SERVICE MANUAL

for the following Receivers:

B31, B33
A34, A34RG, A36, A38
AD32
D34, D34RG, D36, D38

MURPHY RADIO LTD.
WELWYN GARDEN CITY, HERTS.

070-12-37

CONTENTS

DIAGRAM SHEETS

INTRODUCTION

THIS book contains all the essential practical information required to enable servicemen to adjust or repair any of the following receivers:

B31	A34	AD32	D34
B33	A34RG		D34RG
	A38		D38
	A36		D36

Theoretical considerations of design, and descriptions of any new features adopted in the receivers, were given in the *Murphy News* at the time when each new receiver was released, and if any information of this type is required, reference should be made to the following issues:

Vol. 8 No. 1, 9-1-37, for B31, B33, A34
,, 8 ,, 2, 23-1-37 ,, B31, B33, A34
,, 8 ,, 3, 6-2-37 ,, D34
,, 8 ,, 4, 20-2-37 ,, AD32, A36, D36
,, 8 ,, 5, 6-3-37 ,, AD32, A36
,, 8 ,, 6, 20-3-37 ,, D36
,, 8 ,, 7, 3-4-37 ,, A38, D38
,, 8 ,, 8, 17-4-37 ,, A38, D38

Some of the receivers have been modified a little since they were reviewed in the *Murphy News*, and particulars of these modifications are given on page 31 of this manual.

The component reference numbers used in the reviews in the *Murphy News* refer to those on the preliminary circuit diagrams, and do not necessarily agree with those used in this manual, but we think that the descriptions are sufficiently clear to avoid confusion in this direction, provided this point is remembered when making reference to the diagrams.

MECHANICAL DETAILS

REMOVING THE TABLE AND CONSOLE CHASSIS

THE chassis in this range of receivers are, with the exception of the radio-gramophones, held in the cabinets by three bolts underneath. The top of the tuning scale frame is also secured by a screw on the A34, D34, and B33 models. The procedure for removing a chassis from its cabinet is therefore as follows:

1. Disconnect the flexible leads from the chassis. In all cases except the B31 and AD32, this is simply a matter of pulling out plugs and unscrewing an earthing connection to the loudspeaker in the case of the consoles. In the B31 the loudspeaker leads are soldered to tags on the output transformer and in the AD32 they are soldered to sockets on the mains tapping panel. In both receivers the chassis can be taken out for inspection without unsoldering the leads, but if it is desired to remove the chassis entirely, unsolder the wires with a hot well-tinned iron.

2. Remove the control knobs.

3. Take out the screw at the top of the tuning scale in models which are secured in this way.

4. Remove the chassis fixing bolts with the aid of a $\frac{1}{4}$" Whitworth box spanner, or a large screwdriver. The D.C. receivers have rubber covers over the bolt heads and these must be prised out with a screw-driver. It is important to replace these covers on re-assembly.

5. When the bolts have been removed, the chassis may be lifted out. The A36, D36, and D38 have screens under the chassis, which may be left in position ready for re-assembly.

REMOVING THE RADIO-GRAMOPHONE CHASSIS

The chassis is mounted sideways in these instruments and the procedure for removal is as follows:

1. Remove the extension spindle from the noise-suppression switch by pulling it downwards.

2. Release the cable control for the radiogram switch by removing the two screws holding it to the bracket on the chassis.

3. Pull out the pickup, loudspeaker, and motor plugs, and unscrew the earth connection from the loudspeaker.

4. Take off the control knobs.

5. Remove the screw from the centre of the volume control spindle. Give the spindle a gentle pull until the extension portion comes away.

6. Unscrew the four wood screws holding the mains transformer. (Do not unsolder the connecting wires.)

7. Remove the four fixing bolts with a strong screwdriver and take the chassis and mains transformer out together.

LOUDSPEAKERS

In all the receivers it is important that the loudspeaker should be actually touching the front of the cabinet, otherwise reproduction will sound high-pitched, due to lack of bass. This point should therefore be investigated before the fixing bolts are finally tightened when a receiver is being re-assembled or when a loudspeaker is being replaced.

THE B31 AND AD32 CORD DRIVE

When changing the drive cord in the B31 and AD32 receivers, turn the tuning knob until the condenser vanes are fully in mesh; then slacken the two string clamping screws on the drive spring assembly.

Take twenty-four inches of drive cord and push the two ends through the small hole in the drive drum and then through the clamping device on the drive spring assembly.

Allow about half an inch of each end of the drive cord to project through the clamp and tighten the two clamping screws.

Wind the loop of drive cord round the drum, taking the two ends in opposite directions, thus completely encircling the drum with the cord and forming a smaller loop of spare cord.

Place the bottom end of the small loop over the lower pulley on the tuning dial bracket and then pass the top end of the loop over the top pulley, easing the tension spring upward to relieve the tension if necessary.

If the cord is not held under tension by the spring, slip it off the top pulley, and pass the ends further through the clamping device. Then refit it over the pulley by easing the tension spring upward as previously suggested.

B31 AND AD32 POINTER

Pointers which become slightly bent may often be straightened, but in serious cases it may be impossible to remove kinks and a replacement is necessary.

A damaged pointer should be removed by slipping the cord drive off the top pulley and then pulling the pointer to the left. The small trolley should be held between the thumb and forefinger while the pointer is being withdrawn, to prevent the small guide wheels falling. When the pointer is removed, the trolley and the guide wheels may be taken away.

Place one of the small guide wheels on the end of the new pointer.

Push a small loop of drive cord through the hole in the trolley, and place the end of the pointer through the loop.

Now place the second guide wheel over the end of the pointer and tighten the drive cord until the pointer is held firmly with the two guide wheels fitting into the slots provided for them in the trolley.

Refit the drive cord over the pulley; place the condenser vanes fully in mesh, and slide the trolley and pointer up the cord until the pointer is exactly in line with the top horizontal lines on the tuning scale.

The pointer should be so placed in the trolley that it does not cover the lettering on the medium wave scale.

THE B31 AND AD32 DIAL

Before removing the dial on the B31 and AD32 receivers, rotate the tuning knob until the pointer registers about mid-scale.

Loosen the two screws holding the tuning scale.

In the AD32 remove the dial lamp bracket and deflector plate.

Withdraw the dial forwards and sideways against the tension of the drive cord.

Insert the new dial in position, taking care that the large washers remain close to the screw heads. There should be nothing between the frame and the lugs on the scale.

