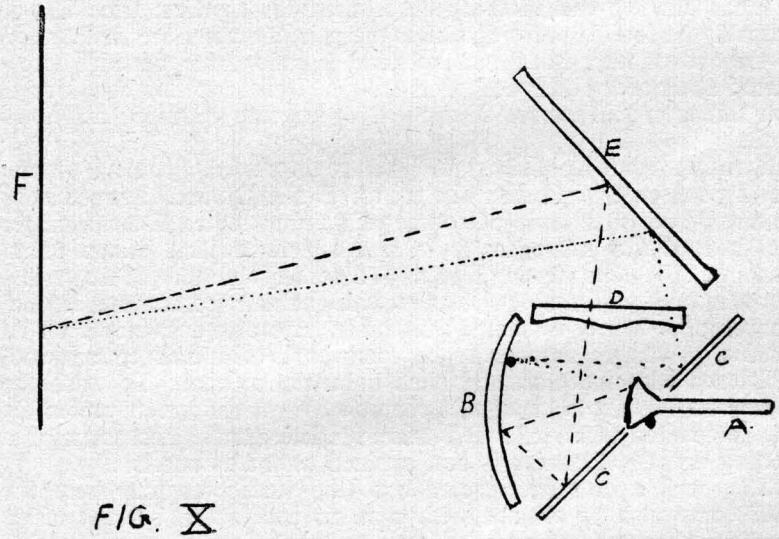

FIG. X

Here A is the CRT facing through a central hole in an inclined mirror C towards a concave mirror B. The picture image is reflected by B on to C and by C through a corrector lens to another mirror E, finally reaching the viewing screen F. The paths of diverging light rays from a point on the tube face are indicated by dot and dash lines.

So far as service engineers are concerned the chief points for consideration are focusing and positioning the picture and the cleaning of the optical surfaces.

Before any adjustment of the projection system the picture must be correctly focused and positioned on the CRT face by the usual methods. Here it may be mentioned that projection tubes have been found to emit soft X-rays and when directly viewed they should be reduced in brightness or viewed through a sufficiently thick sheet of lead glass. Such precautions may be a counsel of perfection when only short and occasional observation is made, but any frequent or prolonged viewing would be foolish to risk without such safeguard.

To focus on to the screen a pair of adjusting screws will be found on the optical unit (which comprises parts A, B, C and D) and a single similar screw at right angles to them. The pair of screws should be adjusted first and this will be found simpler if the odd screw is first mis-adjusted. The two screws should be simultaneously adjusted in the same direction until a strip of the picture is seen to be in focus and to pass through the centre of the screen. The same screws are then simultaneously adjusted in opposite directions until the strip in focus is vertical (and still passing through the centre of the screen). Lastly adjust the third screw to bring the sides of the picture into correct focus and lock all three screws.

When starting this focusing adjustment for the first time it will probably be found confusing unless the pair of screws are first turned to the end of their travels in the same direction and the third screw placed at or near either end of its travel. Return to this condition if you fail to reach correct adjustment or become confused and start again.

Focusing being completed the picture is placed correctly on the viewing screen by releasing the mirror E slightly and tilting this as required, and afterwards of course refastening same. Do *not* finger the face of this mirror as it is face silvered, which brings us to cleaning. First the viewing screen. These vary, but the plastic variety generally met with may be cleaned with chamois leather and alcohol (industrial). Mirror E should preferably have any dust blown off its surface. A finger mark may be removeable with soft cotton wool moistened with the aforementioned industrial alcohol. To wash the mirror surface use a clean soft chamois and warm water (preferably distilled water with an added trace of detergent in the form of a wetting agent). Cleaning is best avoided as far as possible.

The outside of the corrector lens (the surface remote from the CRT) may also be cleaned with chamois and water, but the inside should *not* be touched and the face silvered surface of parts B and C are also best left alone. All these are in any case inaccessible. The CRT face is of glass and if soiled may be treated accordingly.

It will be gathered that these optical systems are easily harmed and the writer would not like to be held to blame should any damage

Please turn to page 8

How to Locate and Cure Noise on Car Radios

A SEQUEL TO "HOW TO FIT A CAR RADIO"

BY "H.T."

THERE are many ways to approach this problem, but first and foremost it is essential to get oneself into a rational and unemotional state of mind. It must be remembered that the engineer has just completed the simple task of fitting the instrument. I use the words "simple task" in a wide sense (scan any sales blurb and you will see what I mean) and having gone through what may be described as an interesting experience—interesting from whose point of view is debatable—he must now be in the right frame of mind to tackle the next part of this intriguing problem—interference.

Information on the subject in most books is negligible, but it will be obvious to anyone that the most important part to check is the ignition system. WHATEVER HAPPENS, NEVER FIT PLUG SUPPRESSORS, even if you have to bond the engine in several places, reroute the ignition cables, screen the ignition coil, and maybe fit the coil in another place altogether. Of course the cost of all this will be about ten times that of fitting the suppressors, but this is incidental. Everyone knows the employer never bothers about costs.

It may now be assumed that the ignition system is tamed, but anyone tackling this problem for the first time must not be deluded into thinking this is the end of his work. Nothing could be further from the truth—this is really only the start.

The next part of the car's equipment to query is the dynamo. This has various noisy contributions to make and, to quote the average book on this subject, "a condenser fitted on the brushes side of the dynamo is all that is necessary." Here may I stop for a minute to suggest that for some good clean fun, you try connecting a condenser on the field side. You will be quite surprised at the result.

If you are gifted with patience (which I am not) you may find it is tried to its limit in this alleged simple fitting. In one particular case it is necessary to remove the carburetters and inlet manifold, and even then only a special spanner will fit the nut that secures the condenser. We will pass on from this butchery and incineration of the fingers and arms to the next phase. By rights all should now be well, but on tuning to a weak station there is quite a definite tick-tock, etc. This is a simple job, providing your blood pressure will enable you to lay on your back, your legs somewhere over the front seats, your head fixed between the gear lever, heater, a brake lever, and various other oddments that get under the front panel. You are now in the correct position to affix the suitable condenser. Some American cars have an ash tray just under this facia, and this is often an excellent time for the ash to fall out—*so* amusing! The condenser

is fixed and now all you have to do is to get out and back on your feet.

By now I am sure you are completely sold on the idea of emigration, perhaps having in mind the wide open spaces where only horses are used. However, there are still one or two more points to be considered. First, windscreen wipers—not too difficult, and then the petrol pump—still not too difficult.

You are now at the end of the battle, and may survey your handiwork. You feel that it is a successful installation, then the customer turns up. He doesn't think the tone is all it should be and wouldn't it look better if the whole thing were moved an inch or two to the right?

In the words of Arthur English—OPEN THE CAGE!

Continued from page 6

occur due to cleaning by the above methods, although they are given in accordance with the best of his knowledge. The advice of the makers should always be followed when it is available.

To conclude this part, I want to refer back to Part II in the light of newer developments. Some makers are now using a separate device for positioning the picture on their CRT screens instead of relying on movement of the focus magnet or coil. These take the form of disc(s) or plate(s) around the tube neck which are rotated or swung to move the raster. A complication which arises is that a thin disc is sometimes fitted as a corrector for astigmatism and this must not be mistakenly adjusted to centre the picture. The maker's published instructions should be consulted in case of doubt. Methods of focus adjustment are not affected by such alterations.

