SERVICE MANUAL

for the following Murphy Sets:

A30
D30 } **TABLE, CONSOLE & RADIOGRAM.**

B27
B23 } **BATTERY TABLE RECEIVERS.**

MURPHY RADIO LTD., WELWYN GARDEN CITY
HERTS.

058.1.37

FOREWORD

THIS Service Manual is intended to assist you in your work and we should appreciate constructive criticism on any point so that we may make future issues more useful.

It is our aim to make Murphy receivers as reliable as we can, and we test all components fully, but no test is so complete as that of actual use and the only way we can get information of failures in service is from Murphy dealers through the Service Ledger scheme. The developments in component design we make each year are based on the results of our own life-tests and on the reports from dealers which are carefully tabulated.

Please help us to make Murphy receivers more reliable by making sure that all faults occurring in Murphy sets, however slight, are reported to us.

MURPHY RADIO LIMITED.

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DIAGRAMS

Part I
THE CIRCUITS

A30 MODEL

THE Murphy A30 is a superheterodyne receiver with 3 high-efficiency valves and a rectifier. In order to simplify this book, V1, which has two separate valves within one envelope, will be referred to as V1 pen. and V1 triode; similarly V3 will be referred to as V3 duo diode and V3 pen.

The function of the individual valves will be easily understood by reading this brief description of the circuit and following it on the A30 theoretical diagram on Sheet 2. V1 is a triode pentode which acts as oscillator and first detector; V2 is the I.F. amplifier and is a variable mu H.F. pentode; V3 is a double-diode pentode which acts as second detector, A.V.C. rectifier and output valve; V4 is a full wave rectifier supplying H.T. for the receiver.

From the circuit diagram you will see that the aerial is coupled through L1, L2, to the band-pass tuner L3 to L8, C1A, C1B. The image frequency suppressor L0, C0, is coupled to this circuit. The low potential end of L6 is returned to chassis through C8, so that A.V.C. voltages may be applied as steady bias to V1 pen. grid. From the secondary of the band-pass tuner the signals go to V1 pen. grid where they are mixed with the local oscillations generated by V1 triode, and rectified, producing an I.F. signal at 119 Kc/s. The local oscillator circuit is L9 to L12, C12 and C1C, with the trimming condensers C6, C7. C1C has specially shaped vanes, so that no medium wave padding condenser is required, but on the long wave band correct alignment is maintained by a series padding condenser C12. R2 is the anode feed resistance for V1 triode, while R5, C11 are the usual grid leak and condenser. C10 reduces oscillator harmonics to which it offers a low impedance, while R4 is the self-bias resistance making V1 pen. operate as an anode bend detector. Returning to the I.F. signal, the voltage across the first I.F. transformer L15, L16, is applied to the grid of V2, the I.F. amplifier. C9, R3 provide decoupling for V1 pen. anode and screen; C14 and R10 (which forms part of the A.V.C. filter), decouple V2 control grid circuit. R6, shunted with C19, provides initial bias for V2.

The amplified I.F. signal is passed through the second I.F. transformer, L17, L18, to the signal diode DA1 where it is rectified, and results in an I.F. signal across R11 and R19. C22 is the usual filter condenser. The grid circuit of V3 is completed by returning R19 to the cathode of this valve. The I.F. signal is also tapped off from V2 anode and is applied through C20 to the A.V.C. diode DA2. As V3 cathode is some twenty volts positive to chassis, and the A.V.C. diode is returned to chassis, the diode is negatively biased; no rectification occurs at this point until the I.F. voltage exceeds this delay voltage. When the I.F. voltage peaks exceed

the delay, the A.V.C. diode passes a current through R8, R9, and the voltage across these resistances is applied via R7, R1 to the grid of V1 pen.; C21, C8 being by-pass condensers. Part of the A.V.C. bias, obtained from the junction of R8, R9, is applied via R10 to the grid of V2. The L.F. signal developed across R19 is applied via C24 and R13 to V3 pen. grid. R13 is a grid stopper to prevent V3 oscillating and R12 is the grid return resistance. Bias for V3 pen. comes from the voltage drop across R14, while the voltage drop on R14, R15 is the delay voltage for the A.V.C. circuit. Both R14 and R15 are by-passed by the large capacity electrolytic condenser, C25.