With the AD32 replace the deflector plate and pilot lamp bracket.

Hold the dial in this position and tighten the fixing screws.

Set the variable condenser to maximum and move the trolley on

the string until the pointer covers the top horizontal lines on the scale.

Check calibration, and if necessary, retrim in accordance with instructions given on page 20.

THE ALPHABETICAL TUNING MECHANISM

Before making adjustments to the tuning mechanism in receivers which have a vertical dial ("34RG" and "36"), it is necessary to raise the front of the variable condenser assembly sufficiently to allow the pulley at the bottom of the drum spindle to be removed.

To do this, remove the two front screws holding the condenser assembly, and in the case of the A36 and D36, disconnect the short earthing wire. The whole assembly can then be lifted about 1" at the front and propped in this position with a suitable block.

THE "34" AND "36" DRIVE CORD

To replace the drive cord on these models, take 27 inches of cord; pass one end between the condenser drum and the drive spindle.

Then push both ends through the small hole in the condenser drum and into the string clamping device so that $\frac{1}{2}$" of each end projects through the clamp.

Tighten the two clamping screws.

Take the pulley off the tuning drum spindle to which it is fixed by two grub screws.

Fold the cord into two equal lengths, and pass the loop thus formed through the small hole in the pulley.

Fasten the loop under the clamping screw and washer inside the drive pulley.

Wind the cord round the condenser drum in opposite directions.

Keeping the cord under tension to prevent it falling off the condenser drum, wind it in opposite directions round the drive pulley so that the cord from the bottom of the drum passes round the back of the drum pulley.

Keeping the cord at even tension with the right hand, slip the drive pulley back on the drum spindle with the left hand.

Ease the cord coming from behind the drive pulley on to the horizontal jockey pulley, and fit the cord from the front of the drive

pulley over the vertical pulley, pushing the tension spring upward to allow this to be done easily.

When the tension spring is released, it should hold the drive cord under tension. If it does not, slip the cord off the vertical jockey pulley and pull the ends a little further through the clamping device. Then replace the cord on the jockey pulley as previously described.

Set the tuning condenser vanes fully in mesh, rotate the tuning drum until last mark on the wavelength scale (above 550 metres) is under the cursor thread, and tighten the set screws on the drive pulley. Check vertical alignment of cursor by the three station marks at 261 metres—readjust by sliding top end if required.

THE "38" DRIVE CORD

To replace the cord on the "38" models, take 24½ inches of drive cord and thread the ends through the small hole in the condenser drum and through the string clamping device on the tension spring to project about ½" through the clamp.

Tighten the clamping screws.

Remove the drive pulley from the tuning drum spindle and thread a small loop from the centre of the drive cord through the small hole in the side of it. Fasten the loop under the clamping screw and washer inside the drive pulley.

Pass the two ends of the cord in opposite directions round the condenser drum so that the cord encircles the lower half of the drum.

Keeping the cord under tension, wind the cord in opposite directions round the drive pulley until the lower half of the pulley has one strand of cord round it and the top half, two strands.

This will allow the pulley to be replaced on the tuning drum spindle, without any slackness in the cord.

Now slip the cord behind the two top jockey pulleys and in front of the two lower ones, easing the tension spring on the condenser drum upward if necessary.

When the cord is riding on the jockey pulleys, it should be under tension when the tension spring is released. If it is not, slip it off the jockey pulleys again and pull the ends further through the clamping device, then replace it on the pulleys.

Set the condenser vanes fully in mesh and rotate the tuning

drum until the last line on the wavelength scale (just above 550 metres) is under the cursor thread, then tighten the set screws on the pulley.

THE CURSOR THREAD

In cases where the thread breaks close to the bead, it is often possible to join a new length of thread to the old with the knot so placed that it is covered by the top of the tuning frame.

If this method of repair is adopted care should be taken to tie the knot firmly at a point where it will be completely covered by the frame, and the two free ends should be cut very short to avoid the risk of their hanging down over the tuning drum.

When the knot has been tied, pass the extended thread through the small hole in the tension spring.

Put on a bead and allow it to slide down the thread until it rests on the tension spring. Depress the spring and make a slip knot in the thread close above the bead.

Lock the slip knot by knotting it with the free end of the thread.

The thread should be under tension when the spring is released, and should rest in the groove which locates it sideways.

If the tension is insufficient, release the spring by removing the two holding down screws and increase the angle of the "fold back" portion. Then replace the screws.

The holes in the spring are slotted and it should be adjusted to locate the cursor thread. This can be checked by the three marks at 261 metres on the tuning drum.

To replace the cursor thread, the tuning drum must first be removed.

Release the set screws securing the drive pulley and slide the pulley off the drum spindle without disturbing the drive cord. (If the cord does slip off the pulley, follow the instructions for replacing on pages 9 and 10.

Remove the four screws holding the tuning drum bearing plates, and withdraw the tuning drum.

Remove the two screws at the bottom of the tuning frame which secure the cursor thread clamp. Knot one end of the new thread and pass the other end first through a bead and then through the hole in the spring at the top of the tuning frame.

Thread it through the hole at the top of the tuning frame and pass it under the clamping plate, replace the two screws and partially tighten them.

Pull the thread through the clamp until it is held under tension by the spring. Holding it in this position, tighten the two fixing screws to hold it securely and cut off any spare thread.

Replace the tuning drum by following the instructions below.

THE ALPHABETICAL TUNING DRUM AND SCALE

In the A34 and D34 it is advisable to remove the tuning indicator from the tuning drum assembly before changing the drum or dial, to make the tuning frame more accessible.

THE TUNING INDICATOR SCREEN

A screen is provided between the tuning indicator and the tuning drum on the A34 and A38 receivers. This is to diffuse the heat from the tuning indicator. The screen should therefore be so adjusted that it springs against the glass envelope. This will also prevent rattles.

The scale can be removed without disturbing the drum if care is taken to prevent the edge of the scale rubbing the drum and damaging it. When both the scale and the drum are to be replaced it is simpler to remove the drum first. We will therefore describe the method for changing the two together and will cover cases where the drum or the scale only is to be changed.

Slacken the two set screws on the drive pulley and slide it off the tuning drum spindle.

Remove the screws which hold the tuning drum bearings at the top and bottom of the tuning frame. This will allow the drum to be withdrawn complete with the two bearing plates.

Next, release the alphabetical scale by undoing the four fixing screws.