NOTES FROM THE NORTH-EAST

By "H.T."

A General Meeting was held at the Roma Café, Newcastle-on-Tyne, on September 5th, 1951, and was addressed by the General Secretary, Mr. H. Hill, who spoke on the subject of the Radio Trades Register.

Owing to the pressure of Television work, many engineers were unable to attend, but it is hoped that future meetings will be at full strength to further the aims of the Guild.

It was very gratifying to see members of the West Hartlepool contingent—their presence was very gratifying.

The Area Secretary is anxious that members will communicate with him immediately they have any complaints or grievances and they can rest assured these will be thoroughly investigated.

A. KELLY (*Area Secretary*)
194, Saltwell Road, Gateshead-on-Tyne.

The Service Engineer and His Future

By Celestus

This article is reprinted by courtesy of the "Wireless and Electrical Trader." It first appeared in July last and the publishers made it clear that the views outlined were those of the author and were not necessarily endorsed by themselves.

Comments on the article have been many and varied and the W. & E. T. has suggested that we print a summary of them. This will be done in the December issue of "Radio Service" and members are asked to send in their own views for inclusion in this summary. YOUR views are of the utmost importance.

"Celestus" can hardly expect GRSE to agree with him when he states that the service engineer has no real body properly to represent him. GRSE exists solely for that purpose, and if the Guild is not as large and powerful as the organizations he refers to when he mentions "the louder-toned bodies in the Trade," only the apathy of many service engineers themselves can be blamed. To quote from the leading article in the September issue of "Radio Service"—" . . . when the majority of service engineers in this country are Guild members, they can expect a tremendous change for the better in their status and standards of living."

RECENT articles in the technical press have made it clear that the industry faces a future grave shortage of skilled service engineers. There can be no doubt at all that this probability is causing concern in some quarters—as well it may. We have had a reasoned summing-up of the situation, and some well-thought-out suggestions for dealing with the threatened lack of trained men. On the whole, one would gather that employment prospects in the servicing profession are going to be very good for a long time to come. Yet, as a service engineer with over twenty years' experience at the job, my only advice to any enthusiastic youngster contemplating making radio or television servicing his career would be to keep out of it at all costs. If you want to work in radio, become a salesman, or a draughtsman, or something on the executive side, but don't go in for servicing.

If you are shocked that I should say this, let me explain a few things. I don't mind shocking anybody as long as it is in a good cause, and if it shocks someone to an appreciation of the points of view I am going to expound, all well and good; I shall at least earn the thanks of a good many service engineers up and down the country. But I do not wish to grip you by shock tactics alone; it is essential to preserve a modicum of common sense and reason if we are to gain anything in understanding and progress.

Qualified to Speak

I feel myself quite well qualified to speak for the average servicing man, for I went into the trade twenty-two years ago, at the age of fourteen, and have been regularly engaged in it ever since. I did leave it for the war service, but even then I kept in close touch. My experience has been mainly retail, although I have had one or two

manufacturers' courses which have helped me to peep a little way beyond the manufacturing curtain. I have handled pretty well everything that service engineers are expected to handle; have worked for several employers—good, bad, as well as the couldn't-care-less type; and I have a reasonably sound knowledge of all the problems that exist in the trade, whether seen from the point of view of the manufacturer, the retailer or just the plain man in the street.

My television experience goes back to pre-war days, and I have managed—quite successfully I can honestly say—a fairly busy department handling a lot of service, both retail and for the trade. Yet here I am, no longer in the first flush of youth, seeking to change horses in mid-stream; to leave radio servicing, with all its many interests, for something completely different. Let me tell you why, in as few words as possible. Three words in fact will suffice : disappointment, disillusion and frustration. They are key words, and should be borne in mind when examining the reasons why I would advise any youngster to steer clear of servicing. Those reasons all boil down to two definite complaints.

Agreed Wage Standards "Laughable"

The first concerns money. Other people have said it before, as doubtless others will say it again, but the fact remains that the average wages paid to service engineers are completely inadequate. Understand, when I say this, that I am referring to really good engineers; not to beginners, salesmen-cum-technicians, or those who only dabble part-time. I mean men who have spent a lot of time studying their job, and who are genuinely technically minded men with a real interest in their work.

Now, I am not complaining particularly against the wage standards agreed upon as minima by the G.R.S.E./R.T.R.A., for, although they are in fact laughable, credit must be given to those concerned for their efforts, even if the result has so far fallen short of what is required. The problem goes a good deal deeper.

I have used the term "laughable" concerning those wage minima; for the fact is that any engineer worth his salt can—*at the present time*—find an employer willing to pay a lot more for his services. *At the present time*, remember, your guess is as good as mine as to what will happen should the demand for engineers slacken off.

I am not fussy about mentioning personal details. Before the war, the best job I had—as a service manager—brought me in £3 15s. per week. Of course, that was in the bad old days when one could get along nicely on that amount, but that's beside the point. In my present situation, the best I have had in the post-war period, I earn £8 10s. weekly; less deductions, naturally. I am not grumbling personally, for I know that I am better off than many service engineers, who may be sounder than I technically. But I have had managerial as well as sales experience to help me along.

The whole point is that, by comparison with many other trades and professions nowadays, the *skilled* service engineer cannot get the remuneration which his ability, his specialized knowledge, and his years of experience merit. I have a Continental friend who, not long ago, came over to this country to work. He is considerably younger than I, and is now working as a waiter in a London hotel, earning much more than I am. In fact his commencing wage whilst on probation was just a little higher than mine. *I say that you can't build up an army of skilled, conscientious television experts unless you are prepared to give them at least parity with other occupations, which do not require years of study, plus the continuous assimilation of new data which falls to the lot of the radio or television service men to-day.*

I do not wish to imply that the whole problem could be solved overnight by a joint decision of all employers to pay their engineers tip-top wages. It isn't a bit of good prescribing a preventive medicine after the patient has been taken ill; and the retail radio trade is a very sick body in some respects.

Status of the Engineer

I now come to the second reason for the disappointment, disillusion and frustration factors, namely, the status of the service engineer. When the radio industry first began to emerge as a coherent body, the retail trade was carried on the shoulders of the early pioneers—men of enthusiasm; keen amateur fans chiefly, and all genuinely wishing to develop the new medium of entertainment and willing to devote much of their time and energy to building up the trade. They were men of courage and hope, too; and, looking down the somewhat hazy avenue of the future, they certainly saw a vision of a radio-conscious public being served by men of integrity.

Although many of these pioneers have, through disappointment, left the trade for other spheres, I do not wish to imply that there are no longer men of integrity in the trade. Fortunately, there is still a hard core of really service-minded men serving the public instead of just *selling* to them. The point I want to drive home is that things did not go the way the early pioneers of the trade expected. There were several reasons for that, but chiefly it came about because other people, smart business men undoubtedly, but without any real interest in radio, as such, saw the limitless possibilities, and came into the trade to exploit them. This undoubtedly affected the status of the service engineer.