The output valve is coupled to the loud-speaker by the usual matching transformer, T1, across the primary of which is connected a variable tone control unit R21, C27. R16 is included to prevent any tendency to parasitic oscillation in the output valve. The H.T. supply is rectified by a full wave rectifier valve V4. C29 is the reservoir condenser, initial smoothing being carried out by the speaker field L13 (in the negative lead) and C28. This provides sufficient smoothing for the output valve and V2 anode, but additional smoothing for V1 and V2 screen is obtained from R17 and C26. There are three separate L.T. windings on the mains transformer T2; one for the rectifier heater, one for the output valve and pilot lamp, and the third for V1 and V2. The latter winding is not connected to chassis, but to the cathode of the output valve in order to prevent modulation hum.

A30RG MODEL

The A30RG circuit is basically the same as that of the A30; the modifications are shown in heavy lines on the composite circuit diagram (Sheet 2).

The pickup is shunted by a resistance and condenser combination, R23, C32, to provide better matching. It is wired between the grid and cathode of the I.F. valve, V2. Actual connection is made at the low potential end of the I.F. circuit, L16, C16, so that the pickup voltage is applied to V2 control grid. A resistance, R24, is inserted in series with the screening grid lead to V2; the screen thus acts as an anode, while a coupling condenser, C30, passes the amplified pickup voltage to the volume control, and on to the grid of the output valve, V3.

At the same time a resistance, R22, is inserted in series with V1 cathode lead, thereby applying a large negative bias to V1 pen. control grid. This resistance which is in series with the oscillator circuit prevents V1 triode oscillating. No radio signals can therefore pass through the I.F. valve, and radio breakthrough on gramophone is prevented.

To change from radio to gramophone a three-pole switch (S6A, B and C) is used. For radio reception S6A short circuits R22, and

allows V1 to function normally, while S6B connects V2 screening grid directly to the H.T. line. S6C is open on radio and disconnects C30 from the volume control.

The gramophone motor is fed from the receiver side of the double-pole mains switch (S5A and B) and S7 which switches on the motor is incorporated in the motor board auto stop mechanism. It is shunted by a high voltage test condenser, C31, to prevent surges when the motor is switched off.

D30 MODEL

The theoretical diagram of this circuit is on Sheet 3. With the exception of the details given below, the description of the A30 may be taken as applying equally to the D.C. model.

The aerial and earth connections are insulated from the chassis by means of a high voltage test condenser C31, the aerial coupling coils L1 and L2 and the image suppressor coil L0 being connected directly to the earth terminal of the set instead of to the chassis.

The mains equipment, of course, is entirely different from that incorporated in the A.C. models. The mains are connected via a double-pole switch S5A and B, to an H.F. filter (L20, 21) to stop mains borne interference. The negative lead is connected directly from the filter to the chassis. The positive lead is connected to the heater current adjusting resistances, R20, 23, 24, 25, 26 and 27. The circuit to chassis is then completed through the valve heaters and the pilot lamp. The current taken by this circuit must be regulated to 0.2 amps for the valve heaters and this is done by putting the Mains-tap plug into the correct socket. A second wire from the positive side of the filter feeds the rectifier valve via R18 which protects the rectifier valve from current surges when the set is switched on. A condenser C30 prevents modulation hum. When the set is operated on A.C. Mains, V4 acts as a rectifier and feeds the reservoir condenser C29. On D.C. Mains it protects the electrolytic condensers from damage in the event of the mains plug being connected the wrong way round. Initial smoothing is provided by L14, and C28, and the output valve and speaker field are supplied from this point. Additional smoothing for V1 and V2 is provided by L19 and C26.

N.B.—In all D.C. models prior to serial No. D30 6357, D30C 4540, D30RG 2986, the pilot lamp is connected between L21 and the voltage adjusting resistances, R23 etc.