With the two screws holding the lower clamping strip in position but slackened as far as possible, place the new scale into the lower clamp with a rubber on either side of the glass.

Now place the top of the scale into the top clamp and fit the protecting rubber strips on each side of the glass.

Do not tighten the clamps at this stage.

Transfer the bearing plates and washer to the new drum (Note: the spring washer should be immediately beneath the top bearing plate).

Insert the new drum in position and replace the four bearing fixing screws loosely. Adjust the drum until it is just clear of and parallel to the cursor thread and tighten the four fixing screws.

Adjust the glass scale until it is close to the drum, and the indicator lines beside the stations register with the lines on the drum. Then carefully tighten the four clamping screws until the scale is held firmly. Any attempt to tighten beyond this point will result in breakage of the glass. Check that the drum does not foul the glass when it rotates.

Refit the drive pulley on to the tuning drum spindle. This operation is simplified by release of the tension on the drive cord by pressing the tension spring towards the outside of the tuning drum.

Set the condenser vanes fully in mesh and rotate the tuning drum until the cursor thread covers the top mark on the wavelength scale—above 550 metres.

Tighten both set screws on the drive pulley and check the set for calibration accuracy. If the above adjustments have been carried out with reasonable care, any calibration inaccuracies will be quite small and can be corrected by retrimming in the usual way.

THE S.W. CORD DRIVE

If a cord drive is to be replaced on a short wave condenser assembly, the first step is to see that the notched drum is correctly located on the condenser spindle. When the condenser vanes are fully in mesh, the stop behind the drum should come into action and at the same time the locating spring should drop into the end notch on the drum (the one which should correspond with the 49M setting on the dial). The correct order for adjustment is:

1. Set the stop when the vanes are fully meshed;
2. Rock the bracket supporting the click pawl until it drops into the 49M notch. The slots for the fixing screws of the pawl bracket allow the tension of the click spring to be varied.

Now take 25 inches of drive cord and fold it in half. Push the

loop thus formed through the small hole in the scale pulley, and secure it with the screw inside the pulley.

Push the two ends through the small hole in the condenser pulley and thread them through the spring clamp until about 1 inch projects, then tighten the two clamping screws.

Wind the cord around both pulleys so that the scale pulley has two loops of cord around it and the lower half of the condenser pulley has a single cord around it.

The spare cord between the two pulleys should then be just sufficiently long to allow the dial pulley to be pushed on to the dial spindle if the tension arm is pushed towards the outside of the drum.

Provided the cord is taut and the 49M mark comes in the centre of the window, the adjustment is now complete.

If the cord is not under tension, slacken the two clamping screws and pull the cord further through the spring clamp.

If the waveband markings do not come in the centre of the window (this will be most critical on the 19M and 21M bands), slacken the clamping screws slightly and ease one end of the cord further through the clamp, thus altering the setting of the dial relative to the setting of the condenser, until the correct adjustment is obtained. Then tighten the two screws.

USING THE DIAGRAM SHEETS

THE diagram sheets at the back of the book contain most of the information required for carrying out normal service work. The following information will help you to make full use of the sheets:

Each sheet contains the circuit diagram, the top and underside views of the chassis, the key to values of components, and the voltage table, for one particular model.

The circuit diagram is numbered at each "junction point," so that every component has a number at each terminal. These numbers are marked at the ends of the components in the underside and top views of the chassis so that the respective terminals may easily be identified with those on the circuit diagram.

The underside and top views of the chassis are divided into squares which are lettered horizontally and numbered vertically so that any section may be referred to by quoting the appropriate "square."

The use of the scheme is best shown by giving a practical example.

Suppose, in tracing a fault in an A34 receiver, we suspect the A.V.C. decoupling condenser; we refer to the circuit diagram and find that its number is C8. By referring to the tabulated list of values, we find that it is .1 mfd. and is located in "square 10D." By referring to the square at the junction of column "10" vertically, and column "D" horizontally, on the underside view of the chassis, we find that the condenser is mounted between the two outside top tags on panel No. 2. The numbers inside the circles representing the tags, show (from the circuit diagram) which end is connected to earth (10) and which to the band pass coils (12) without the necessity of checking wiring. Reversing the process, any tag or terminal on the receiver can be identified on the circuit diagram by referring to its number.

The panels are represented as being laid flat against the chassis with the tags uppermost and the components on the underside. The small circles represent the tags, and the components are drawn in full lines for clarity (being underneath, they should normally be shown dotted).

To enable the panels to be shown flat without covering other components, it has been necessary to draw one or two components

out of the correct positions but where any considerable alteration has been made in this respect, an arrow indicates the direction of the correct placing.

In the cases of the A34 and the D34, a table model is shown, but with the Radiogramophone components added. The Radiogramophone components must therefore be ignored when considering a table model, and allowance must be made for the re-arrangement of one or two components in the case of the radiogramophones.

A composite circuit diagram is used for the A34 and D34 table and radio-gramophone models. For the A34 and D34 table models, the heavy lines should be ignored and the dotted lines treated as full. For the radio-gramophones, ignore the dotted lines and include the parts shown in heavy lines.

In the component tables, all resistances are given in ohms, and capacities in micro-farads, unless otherwise stated. The D.C. resistance of coils is quoted in ohms in all cases, except where the reading would be too small to be of use, when they are omitted altogether.

The voltage tables should only be taken as a guide, as considerable variations may occur without affecting the efficiency of the receiver.

The readings were taken with a 0-50v and 0-500v 1000 ohms-per-volt meter, with the mains receivers working on 230 volts A.C., and the battery models using a new 120 volt H.T. battery.

TRIMMING

ALL trimming adjustments should be carried out with the greatest possible care as the condenser settings are very critical and faulty trimming may spoil completely the performance of the receiver.

APPARATUS REQUIRED

For work on any parts other than the medium and long wave, R.F. and local oscillator circuits, a service oscillator is essential.

Extreme accuracy of calibration is necessary in the service oscillator and it is advisable to check this regularly by the method suggested on page 10 of the "28" service manual.

Short wave ranges can be checked in a similar way by "beating" the service oscillator signals with signals from a suitable station of known wavelength.

A means of measuring changes in the output of the receiver is also required. Although the tuning indicator where provided gives a rough indication, the variations in the width of shadow for critical adjustment are extremely small, and an A.C. voltmeter, used in the output stage therefore is preferable. This should be of the rectifier type, with a range of 0-50 volts, and it should be placed in series with a 1 mfd condenser between the output valve anode and the receiver chassis. The condenser is to prevent D.C. current flowing through the instrument. It will be obvious that when using this method, a constant A.F. note is necessary.