The bitter pill that genuine service engineers have had to swallow in the past has been the realization that their position in the trade has counted no more—and often a good deal less—than that of men on the sales staff, who may or may not have a smattering of technical jargon; but who certainly have the gift of selling. These men have not had to put in years of study of their craft as have their opposite

numbers behind the service-room door. You see, it is not only the question of pay; frequently it is this forced playing of second fiddle; this business of possessing an inferior status in the eyes of the proprietor that engenders a sense of frustration in the service engineer.

Non-Technical Employer's Logic

To the non-technical employer, who has no great love of radio itself, there is logic in the argument that a good man on the sales staff can put a lot more cash in the till each week than his colleague in the service department, who may even be working at a loss if his value is assessed solely in terms of cash receipts. What does not get taken into account in many cases is that without the service department and the engineers who man it and make it work, the business couldn't go on.

Take then this matter of inadequate pay; add to it the sense of inferiority in status which many good technical men feel; throw in the fact that for far too long there were no real standards by which an engineer's ability and worth could be measured; pour in the acid truth that even to-day the servicing man has no real body properly to represent both his unity of aim *and* his individuality of thought, and to give him adequate opportunity of making his voice heard among the louder-toned bodies in the trade—and you have a mixture that typifies the feelings of the service engineer to-day.

There is a lot more to it, of course; how can I, in the short space of this article, say all that needs saying on the subject? I have said nothing yet about dabblers; about the dog-in-the-manger attitude that certain manufacturers adopt over parting with the "secrets" of their designs to service engineers unfortunate enough not to be employed by one of their agents; and I have only just mentioned in passing the incredible number of things a service engineer is expected to read, mark, learn and remember for evermore about new valves, new circuits, and new gadgets of every other type and variety.

At the present time I view the future of the service engineer with doubt and sympathy. I feel that if it is intended to recruit a fresh army of servicing men to cope with the ever-increasing demand, then they must be given something worth working and studying for. If it is hoped to do that, what better start could be made than to put the service engineer not on a pedestal—for that he doesn't expect or desire—but at least on the same level as those whose job may not require a fraction of the skill and concentration needed to handle efficiently radio and television repairs. The trade is in a nasty mess in many respects, and a good clean-up would do a whole world of good.

What about starting off with cleaning-up the general attitude to the servicing man? You know, in whatever difficulties it may be now, the trade would be in a pretty fine state of chaos without him.

News From Northern Ireland

I AM pleased to be able to say that I have successfully completed investigation of all complaints received to date, and I wish to thank all members who so willingly helped me in this task.

This has only been achieved by a unity of purpose and loyalty to the Guild, and a firm determination to do better in the future.

I do not expect that everything in the garden will be lovely from now on, but this I know for certain; when all members are prepared to help themselves by paying their subscriptions regularly and without having to be asked, are active in co-opting fellow engineers to strengthen their own cause, attend at Meetings, and, finally and most important, encourage the exchange of views between members, perfection will not be far off.

Why some members remain silent at Meetings when, outside, they usually have a lot to say is a mystery. As we know, Irishmen like good argument and the best place to let off steam is where it will do the most good. That is at a Meeting with your fellow members.

I can assure all that everything possible is being done to improve your status and particularly your wages. Only the best is good enough, and the quickest way of getting the best is to enlist more members. Surely this should not be difficult, in view of the fact that the Guild is now a permanent institution, and has achieved more for its members in a shorter period of time than any other similar organisation. One hundred per cent. membership is our aim, and we in Northern Ireland hope to reach that figure before any other area.

Please forward all your queries, application forms, subscriptions, complaints, etc., to me at the Local Office, 84, Omeath Street, Woodstock Road, Belfast, N. Ireland, or direct to our General Secretary, Mr. H. Hill, 2, Stevenson Street West, Accrington, Lancs. I can assure you of immediate attention to all your correspondence.

Please note that Meetings will be held Quarter Nights or as near as practicable instead of fortnightly, as formerly.

Finally, may I thank all members for their co-operation, and look forward with them to an industrious and successful Northern Ireland Area.

John Steenson,
Hon. Secretary.

Book Reviews

THE PRACTICAL ELECTRICIAN'S POCKET BOOK 1952 EDITION

edited by

Roy C. Morris, Technical Editor of "Electrical and Radio Trading"

(Odhams Press—5s.)

Cables for Sound Distribution. A description of types of cables required for public address and relay work, with practical notes on their selection. By R. C. Mildner, of the Telegraph Construction and Maintenance Co., Ltd.

Transformers. A new practical article by G. B. Proctor, manager of Ferranti Transformer Sales Department, dealing with the choice, installation and maintenance of power transformers as used in factories.

Portable Electric Tools. A new chapter written by F. W. Hughes, sales research engineer of Black and Decker, explaining types, choice, use, maintenance, safety precautions.

Interference Suppression, now tells how interference with T/V caused by small domestic appliances can be suppressed. A note has been added on **Phase Conversion** (three-phase from simple phase). The **Lighting** section has been revised and the **Mains Voltage Tables** have been brought up to date.

MAGNETIC RECORDING

by S. J. Begun,

(Thermionic Products, Ltd., Morris House, Jermyn Street, W.1—25s.)

Mr. Begun is Vice-President and Chief Engineer of The Bush Development Company of Cleveland, U.S.A. In his preface to this well-printed and profusely illustrated work he makes the point that it is a dangerous thing (for the author) to write a book on a subject that is still in the adolescent stage. "Events of to-morrow," Mr. Begun writes, "might produce major innovations which could easily make incomplete the story which is told here." While this is true, there is little doubt that the author has done everything in his power to make his book a complete treatise and it is certain that all who are interested in magnetic recording, whether professionally or from the standpoint of the technically interested amateur, will find this book a most valuable addition to the rather sparse amount of information already in existence on the technical and scientific aspects of this important and growing side of our industry.

This publication has nine chapters, with a comprehensive bibliography at the end of each and extremely useful Glossary and Index sections.

Technical Information

B.B.C. News

As announced in June, the B.B.C. intends to improve reception of the Home Service in certain areas where conditions have proved unsatisfactory. This is to be achieved by installing low-power transmitting stations in these areas.

Two more of the twelve proposed stations, making five in all so far, came into operation on 7th October, at Whitehaven and Barrow. Both transmitters will radiate the North of England Home Service, Whitehaven on 434 metres (692 kc/s) and Barrow on 202 metres (1484 kc/s).

New RF EHT Coils

A range of High Voltage Coils, vacuum impregnated, and capable of withstanding large changes of temperature and humidity and dust and dirt, has been produced by Hivolt Ltd., of Pottery Lane, London, W.11, based on the experience gained over the past three years. These coils are now constructed upon a number of combs, mounted radially and clamped end to end by two fixing plates. The LT windings of the coils are terminated in a valve base and the coil will plug directly into a standard B8G valve holder. The EHT is terminated at the top of the coil in a special anti-corona connection. In order to cover the range of outputs which are now required the following four types are available:—

1. *Type C150*
   3-8 kV 250 microamps.
2. *Type C151*
   8-15 kV 500 microamps.
3. *Type C152*
   15-30 kV 500 microamps. (using voltage doubler).
4. *Type C153*
   15-50 kV 500 microamps. (using voltage tripler).

Ekco Model CR117—Deletion of R17 and C3

The Service Manual for this receiver shows a resistor of 330 ohms (R.17) in the cathode circuit of V3. This resistor was included to provide a small negative bias to the anode of the diode section of this valve, thus preventing the diode from conducting until the signal level reached a value in excess of this bias. In this way it formed a simple inter-station noise suppressor designed to "silence" the speaker until a worth-while carrier signal was received.

Unfortunately what is considered to be a worth-while signal depends partly on the nature of the signal, partly on the level of the background noise at the time of receiving it and partly on the user's opinion and a device which limits reception to signals exceeding a given strength, can easily give rise to a mistaken impression of poor sensitivity. Further, a signal whose strength happens to be only slightly in excess of the delay voltage introduced by R.17 can suffer a certain amount of distortion.

It has thus been decided to delete R.17 and its associated by-pass capacitor C.3 from future production receivers and while this will inevitably result in an increase of noise between stations, under favourable conditions it will permit satisfactory reception of weaker stations than before, and many users may consider the modification to be a useful improvement.

Murphy Servicing Notes

Earthing the Line-Output Transformer Metal Case of the V200:—In the V200 modification sheet issue 3, details were given of the procedure for fitting rubber covers to the line-output transformer, and in these instructions the parts list included a clamp to go round the neck of the transformer case for the connection of a lead to "earth" it to the h.t.+ terminal. Because of the delay in getting

these clamps made, it was decided temporarily to earth the transformer case by the use of two self-tapping screws in the mounting cradle. A large number of transformers have been earthed by the use of the self-tapping screws, but now that supplies of the clamping rings have become available, they are being used in the production of the receiver, and the case is being connected to the h.t.+ terminal of the transformer.

Instances have been brought to light in which engineers have noticed in these receivers that earthing screws are missing and fitted them only to find that the receiver fuses promptly blow, simply because the transformer case is already earthed through the h.f. line and the direct earthing to chassis produces an h.t. short circuit.

Most of the rubber bag kits, which have been supplied for existing receivers, have included the self-tapping screws for earthing, and when these are fitted some care must be taken not to tighten the screws too far or there may be risk of puncturing the transformer case. It will be noted that in the instructions covering this kit of parts, a quarter-inch self-tapping screw is quoted, but we actually supply one which is three-eighths of an inch long, because the quarter-inch one cannot be relied upon to make good contact to the transformer case. Later, rubber bag kits will be supplied with the clamping ring, and instructions for fitting these should be taken from the modification sheet issue 3.

Shortage of Inductance;—Our engineer reports that during conversion operations of the V180C models for use on Channel 2, he found on two occasions that the oscillator coil tuning range would not give the correct oscillator frequency. Tests showed a lack of inductance. In both these cases the coil unit was removed and the spacing between the turns reduced, and this overcame the trouble.

Very Poor Definition, V150.—A customer complained that the picture disappeared intermittently, leaving only a few dark shadowy streaks across a perfectly locked and peak white raster.

The set was connected to a Murphy P.G. and it was found that when the fault occurred, only the four horizontal black bars of the Test Pattern were visible on the tube. It was quite obvious that the higher frequency components of pattern were getting lost. The fact that the raster was locked and interlacing led to a belief that the modulation was all complete at the cathode of V6, and in fact a quick check with a 'scope proved this assumption to be correct; but at the anode of V6 something was very sadly lacking.

The fact that the fault was extremely inetrmittent did not help in locating the exact component that was causing the fault, so the components in the anode circuit were checked by substitution, and after changing V7 the fault did not re-occur. The V7 was tested by various means; at first it appeared to be o.k. but after a long soak test an intermittent anode-to-cathode short circuit appeared in the interference limiter section of the valve. This, of course, was causing C37 to be shunted across the anode circuit of the V6 and by-passing all but the lower frequency components of the picture.

Severe Heterodyne Pattern, V150.—This fault occurred on a new stock receiver. It was found that the pattern only occurred on B.B.C. transmissions and that the T.P.G. gave a perfect picture with no heterodyne, until a sound signal was fed in from another signal generator. It was obviously an old friend, namely, harmonics of sound i.f. getting mixed up with the picture.

The alignment of the whole set was checked, but all was well and the heterodyne remained. A long search for dry joints in the sound i.f. stage began and at length it was discovered that the leads to C18 had been left rather long; these were shortened and the condenser was tucked down against the chassis. This completely cleared the trouble and the set has been working perfectly ever since.

NOTE FROM MURPHY SERVICE: We have never come across anything like this in the Service Department. The length of the leads from the capacitor C18 would be expected to have some bearing on the tuning of the circuit, but it is presumed in the case referred to above that these leads were very long indeed, resulting in the i.f. circuits going unstable.

AN ADVENTURE IN WALES

EVERY YEAR Service Engineers are let out of their cages for two weeks respite. I am no exception and, in an ancient Austin Seven tuned to its maximum, the respite begins . . . the destination Wales, the town Cardiff.

Due to the kindness of relatives with whom we lived, there was sufficient 'kitty' for excursions outside the precincts of the city. This is no reflection on the City of Cardiff, in fact the Civic Centre there is one of the most attractive in the country, but as a Service Engineer, whose lifelong job is looking for (and finding) the unusual, the unbeaten track is the thing.

Therefore with the set purpose of turning left when right was indicated, and vice versa, many a picturesque bay was found, and headlands without a single T/V aerial to spoil the picture!

On one of these journeys into nowhere, I chanced to go down a narrow hedged lane leading, I hoped, to the sea. I arrived, eventually, at a small clearing, with a cottage and a very small Church. The Church was surrounded by a low stone wall, and as the sun was warm, the wall presented an ideal place for a rest. Trying to get one's head comfortable against a stone wall is no easy feat, and turning to find out what a notable projection was, I noticed a small brass plaque. Thinking this was, no doubt, some dedication to a founder of the building, I was disinterested until I caught sight of a word in capitals, and I suddenly felt strange and humble.

On a holiday some two hundred miles from home, I had gone down a narrow unspoilt lane, sat down against a Church wall and now I read, on a brass plate, this inscription:—

1897 1947

Near this spot the first radio messages were exchanged across water by

GUGLIELMO MARCONI and GEORGE KEMP

Between Lavernock and Flat Holm, 11th May, 1897 and Lavernock and Brean Down, 18th May, 1897.

I was at Lavernock Point. Be sure that History is where you find it.

LETTERS

Interference

Dear Sir,

The Post Office have recently issued a pamphlet dealing with Interference, the main purpose of which is to inform viewers and listeners that it is possible that their aerial installation is faulty. They go further and state that persons should make certain of this before calling on the Interference Investigation Branch.

I do not agree with this in any way, shape or form, and I hope that the Guild Council will make it clear to the Postmaster-General that the view of the Service Engineer is that the Interference Branch is in existence for the sole purpose of REMOVING THE CAUSE OF THE INTERFERENCE.

My Service Department is in a congested area with flats, factories, etc., where most of my customers do not even have the facilities of erecting an aerial, let alone a good earth, and so I consider that the only solution to this question is the suppression at source.

Yours faithfully,
" D.T." London.

One of the purposes for which "Radio Service" exists is to publish YOUR views on current matters of interest. Why not use this facility more often? ED.

Printed for A. Vernon Free & Co., Ltd., by The Walthamstow Press, Ltd.