A 0-3 volt A.C. meter may be used across the loudspeaker sockets as an alternative and a series condenser is unnecessary in this case.

The screwdriver for adjusting the trimmer screws should have an insulated blade approximately $\frac{1}{8}$" in width.

MAKING THE ADJUSTMENTS

In following the instructions given below, use can be made of the component tables for locating the positions of the various trimmers.

It is important to keep the input low so that A.V.C. does not operate. Therefore reduce the input whenever the output voltage exceeds 10v on the anode or $\frac{1}{2}$ volt on the L.S.

I.F. TRIMMING

1. Switch the set to long waves and tune to 2000 metres.

2. Connect the service oscillator between the control grid of V2 and chassis via a dummy aerial.

3. Switch the service oscillator to the I.F. range and internal modulation and tune it to exactly 119 K/cs.

4. Adjust the input from the service oscillator to give a low reading on the output meter with the volume control on the set fully up.

5. Adjust the trimmers C17 and C18 for maximum meter deflection. Repeat the process for final adjustment.

6. Transfer the service oscillator input to between the pentode control grid of V1 and chassis and reset the attenuator again to give a suitable small reading on the output meter.

7. Adjust the trimmers C15 and C16 in turn for maximum meter deflection. Repeat the process for final adjustment.

8. Tune the service oscillator through about 15 K/cs either side of 119 K/cs. The meter reading should drop evenly on either side of 119 K/cs. If it does not, the adjustment has not been carried out sufficiently accurately, and should be repeated. The tuning indicator should peak exactly at 119 K/cs., if not, the 2nd I.F. secondary is out of adjustment. After trimming the I.F.'s it is always best to retrim the oscillator and R.F. circuits.

R.F. AND OSCILLATOR TRIMMING

(All sets except the B31 and AD32.)

By adopting the following procedure, the adjustment of the oscillator trimmers, which are the most critical, is made independent of the calibration of the service oscillator.

1. Switch the receiver to medium waves, connect an aerial and earth, and adjust the dial to the wavelength of a known broadcast signal, as near to 220 metres as possible.

2. Adjust the medium wave oscillator trimmer (C6) to receive the station at maximum volume—judged by the tuning indicator or by ear.

3. **Without altering the setting of the tuning control,**

replace the aerial and earth with the dummy aerial of the service oscillator.

4. Tune the service oscillator to obtain the maximum signal in the output meter on the receiver, ignoring the actual calibration.

5. Adjust aerial trimmer (C2) for maximum deflection.

6. Adjust the grid trimmer (C4) for maximum deflection.

7. Retrim C2 and C4 as a final adjustment.

8. Reconnect the aerial and the earth.

9. Switch the receiver to long waves and set the scale to the wave length of a known L.W. broadcast station (Droitwich at 1500 metres is suitable for the purpose.)

10. Adjust the long wave oscillator trimmer (C7) to receive the station chosen at maximum volume (judged either by the tuning indicator or by ear).

11. Tune the set to exactly 1000 metres.

12. Connect the service oscillator in place of the aerial and earth, switch to long waves, and rotate the dial of the service oscillator to the point giving maximum deflection of the output meter. (If the oscillator calibration is correct, the setting will correspond with 1000 metres.)

13. Adjust the L.W. aerial trimmer (C3) for maximum reading.

14. Adjust the L.W. grid trimmer (C5) for maximum reading (keeping the input sufficiently small to prevent the A.V.C. circuit operating).

15. Retrim C3 and C5 as a final adjustment.

AD32 R.F. TRIMMING

The procedure for this receiver is the same as for the other models, with the exception that there are no L.W. trimmers in the R.F. circuits, and the condenser numbers are different. Instructions 1-10 therefore apply, but in this case the condenser numbers are as follows:

Medium Wave	Oscillator	C4	Square	18Q	On top of the variable tuning condenser.
,,	,,	Aerial	C3	,,	18N	
,,	,,	Grid	C2	,,	18P	
Long	,,	Oscillator	C5	,,	10G	

B31 R.F. TRIMMING

1. Connect a 0-50 volt A.C. meter, in series with a .1 mfd. condenser, between the output valve anode and the receiver chassis.

2. Connect an aerial and earth and tune to the wave length of a known station, below 265 metres. Adjust reaction control just below oscillation point, and turn volume control half down.

3. Without altering the setting of the tuning control, adjust C6 for maximum output, judged aurally.

4. Connect the dummy aerial of the service oscillator in place of the aerial and earth, and tune it to give the greatest output meter reading. (The service oscillator reading will correspond with the wave length of the chosen station, if the calibration is correct.)

5. Reduce the output from the oscillator to give a suitable reading.

"36" SHORT WAVES

If a receiver is working normally on short waves and the service man wants to readjust the trimmers to give the highest possible gain, it is sufficient to set the band selector to 16.2 metres (in the 16-metre click), tune the M.W. tuning control to 300 metres, and then adjust the two S.W. R.F. trimmers (C41 square 41N, and C42 square 41Q) to give the maximum amount of hissing noise from the loudspeaker with volume control and tone control up, and noise suppression off. An aerial should be connected when adjusting aerial trimmer.

To readjust completely the S.W. R.F. and oscillator trimmers, the method is as follows:

1. Switch the receiver to short waves and adjust the band selector dial to the 16-metre band.

2. Adjust the tuning control to 300 metres ("5" on the S.W. scale).

3. Connect the service oscillator to the aerial and earth terminals of the receiver and apply a signal at the 17.7 Mc/s. (16 m.)

4. Adjust the S.W. oscillator trimmer (C43) and then the S.W. R.F. trimmers (C41 and V 42) for maximum gain (measured by the output meter).

5. Recheck the three trimmers as a final adjustment.

The trimming should hold for all positions of the short-wave

band selector and the test frequencies to apply for each position of the band selector, when the tuning control is tuned to 300 metres, are as follows:

Band Selector Dial	*Test Frequency*
13 M	21.5 (m)
16 M	17.7
19 M	15.25
21 M	14.2
25 M	11.9
31 M	9.5
42 M	7.15
49 M	6.1

There will be some variation from set to set but normally all the signals 6.1—15.25 Mc/s should come in at 5 (300 metres) on the tuning control and those of 17.7 and 21.5 Mc/s between 3 and 7 on the scale. If no 21.5 Mc/s signal can be heard, readjust the 17.7 Mc/s signal to come in at 3 and check on 21.5 Mc/s.

If there is a tendency for the tracking to become inaccurate, which will be shown by the maximum hissing occurring away from 300 metres, at the lower frequencies, the spacing of the turns on the S.W. coils (L21 and L23) may be adjusted for maximum gain when the short wave band selector is adjusted to the 49-metre band and a signal of 6.1 Mc/s is applied.

Obviously, a service oscillator which is accurately calibrated on short waves, is necessary for these adjustments, and if there is any doubt about the accuracy of the service oscillator, it is better to tune-in a short wave station on the 16-metre or 19-metre band and trim for maximum gain. (Daventry and Zeesen are suitable stations which are usually receivable in day time.)

ADJUSTING THE IMAGE FREQUENCY SUPPRESSOR

Image frequency, or as it is sometimes called, second channel interference, is only troublesome on powerful signals, and a large signal is therefore necessary for adjusting the image frequency suppressor circuit.

The method employed in the factory and which is suitable for most working conditions is as follows:

1. Adjust the service oscillator to 333 metres and connect it by means of a dummy aerial between the aerial and earth sockets of the receiver, setting the oscillator output to maximum.

2. Tune the receiver to 453 metres and turn the volume control full on. A weak (image) signal should be heard, but if it is not, slightly alter the receiver tuning between 440 and 460 metres until the image signal is heard.

3. With an insulated screwdriver, adjust the erinoid screw situated in the top of the band pass secondary (or grid) coil can until the minimum signal is heard in the loudspeaker; this adjustment must be made with the coil can in position. When the operation is properly done, any movement of the erinoid screw in either direction should cause the image interference to increase.

It will be noted that we recommend an aural test in preference to the use of an output meter for this adjustment. This is because we are adjusting for a minimum signal and the ear is more sensitive for this than the normal output meters used for trimmer adjustments.

When the suppressor circuit is adjusted according to the above instructions, it provides the maximum degree of suppression over a large portion of the medium wave band and is the best setting for most localities. In places where a strong signal is received near the bottom end of the medium wave band, second channel interference may still be apparent on a particular station towards the middle of the band, which otherwise would be of good programme value. In these cases, carefully tune the set to this wanted station and readjust the erinoid screw until the interference is at minimum. This adjustment should take only a few seconds to complete as it is unnecessary to remove the chassis from the cabinet. In localities where the readjustment is found to be necessary, we recommend that it should be carried out on all new sets received, as part of the initial adjustment of the receiver prior to demonstration.

AUTHORIZED MODIFICATIONS

THE pickup modifications suggested in this chapter are for A.C. receivers only. We have carefully considered the question of similarly modifying the Universal and D.C. receivers but the possibility of introducing undesirable hum with a live chassis or when long pickup leads are used, and the risk of electric shock, are so great that we have decided that we cannot recommend or authorize pickup modifications to these receivers.

All modifications described allow the receivers to be used with any good make of pickup, but if a piezo electric type is used, it will be necessary to reduce the output, and a tone correction filter will be desirable. A suitable arrangement is to wire a 2-megohm resister and a .0003 mfd. condenser in parallel and place this unit in series with the pickup leads. The unit can be mounted at any convenient point between the pickup and the pickup plug, and probably the most convenient place is inside the gramophone cabinet, close to the motor board assembly. It will probably be necessary to use screened leads, and also to screen the resistance and condenser to avoid hum pickup from the motor and mains leads.

In all cases where long pickup leads are used they must be screened and the screening connected to the chassis of the receiver.

To prevent the mechanical noise from the pickup interfering with the electrical reproduction, the motor-board assembly should be covered with a well-fitting lid while records are being played.

THE A34

The alterations described below convert a table chassis into an RG chassis with the same circuit arrangements that we use in the A34RG.

The I.F. valve (V2) is made to work as a low frequency amplifier for record reproduction by the inclusion of a 50,000 ohms resistance in its screen circuit. The amplified signals are then passed through a coupling condenser from the screen to the volume control and output valve. At the same time a resistance is introduced in the cathode circuit of the frequency changer valve (V1) to stop the valve functioning, and so prevent radio break-through. The radio gramo-

phone switch completely disconnects the pickup from the radio circuit, so that the pickup leads may be left plugged into the sockets at all times.

The following components are required to carry out the modification:

1 Four-pole gramophone change-over switch.
1 Bakelite washer.
1 A34RG pickup socket panel assembly.
1 A34RG No. 5 panel less 25 mfd. condenser (C34).
1 .001 mfd. condenser.
1 100,000 ohms $\frac{1}{4}$ watt resistance.
1 4BA soldering tag.
4 6BA $\frac{1}{4}$" round-headed screws, with nuts.
2 6BA $\frac{1}{2}$" ,, ,, ,, ,,
2 4BA $\frac{1}{2}$" ,, ,, ,, ,,

These can be obtained from the Service Department at an inclusive cost of 10s., less 27$\frac{1}{2}$ per cent.

MOUNTING THE COMPONENTS

The new components are fixed by screws and should be mounted as follows:

1. Place the pickup socket panel on the back of the set with the sockets projecting into the chassis through the holes provided for them, and secure the panel with the four 6BA $\frac{1}{4}$" screws and nuts.

2. Mount the four-pole switch in the large hole in the same panel with the bakelite washer behind it.

3. Remove the cleat which holds C34 and mount the new panel in its place, using the 4BA screws and placing a soldering tag beneath the screws nearest to the front of the chassis (square 12B).

4. Mount the .001 mfd. condenser (C19) on the "tag" side of No. 2 panel close to the chassis (square 11F), using the two 6BA $\frac{1}{2}$" screws and nuts.

WIRING

Now commence the wiring in the following order, and remember to press all wires down close to the chassis:

1. Remove the wire between tag 12 on No. 1 panel (square 13G) and chassis.

2. Run an orange tracer wire from tag 12 on No. 1 panel to tag 12 on the gramophone switch (square 10J) and thence to tag 12 on No. 5 panel (square 10B).

3. Run a black tracer wire from a solder tag on the chassis to tag 10 of the gramophone switch (square 10J).

4. Put the 25 mfd. condenser (C34) on the back panel 5 and connect it between tag 10 (square 11B) and tag 56 (square 10B). (The end marked ++ or with a yellow ring *must* go to tag 56.) Wire the white tracer which was connected direct to C34 to tag 56.