The PERFECT TEST TEAM

The illustration depicts a set of modern "AVO" testgear being used to measure the "Q" of the secondary winding of the second I.F. transformer on a chassis of unknown characteristics—just one of many tests which can be performed by this combination of instruments.

A signal of predetermined frequency from the "AVO" Wide Range Signal Generator is being fed into the Electronic Test Unit, where it is amplified and fed to the secondary winding of the transformer. The Electronic Testmeter is connected across the tuned circuit under test and, from the readings obtained and the controls of the Electronic Test Unit, the "Q" of the circuit can be determined.

The three instruments, shown as a team, cover a very wide field in measurement and form between them a complete set of laboratory testgear, ruggedly constructed to withstand hard usage.

ELECTRONIC TESTMETER

A 56-range instrument combining the sensitivity of a delicate galvanometer with the robustness and ease of handling of an ordinary multi-range meter. Consists basically of a highly stable D.C. Valve Milli-voltmeter, free from mains variations and presenting negligible load on circuit under test. Switched to measure:—

D.C. Volts: 5mV to 10,000V
D.C. Current: 0.5μA to 1 Amp.
A.C. Volts: .1V to 2,500V. R.M.S. up to 2 Mc/s. .1V to 250V R.M.S. up to 200 Mc/s.
A.C. Power Output: 5mW to 5 Watts
Decibels: —10db to +20db.
Capacitance: .0001μF to 50μF.
Resistance: 0.2ohm to 10 Megohms

ELECTRONIC TEST UNIT

For measuring small values of A.C. voltage, inductance, capacity and "Q" at radio frequencies. Although designed primarily for use with "AVO" instruments, it can be used with any suitable Signal Generator / Valve Voltmeter combination.

As a Wide Range Amplifier, it is capable of an amplification factor of 40 ± 2—3db between 30c/s and 20Mc/s.

As a Capacity Meter, it covers measurements at radio frequency from .5pF to 1000pF in two distinctly calibrated ranges.

As an Inductance Meter, it gives direct measurements from .5μH to 50mH in six ranges.

As a "Q" Meter, it indicates R.F. coil and condenser losses at frequencies up to 20Mc/s.

WIDE RANGE SIGNAL GENERATOR

An instrument of wide range and accuracy for use with modern radio and television circuits. Turret coil switching provides six frequency ranges covering 50Kc/s. to 80Mc/s.

Range 1. 50 Kc/s.—150 Kc/s.
,, 2. 150 Kc/s.—500 Kc/s.
,, 3. 500-Kc/s.—1.5 Mc/s.
,, 4. 1.5 Mc/s.—5.5 Mc/s.
,, 5. 5.5 Mc/s.—20 Mc/s.
,, 6. 20 Mc/s.—80 Mc/s.

Accuracy to within 1% of scale marking. Gives sensibly constant signal of good waveform, modulated or unmodulated, over entire range. Minimum signal less than 1μV at 20 Mc/s. and less than 3μV between 20 and 80 Mc/s. Gives calibrated output from 1μV to 50mV.

Fully descriptive leaflets available from the Sole Proprietors and Manufacturers:

The AUTOMATIC COIL WINDER & ELECTRICAL EQUIPMENT CO. LTD.
WINDER HOUSE • DOUGLAS STREET • LONDON • S.W.1 *Telephone: VICTORIA 3404/9*

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MODEL 505

FERRANTI

SERVICE INSTRUCTIONS

CIRCUIT DESCRIPTION

WAVE-RANGE SWITCHING The wave-range switch S1, S2 (two wafer, two-way) selects either the Medium Wave band of 190-550 metres or the Long Wave band of 1,000-2,000 metres.

VALVES The Mullard valves used have their heaters in series. They are:—

V1–UCH42	Triode Hexode (Frequency Changer).
V2–UF41	R.F. Pentode (I.F. Amplifier).
V3–UBC41	Double Diode Triode (2nd Detector, A.V.C. and Audio Amplifier).
V4–UL41	Pentode (Power Amplifier).
V5–UY41	Half-wave Rectifier.

AERIAL INPUT This receiver normally operates efficiently with the built-in loop aerials (L1 and L2). An external aerial connection ('A' on the back) is provided but is only necessary for long distance reception. V1 grid inductance (which consists of L2 and the loading inductance L3 in series for Medium Waves) is tuned by C6 and the parallel pre-set trimmer C4. V1 grid inductance on the L.W. is L1 in parallel with fixed trimmer C1 and variable trimmer C2 and tuned by C6.

OSCILLATOR The permeability tuned oscillator grid coils L8 (M.W.) and L6 (L.W.) are tuned by C7, parallel trimming is by C9 (M.W.) and C12 fixed (L.W.). Padding is by C13 (M.W.) and C14 (L.W.). The oscillator reaction coils are L9 (M.W.) and L7 (L.W.).

I.F. STAGE The I.F. amplifier V2 is transformer coupled to V1 by the permeability tuned primary and secondary coils L4, L5. These are parallelled by fixed tuning capacitors C10, C11. V2 is transformer coupled to the detector diode of V3 by permeability tuned primary and secondary coils L10 and L11 which are parallelled by fixed tuning capacitors C16 and C17. The I.F. is 470 Kc/s.

AUDIO STAGE The audio frequency component developed across R4 (detector diode load resistor and manual volume control) is fed via C21 to the control grid of V3. The amplified signal developed across anode load resistor R6 is fed via C23 to the control grid of pentode power amplifier V4. C22 decouples V3 anode.

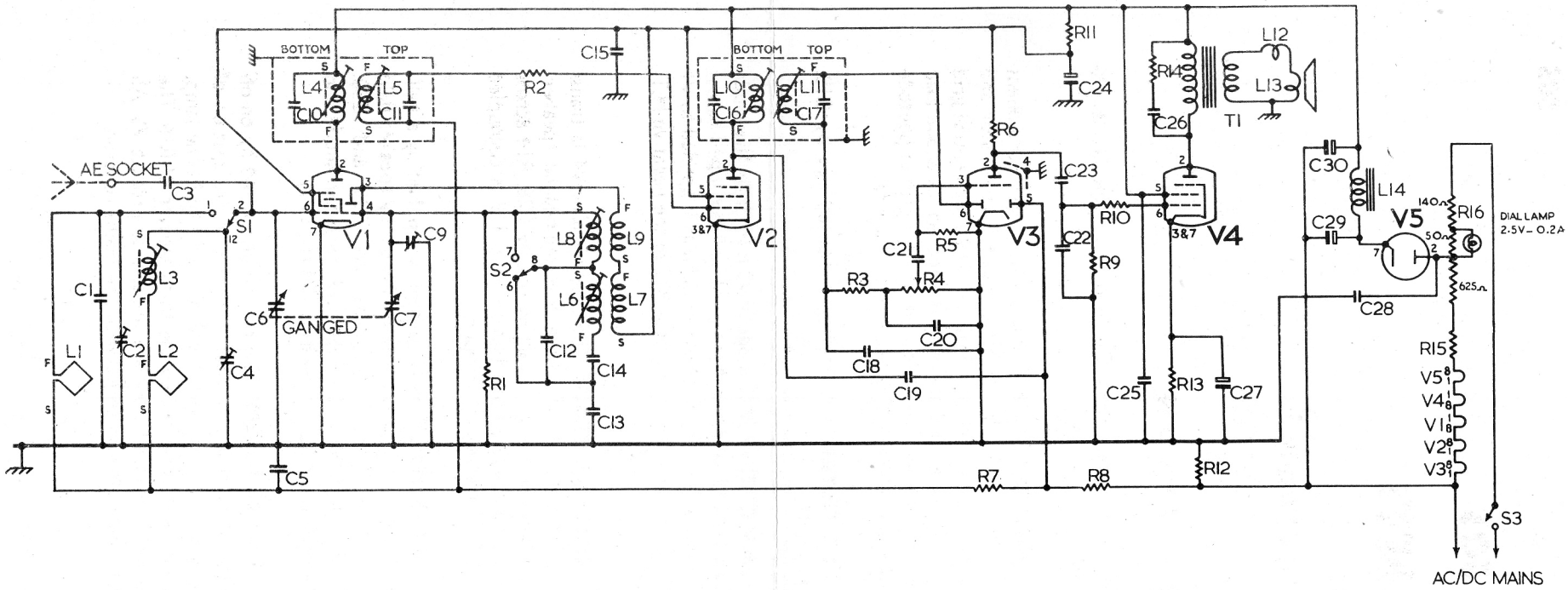
I.F. FILTER I.F. filtering is carried out by C18, C20 and R3.

A.V.C. The A.V.C. diode of V3 is fed from the anode of V2 via C19, and the A.V.C. voltage developed across R8 is fed to V1, V2 via R7. An initial bias is applied to V1 and V2 by the volts drop across R12 in the negative H.T. lead.

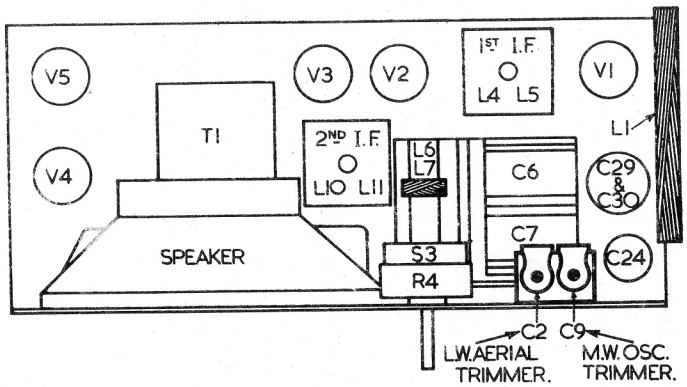
OUTPUT STAGE The output valve V4 is transformer coupled by T1 to a low impedance speaker. Fixed tone correction is carried out by C26, R14 across the primary. V4 cathode bias resistor R13 is decoupled by C27. R10 is V4 grid stopper.

H.T. SUPPLY H.T. current is supplied by a half-wave rectifier V5. Smoothing is effected by speaker field coil L14 and smoothing capacitors C29 and C30. Decoupling (of V1, V2 screens, V1 oscillator anode and V3 anode) is carried out by R11, C24 and C15.

MAINS INPUT The mains input is fed by on-off switch S3 to mains resistor R16, the centre section of which is in parallel with the 2·5V ·2A M.E.S. dial lamp. V5 anode is connected to the third tapping of R16. The 140 and 50 ohm sections are limiters to protect V5. All valve heaters are in series with the mains resistor.

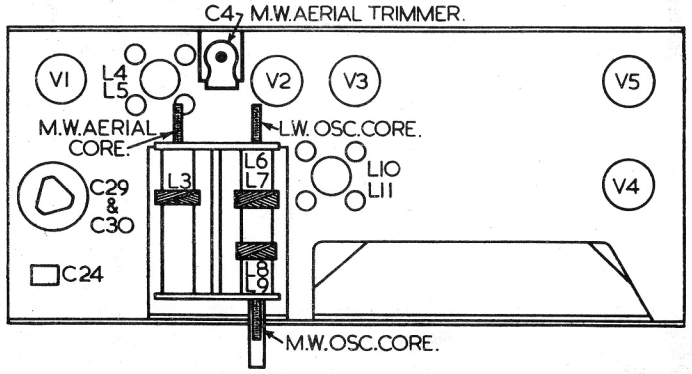


V1–UCH42			V2–UF41			V3–UBC41			V4–UL41			V5–UY41		
ANODE	140V.	3·5 mA.	ANODE	140V.	8·0 mA.	ANODE	60V.	0·5 mA.	ANODE	130V.	40 mA.	ANODE	200V.	R.M.S.
SCREEN	100V.	5·0 mA.	SCREEN	100V.	2·5 mA.				SCREEN	140V.	7·5 mA.	(A.C. Mains 230V.)		
OSC. ANODE	100V.	5·0 mA.							CATHODE	7·5V.				



Unsmoothed H.T. . .	200V.
Smoothed H.T.	140V.
H.T. current	72 mA.
V1, V2 grid bias (across R12)	2V.

Measurements taken with A.C. Mains 230V. 50 c.p.s.



COMPONENTS

Ref.	Capacitance	Tol. ±%	Wkg. Volts	Function
C1	75 *pF*	5	350	L.W. aerial trimmer (fixed).
C2	2·5–40 *pF*	—	—	L.W. aerial trimmer.
C3	15 *pF*	10	2250V. test	Aerial series capacitor.
C4	2·5–40 *pF*	—	—	M.W. aerial trimmer.
C5	·1 μF	20	350	A.V.C. decoupling.
C6	—	—	—	Aerial tuning (ganged capacitor rear section).
C7	—	—	—	Oscillator tuning (ganged capacitor front section).
C9	2·5–40 *pF*	—	—	M.W. oscillator trimmer.
C10	105 *pF*	5	350	1st I.F. primary fixed tuning.
C11	105 *pF*	5	350	1st I.F. secondary fixed tuning.
C12	190 *pF*	1	350	L.W. oscillator trimmer (fixed).
C13	500 *pF*	1	350	M.W. oscillator padder (fixed).
C14	1000 *pF*	2	350	L.W. oscillator padder (fixed).
C15	·1 μF	20	350	V1, V2 screen decoupling.
C16	105 *pF*	5	350	2nd I.F. primary fixed tuning.
C17	105 *pF*	5	350	2nd I.F. secondary fixed tuning.
C18	150 *pF*	20	350	I.F. decoupling.
C19	50 *pF*	20	350	A.V.C. coupling.
C20	400 *pF*	20	350	I.F. decoupling (diode load by-pass).
C21	5000 *pF*	20	350	V3 audio coupling.
C22	400 *pF*	20	350	V3 anode by-pass.
C23	·02 μF	20	750	V3, V4 audio coupling.
C24	16 μF	—	350	V1, V2, V3 decoupling.
C25	·05 μF	15	700	H.T. line filter.
C26	·01 μF	15	500	Tone corrector.
C27	25 μF	—	25	V4 cathode by-pass.
C28	·01 μF	15	500	Mains R.F. by-pass.
*C29	16+16 μF	—	350	H.T. reservoir.
*C30				H.T. smoothing.

* Capacitors are in one unit.

Ref.	D.C. Resistance (under 1 ohm*)	Function
L1	13	L.W. loop aerial.
L2	·5	M.W. loop aerial.
L3	1·5	M.W. aerial loading coil.