5. Earth the two No. 10 tags on this panel to chassis (to the new soldering tag). The black tracer (originally to C34) from panel 3 earthing tag can then be removed.

6. Run a blue tracer wire from panel 5, tag 31, to the gramophone switch, tag 31.

7. Run a blue tracer wire from the gramophone switch, tag 38, to panel 3, tag 38 (square 6E).

8. Run a yellow tracer wire from panel 5, tag 47, to the gramophone switch, tag 47.

9. Run a yellow tracer wire from the gramophone switch, tag 48, to panel No. 4, tag 48 (square 3H).

10. Run a pink tracer wire from panel No. 5, tag 46, to panel No. 4, tag 46 (square 4G).

11. Remove the green tracer wire from the screen socket of V2 valve holder (socket 24) and connect it to the gramophone switch, tag 23.

12. Run another green tracer wire from the gramophone switch, tag 23, to panel 5, tag 23.

13. Run a green tracer wire from the gramophone switch, tag 24, to V2 valve socket No. 24 (screen), and thence to panel No. 5, tag 24.

14. Wire the 100,000 ohms resistance across the terminals of C19 (now mounted on panel 2, square 11F).

15. Remove the two orange tracer wires from panel 2, tag 27, and

connect the one from the first I.F. can to the pickup socket 26 (square 12J—"P" socket) and the one from the second I.F. can to the pickup socket 27 (square 11J—"U" socket).

16. Run another orange tracer wire from pickup socket 27 to the near terminal of C19 and thence to tag 27 on panel No. 2.

17. Run a white tracer wire from pickup socket No. 26 to the further terminal of C19.

18. Run a black tracer wire from pickup socket No. 10 (square 11J—"C" socket) to chassis. This socket is to be used for earthing the screening of the pickup leads.

Finally, a small hole will have to be cut in the fibre back of the receiver to allow access to the sockets and clearance for the plugs. Use a sharp chisel after drilling out the material and touch up with black varnish.

The time required for the conversion is between $1\frac{1}{2}$ and 2 hours.

THE A36

The modification of the A36 for use with a gramophone pickup is very simple, as a special jack has been produced for the purpose, suitable for use with a universal plug; this obviates the need for other components. To save the dealer as much time and trouble as possible, the jack will be supplied with five wires of the correct length, already attached. This means that six of the seven contacts will have the connections already made to them.

The parts required for the modifications are:

One pickup jack for A36, wired.
One cleat with fixing screw.

These can be supplied by the Service Department, at the price of 5s. 6d., less $27\frac{1}{2}$ per cent discount.

PRACTICAL WORK

Mount the jack in the hole in the back of the chassis (square 16K). Disconnect the blue tracer wire from tag 30 on panel No. 5 (square 13B), shorten it by three inches, and connect it to the blank tag on the pickup jack (the one next to the frame tag). Connect

the blue tracer wire from the next pickup tag to panel No. 5, tag 30.

Connect the white tracer wire to panel 4, tag 47.

Pass the two screened wires round the "tag" side of panel No. 4, under the wave range switch assembly to panel No. 1.

Connect one screened lead to panel 1, tag 33 (square 5C), and the other to panel 1, tag 58 (square 5C).

Fasten the two screened leads to the chassis with the cleat and 4BA screw. A tapped hole in the chassis is provided for this purpose (square 9B).

On completion of these modifications the wiring should be pressed down against the chassis. Also, a hole must be cut in the fibre back to allow the plug to be inserted.

The work should be completed in approximately half an hour.

THE A38

In this receiver a simple jack can be arranged to break the circuit from the diode load to the L.F. valve and insert the pickup in the grid circuit of this valve. The jack can be supplied by our Service Department with wires of the correct length already attached, and the price is 2s. less 27½ per cent discount.

ASSEMBLY AND WIRING

Mount the jack in the hole at the back of the chassis close to the noise suppression switch (square 7K).

Remove the short wire between the two No. 42 tags on panel 3 (square 7G). See that the tracer wire from the switch to the panel is connected to C29 and not to the junction of R17 and R18, otherwise radio breakthrough will occur.

Connect the white tracer wire from the jack to panel No. 3, tag 46 (square 7G), the blue tracer wire to the next tag on the same panel (tag 42, square 7G), and the purple tracer to the other tag marked 42 on that panel.

This completes the modification to the chassis, but a hole

must be cut in the fibre back to allow the pickup plug to be inserted.

THE B31 WAVETRAP

For listeners near Droitwich a wavetrap may be necessary with the B31 to permit reception of Luxembourg. The wavetrap may be obtained from the Service Department at 3s. 9d., subject to a discount of 27½ per cent. It is very easily fixed.

The B31 has been tooled so that the wavetrap may be fitted on the chassis in a similar way to the normal coil-can assembly. Holes are pierced in the chassis near the aerial and earth sockets to conform to our standard coil-can base. The wavetraps fit here and the two leads must be soldered to the aerial and earth sockets inside the set, the two wires afterwards being pressed close to the chassis. The time taken should not be more than a quarter of an hour.

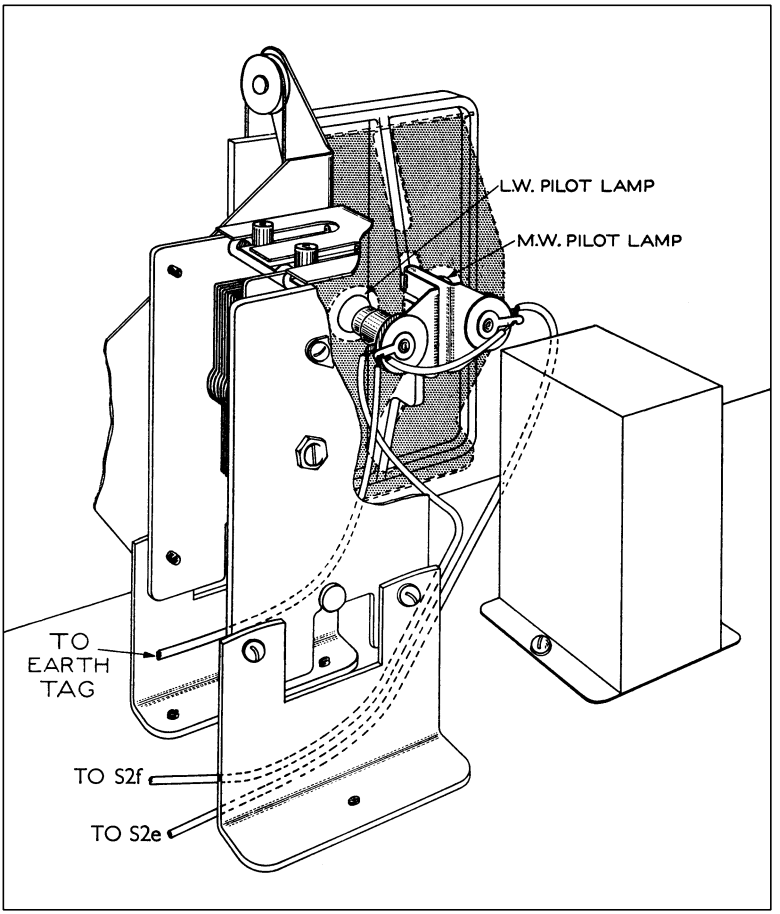
The wavetraps are sent out already adjusted, but in all cases should be checked by tuning the set to Luxembourg and trimming the wavetrap for minimum interference from Droitwich.