Ref.	D.C. Resistance (under 1 ohm *)	Function
L4	8	1st I.F. coil (primary).
L5	8	1st I.F. coil (secondary).
L6	4·75	L.W. oscillator grid coil.
L7	1·1	L.W. oscillator reaction coil.
L8	2·75	M.W. oscillator grid coil.
L9	·65	M.W. oscillator reaction coil.
L10	8	2nd I.F. coil (primary).
L11	8	2nd I.F. coil (secondary).
L12	*	Humbucking coil.
L13	2·5	Speech coil.
L14	750	Field coil.
T1	330 Prim. * Sec.	Speaker transformer.
S1, S2	—	Wave-range switch.
S3	—	Mains on-off switch.

Ref.	Ohms	Tol. ±%	Watts	Function
R1	33K	20	¼	Oscillator grid leak.
R2	680	10	¼	V2 grid stopper.
R3	100K	20	¼	I.F. filter.
R4	500K	—	Pot'r	Volume control.
R5	10M	20	½	V3 grid leak.
R6	100K	20	¼	V3 anode load.
R7	2·2M	20	¼	A.V.C. decoupling.
R8	2·2M	20	¼	A.V.C. diode load.
R9	330K	20	¼	V4 grid resistor.
R10	220K	20	¼	V4 grid stopper.
R11	2·2K	20	½	V1, V2, V3, decoupling.
R12	33	20	¼	V1, V2 standing bias resistor.
R13	150	10	½	V4 bias resistor.
R14	4·7K	20	¼	Tone corrector.
R15	240	5	wire wound	Part of mains voltage dropper.
R16	140	10	0·2A	Mains voltage dropper.
	50	15	0·2A	
	625	5	0·15A	

MODEL 505

CIRCUIT ALIGNMENT

For alignment purposes it is necessary to have the chassis at earth potential on A.C. mains supplies to avoid shock and damage to equipment. The correct plug connection can be found by using a neon lamp or voltmeter.

An output meter should be connected via a 0·1 μF series capacitor across the primary of the speaker input transformer. The input signal should be sufficient to give a reading of 10-20 volts on the output meter.

I.F. Alignment
470 Kc/s

1. Connect the signal generator via a ·1 μF capacitor, between the grid of the frequency changer V1 and the chassis.

2. Switch set to M.W.; place the ganged capacitor at approximately 400 metres; rotate the volume control to maximum output position.

3. Inject a 470 Kc/s signal and adjust iron dust cores of L4, L5, L10 and L11 for maximum reading on output meter. Repeat the operation for maximum output.

M.W. Alignment
190-550 Metres

For M.W. and L.W. alignment it will be necessary to construct a loop consisting of 4 turns of wire approximately the same area as the loop aerial in the receiver This should be connected across the output terminals of the signal generator in series with a 400 (approx) ohms non-inductive resistor.

During alignment, the signal generator should be adjusted for maximum output and the loop placed sufficiently near to the set loop aerial to give a reading of 10-20 volts on the output meter. The distance should be increased as the circuits come into line. This is to prevent direct transformer coupling between the loop and the receiver loop aerials. The L.W. loop is fastened to the side of the chassis.

1. With the ganged capacitor vanes fully meshed. check that the pointer is exactly horizontal and in line with the 2000 metre scale markings. If the pointer and scale markings do not coincide, the pointer should be adjusted until they do. Switch set to M.W.

2. Set the pointer to 500 metres (600 Kc/s) on the tuning scale and inject a 600 Kc/s signal. Adjust the iron dust cores of the M.W. oscillator and aerial coils L8 and L3, respectively, for maximum output.

3. Set the pointer to 200 metres (1500 Kc/s) on the tuning scale and inject a 1500 Kc/s signal. Adjust M.W. oscillator trimmer C9 for maximum output, then adjust aerial trimmer C4 for maximum output.

4. Repeat the adjustments indicated in 2 and 3 until no further improvement can be made.

L.W. Alignment
1000-2000 Metres

1. Switch set to L.W., i.e., rotate wave-range switch clockwise and set the pointer to 1450 metres (207 Kc/s) on the tuning scale.

2. Inject a 207 Kc/s signal and adjust the iron dust core of L.W. oscillator L6, and the L.W. aerial trimmer C2, for maximum output.

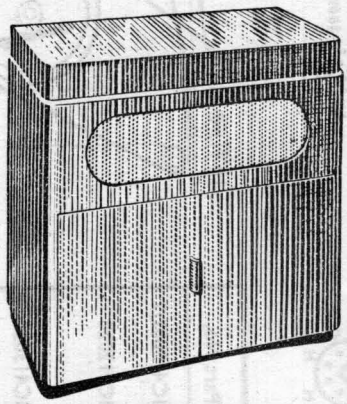
All radio service enquiries should be addressed to :

FERRANTI LTD., Radio Service Dept., Moston, Manchester, 10

FERRANTI RADIO

Printed in England

COSSOR
RADIOGRAM
MODEL 497



GENERAL DESCRIPTION
Five valve all-wave superheterodyne Radiogram for A.C. Mains of 200-255 volts at 50 cycles, the voltage tappings being at 200-215 ; 216-234 ; 235-255.

PRICE £45 10s. 6d. Plus Tax.

DATE RELEASED January, 1950.

CABINET Sapele mahogany. $30\frac{1}{4}'' \times 29\frac{3}{4}'' \times 18''$.

UNDISTORTED OUTPUT 3 watts.

CONSUMPTION 55 watts (approx.).

NETT WEIGHT 77 lbs.

WAVEBANDS

Short waveband	19-5·8 Mc/s.	15·8-51·3 metres
Medium ,,	1605-520 Kc/s.	187-575 metres
Long ,,	320-146 Kc/s.	940-2050 metres

INTERMEDIATE FREQUENCY 465 Kc/s.

DIAL LIGHT. 6·5 volts at 0·3 amp M.E.S. fitting.

LOUDSPEAKER. An 8″ high flux density permanent magnet moving coil unit with a speech coil impedance of 3 ohms. The sockets marked EXT. L.S. are for an external loudspeaker with a speech coil impedance of 3 ohms.

BUILT-IN FRAME AERIAL. The frame aerial mounted on the cabinet back is intended only for local station reception. For more distant station listening a normal aerial and earth should be used.

REMOVAL OF RADIO CHASSIS. Disconnect the mains supply. Remove the 5 control knobs (secured by grub screws). Withdraw the FRAME AERIAL plugs. Remove the cabinet back. Disconnect the L.S. and EXT. L.S. leads. Disconnect the Aerial and Earth leads on chassis. Disconnect the P.U. leads on chassis. Remove the 2 BA screw securing the scale assembly to the cabinet. Remove the four 2 BA screws securing the chassis to the cabinet. Lower and withdraw chassis.

REMOVAL OF RECORD CHANGER. Disconnect the P.U. leads. Disconnect the Mains supply leads. Unscrew the 2 BA nuts on the ends of the suspension spring screws under the motor board. The unit can now be lifted clear of the cabinet. For service instructions see Garrard booklet Model R C.70A.

ALIGNMENT PROCEDURE

The equipment required for alignment of the I.F. and R.F. stages of the Receiver are an accurately calibrated modulated signal generator, an output meter to match to 3 ohms impedance, and a non-metallic trimming tool.

Adjustment of the I.F. transformer inductances should always be followed by complete realignment of the R.F. section.

The output from the receiver should be maintained at 200 mW., by means of the I.F. attenuator, throughout the entire alignment procedure.

All the operations given below should be repeated to ensure absolute accuracy of alignment.

I.F. TRANSFORMERS

Switch to M.W. and set the tuning condenser at minimum capacity.
Set the Volume and Tone controls fully clockwise.
Inject a 465 Kc/s. modulated signal into the control grid of V1, via a 0·1 mfd. condenser.
Adjust L13, L12, L6 and L5 for maximum response on the output meter, in the order given.

MEDIUM WAVEBAND

Switch to M.W. and set the tuning condenser at minimum capacity, adjusting the pointer so that its edge just touches the beginning of the horizontal scale lines.
With a standard dummy aerial in circuit, inject a 1550 Kc/s. modulated signal via the A and E sockets.
Set the tuning pointer to the line marked M on the top left of scale.*
Adjust the oscillator trimmer C11 for maximum response.
Adjust the aerial trimmer C2 for maximum response.
Check calibration and sensitivity at spot frequencies.

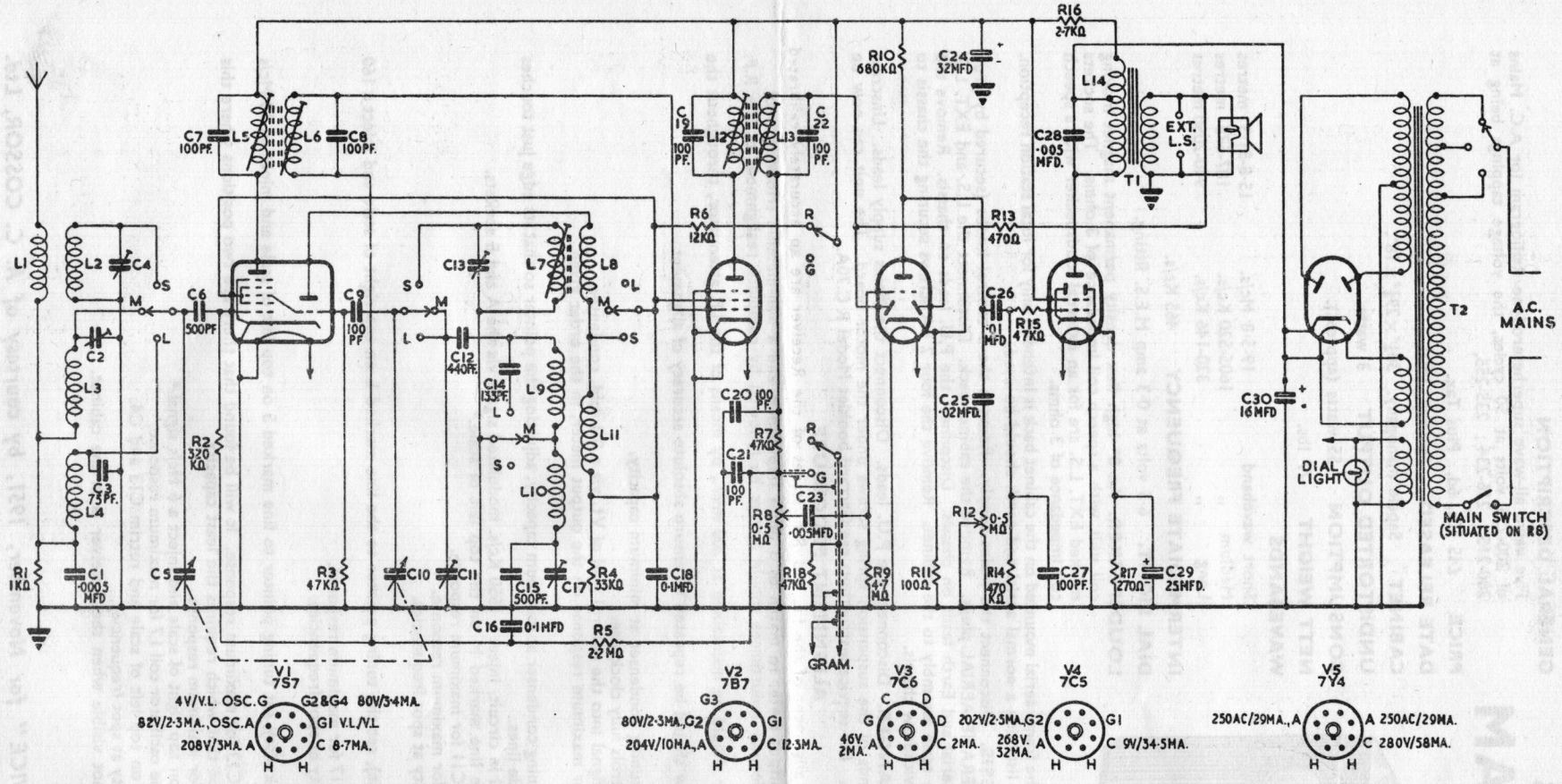
LONG WAVEBAND

Switch to L.W. (fully clockwise), set the tuning pointer to the line marked L on top right of scale and inject a 160 Kc/s signal.*
Adjust the oscillator padder C17 for maximum response.
Check calibration and sensitivity at spot frequencies.

SHORT WAVEBAND

Switch to S.W. (fully anti-clockwise), set tuning pointer to line marked S on top left of scale and inject an 18 Mc/s signal.*
Adjust the oscillator trimmer C13 for maximum response. It will be found that there are two positions where this is possible ; the correct one will be that which requires the least capacity.
Adjust the aerial trimmer C4 for maximum response.
Set pointer to line marked S on top right of scale and inject a 6 Mc/s signal.*
Adjust the iron dust core in the oscillator coil L7 for maximum response.
Set pointer to line marked S on top left of scale and retrim C13 and C4.
Check calibration and sensitivity at spot frequencies.
* This alignment marking is not visible when the Receiver is in the cabinet.

Issued with "RADIO SERVICE" for November, 1951, by courtesy of A. C. COSSOR, Ltd.



APPROXIMATE D.C. RESISTANCE OF COILS AND TRANSFORMERS

Circuit Code No.	D.C. Resistance	Part No.	Circuit Code No.		D.C. Resistance	Part No.
L.1	Very Low		L.12		9 ohms	MC415002/2
L.2	Very Low		L.13		9 ohms	
L.3	3·5 ohms	MC430221	L.14		13 ohms	
L.4	13·5 ohms		T.1	Output Transformer (Pri.)	280 ohms	MC412028
L.5	9 ohms	MC415002/2		Output Transformer (Sec.)	Very Low	
L.6	9 ohms		T.2	Mains Transformer (Pri.) 200V Tapping	40 ohms	
L.7	Very Low	MC430145/3		Mains Transformer (Pri.) 220V Tapping	43·5 ohms	
L.8	2·6 ohms			Mains Transformer (Pri.) 240V Tapping	47 ohms	MC413026
L.9	2·8 ohms			Mains Transformer (Sec.) H.T. Winding	265+265 ohms	
L.10	7·5 ohms	MC430207		Mains Transformer (Sec.) Heater ,,	Very Low	
L.11	5·5 ohms			Mains Transformer Rect. Heater Winding	Very Low