B31 PILOT LAMPS

On page 14 of the B31 Instruction Book, we suggest that pilot lamps can be fitted to the set when required, to illuminate the waveband in use. The modifications to the receiver are very simple. Four new components are required and are obtainable from Murphy Radio.

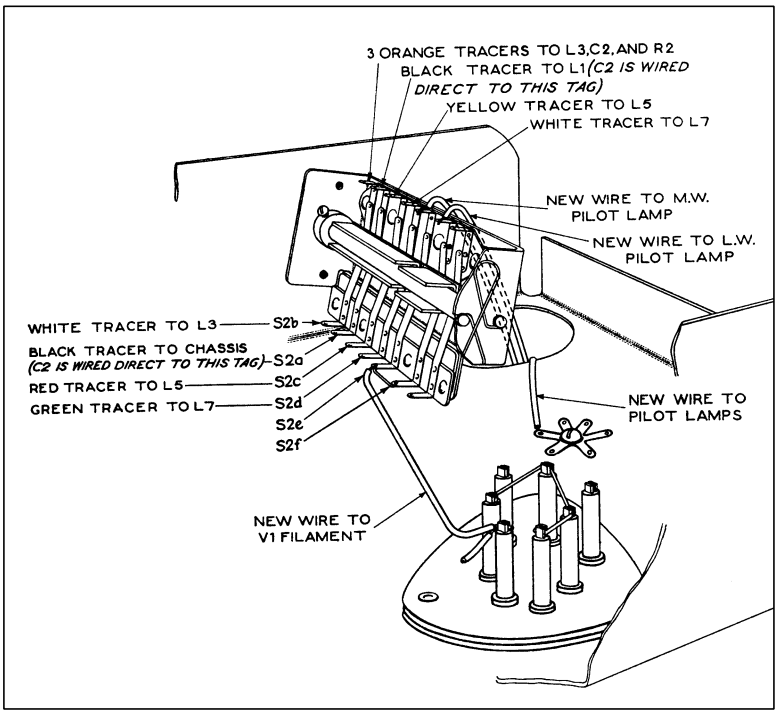
1. One dual pilot lamp bracket.
2. One reflector.
3. One 7-contact wave-range switch.
4. Two 2v 0.2 amp. lamps.

The cost of these components is 7s. less 27½ per cent discount. The time taken in carrying out the work should be approximately one hour, and as it is desirable in jobs of this kind that all dealers should charge approximately the same amount, we suggest than an inclusive charge of 10s. 6d. to the customer will allow a reasonable margin for the work.



The two diagrams show the top and underside of the chassis with the new components in position. The reflector is shown shaded in the above illustration, and it is held by the two screws which hold the tuning scale. If these screws are slackened off the reflector can be pushed into position. Check the accuracy of calibration before the screws are finally tightened by verifying that the index travels exactly to the top mark of the medium wave scale (560 metres) as there is a certain amount of tolerance in the tuning scale fitting. The lamp bracket is clipped on to the rib between the medium-wave and

long-wave scales with the lamps projecting through the holes in the reflector. Notice that it will go on one way only. If it does not fit tightly the clip may be closed a little.



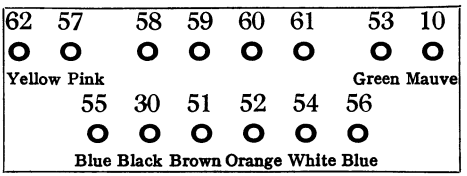
Take the three wires from the pilot lamp bracket under the variable condenser mounting and through the hole cut for the aerial coil assembly, and then to the points indicated in the diagram. Notice that the fourth wire on the underside view is connected to both S2c and S2f.

For constant reaction it is essential that when the wave-range switch is changed the under chassis wiring should be replaced in exactly the same position on the chassis as it was in originally. The points on the switch to which the wires go are marked in the above sketch. When the wiring has been completed, press all wires down close to the chassis.

PRODUCTION CHANGES

ALTHOUGH in most cases the circuit and layout of the receivers has remained substantially unchanged, certain modifications have been carried out and particulars of these are given for each model in the table below. The serial number quoted is the approximate number of the first instrument incorporating the modification.

MODEL	SERIAL NO.	MODIFICATION
A34	11626	100 ohms resistance in the anode circuit of V3 replaced by a 5000 ohms resistance (R23) in the grid circuit and fitted in the grid cap over the valve.
	14021	Components on panel 4 re-arranged. (The modified arrangement is shown on the diagram sheets, but as the alteration is quite small, the old arrangement should not be difficult to follow.)
	17800 (RG2947)	Noise suppression circuit modified. The earlier models had a double pole switch for noise suppression, and one pole was used to vary the bias on the tuning indicator by connecting the cathode of V3 with noise suppression "off" and to the junction of two resistances in the cathode circuit of V3 with noise suppression "on." The two resistances are replaced by a single one of 140 ohms (R24) and the tuning indicator cathode is wired permanently to the cathode of V3.
	27494 (RG3926)	Mains transformer modified. The new transformers are being used for replacement purposes, and the tag connections are therefore given below, with the

MODEL	SERIAL NO.	MODIFICATION
		appropriate circuit numbers, and also the colour code for wiring the transformer to the radiogramophone.  In cases where a new type transformer is used to replace an old type on a table model, new leads must be fitted for the H.T. secondary wires and, as these wires have to carry high voltages, they should be covered with systoflex.
A36	3333	First I.F. coil assembly modified. (The modified arrangement is shown in the diagram sheets.)
	5394	50 mfd. and 25 mfd. electrolytic condensers in parallel were replaced by a 75 mfd. condenser (C35) and the panels Nos. 1 and 3 were modified accordingly. (The modified panels are shown on the diagram sheets.)
A38	4424	The anode circuit of the AC/VP2 valve (V2) modified. Previously it was connected to the low potential end of the resistance (R23). In the modified receiver this circuit is connected to the high potential end of R23.

MODEL	SERIAL NO.	MODIFICATION
	3333	Panel 5 modified (the modified panel is shown on the circuit diagram).
	6722	113 ohms resistance (R27) changed to 118 ohms.
AD32	5627	First I.F. coil assembly modified. (The modified chassis is shown in the diagram sheets.)
	6346	The 50 ohms resistance in the anode circuit of V3 was deleted and was replaced by a 5000 ohms grid resistance (R14) fitted in the screen cap over the valve.
D34	3523	The 100 ohms resistance in the anode circuit of the output valve (V3) was deleted and replaced by a 5000 ohms grid resistance (R23) in the grid circuit and fitted in the grid cap over the valve.
	4444	The receiver was generally modified to suit the PenDD4021 output valve instead of the PenDD4020. The most important change is that the loudspeaker field is used in series with the H.T. supply for smoothing purposes, in place of the choke (L19) which is deleted. Both circuit arrangements are shown on the diagram sheet and a list of components which have been altered in value is given below:

MODEL	SERIAL NO.	MODIFICATION
		Component — *Old Value* — *New Value* C31 — .002 — .005 32 — .0003 — .001 33 — .002 — .005 38 — .04 — .1 *high voltage* R24 — 140+25 — 110 25 — 500 — 250 L13 — 360 — 100 14 — 6700 — 900 T2 Prim: — 350 — 185 It will be obvious from the information given above that the two types of output valve are not interchangeable.
D36	3078	The 100 ohms resistance in the anode circuit of the output valve (V3) is deleted and replaced by a 5000 ohms resistance in the grid circuit, fitted in the screening cap over the valve.
	3646	Two 1-amp fuses fitted between the external and internal loudspeaker sockets. These are to prevent damage to other components if a short circuit occurs between the frame and the speech coil of the internal loudspeaker, due to matter in the gap.
	4792	Receivers generally modified to suit the PenDD4021 output valve in place of the Pen DD4020. These modifications are similar to those carried out to the D34 receiver. The loudspeaker field is used for smoothing in place of the

MODEL	SERIAL NO.	MODIFICATION
		choke L19, which is deleted. The noise suppression circuit is simplified by omitting the second pole of the switch which was used for varying the bias applied to the cathode of the tuning indicator. The H.T. line for R37, R29, R31, and R32 is deleted from S1h and C13 and is taken to the high potential side of the choke L22. Components which have been altered in value are given below:

Component	*Old Value*	*New Value*
C31	.002	.005
32	.0003	.001
33	.002	.005
35	.04	.1
R24	140+25	110
25	500	250
31	10000	15000
L13	360	100
14	6700	400
T2 Prim.	350	185

FAULT FINDING

SERVICEMEN should be able to trace faults quite easily with the aid of the diagram sheets and the information given in other chapters of this book, but the information below is given to assist in locating the less straightforward faults more quickly.

It is not a complete record of all faults which may cause the various symptoms, but it suggests some of the less obvious causes of failure, which may be overlooked in carrying out the normal routine tests.

B31

SYMPTOMS	FAULTS
Low Gain	T1 high leak to stampings (or primary to secondary). Trimmer C4 s/c. Speech coil shorted turns (this will also affect quality of reproduction).
Instability	Choke L8, 9, 10, low resistance.
No Reaction	C8 s/c.
No Reaction. L.W.	Choke L8, 9, 10, faulty.
V/c not operating	S26 moving contact s/c to chassis.

B33

SYMPTOMS	FAULTS
No Signals	C13 o/c.
No Signals M.W.	C10 leaky.
Weak on L.W.	C10 leaky.
Whistles	C8 o/c.

A34 AND A34RG

SYMPTOMS	FAULTS
No signals	C10, C11, o/c.
Weak signals	L16, C14, C30, o/c. C34 s/c.
Weak signals and hum	R19 high resistance or o/c. Bad contact on V3 cap.
Instability	C13 low capacity. C34 low capacity. C20 o/c. C8 o/c.
Distortion on powerful signals	A.V.C. voltage s/c to chassis. (Check R14 s/c to can, C8 s/c.)

A36

SYMPTOMS	FAULTS
Low Gain	C14 o/c. Screened lead from V3 s/c to screening or o/c to valve cap.
Low gain on short waves	C49 o/c.
Hum	C29 o/c. (Note: a reduction in mains hum is sometimes obtained by reversing the loudspeaker plugs.)
Instability	C22 o/c, C21 o/c.
Microphony	C48 loose. V5 microphonic. (Note: this fault may be a little misleading because it will be unaffected by the setting of the volume control.)

A38

SYMPTOMS	FAULTS
Low Gain	Screened lead from V3 s/c to screening. C27 o/c. Mains voltage adjust-

SYMPTOMS	FAULTS
Instability	ment incorrect. This is critical on this receiver. C34 o/c. L20 o/c. Metallizing on V2 not earthed.

AD32

SYMPTOMS	FAULTS
Instability Excessive pilot lamp failure	C28 low capacity. 16 mfd. C28, and 6 mfd., C29, reversed.

FOR SETS BELOW SEE ALSO FAULTS IN A.C. EQUIVALENT RECEIVERS

D34 AND D34RG

SYMPTOMS	FAULTS
Excessive Background Noise	C 38 o/c.
Mains Filter overheated	C.O. tag s/c to fixing screw.
Hum on A.C.	V3 noisy. (Try reversing mains plug and loudspeaker plugs.)
Low Gain	Mains voltage adjustment incorrect. This is critical on this receiver.

D36

SYMPTOMS	FAULTS
No signals	Fuses on speech coil circuit burnt out due to L.S. speech coil s/c to chassis.
Low Gain	Mains voltage adjustment incorrect. This is critical on this receiver.