D30RG MODEL

The arrangements for reproducing gramophone records are similar to those employed in the A30RG (refer to composite diagram on Sheet 3). There are only two differences. First, the anode and screen circuits of V2 are both utilized as anodes for gramophone

reproduction. This is done to obtain the greater voltage necessary to feed the Pen. DD.4020, which is less sensitive than the AC2/Pen.DD though it gives the same output. Secondly, the pickup is connected to V2 grid circuit through a high ratio transformer, T2. This allows a low impedance pickup to be used to reduce hum.

On D.C. mains in which the positive main in earthed, trouble is sometimes experienced from electrostatic interference. To overcome this a variable potentiometer, R28, is fitted which can be adjusted to balance out unwanted voltages.

It should be noted that the gramophone motor board is connected directly to the "E" socket of the receiver. On no account, therefore, should electrical contact be made between the motor board and the receiver chassis.

B27 MODEL

The B27 is a five valve battery operated supersonic heterodyne receiver, employing automatic volume control. The circuit is shown on Sheet 4. As in the A30 and D30 series, two of the valves (V2 and V4) have two separate electrode systems within the one envelope, and in order to discriminate between them, distinguishing names will be given them. The two components of V2 will be spoken of as V2 triode and V2 diode, while reference will be made to V4 triode and V4 diodes.

From the circuit diagram you will see that the aerial is coupled through the aerial coils, L1, L2, to a band-pass tuner (L3 to L8, C1A, C1B etc.). L0, C0 is the image frequency suppression circuit. From the secondary of the band-pass circuit signals pass through C9 to the grid of V1, where they are mixed with the local oscillations produced by V2, and rectified, thus giving an I.F. signal at 119 Kc/s. This signal is fed through the I.F. transformer L15, L16 to the I.F. amplifier V3, and thence through the 2nd I.F. transformer L17, L18 to the detector diode of V4. The volume control R19 is the diode load and the L.F. signal passes from it through R15 (an I.F. filter resistance) and C25, to V4 triode grid. The volume control. being in the L.F. end of the set, also controls gramophone reproduction. The I.F. signal from V3 anode is also applied to V4 diode anode (DA2) through C22. This anode is about 1.5 volts negative with respect to the filament, so that with weak signals no rectification takes place. When the I.F. signal exceeds 1.5 volts, the diode passes a current through R12, R13, and the A.V.C. voltage from these resistances is applied through a decoupling system, R4, C10, R3, to the grid of V1, while a part (actually about four-fifths) of it is applied via R11 and C20, to V3 grid. The range of control obtained in this way, however, is limited and may not be sufficient to cope with the very large input obtainable from a powerful local transmitter. To prevent the overloading which would

occur in the first valve under these conditions the diode element of V2 is used to damp the secondary of the band-pass circuit and so act as an automatic "local distant" switch. With normal signals the voltage on the diode is not enough for current to pass due to the bias applied, but when the diode anode becomes positive on signal peaks, a current passes through R2, L7, L8, L5, L6 and R1, and damps the tuned circuit. This reduces the signal voltage on the grid of V1.

Returning to the L.F. signal at V4 grid, this is amplified and passed through the heterodyne filter F, which gives a very sharp cut-off at 5,000 cycles, to suppress heterodyne whistles. From here the signal is applied through C26 to the grid of V5 (R18 being the grid return resistance) and the amplified signal is transferred to the speaker through the matching transformer, T1, across the primary of which is connected the tone control R21, C33.

Bias for the valves and for the A.V.C. delay voltage is obtained from the voltage drop across R22, R23 in series with the H.T. negative lead. The total H.T. current to the set flows through these resistances with the result that the H.T. negative plug is $3\frac{1}{2}$ volts negative with respect to chassis, while the junction point of R22, R23 is about 1.5 volts negative. The grid return of V5 is taken to the top of R22, so that it receives a negative bias of $3\frac{1}{2}$ volts decoupled by C34, an electrolytic condenser of large capacity. The 1.5 volts bias from the junction of R22, R23 is decoupled by R20, C35 and applied as follows: to V4 via R14; to V3 via R13 and R11; and to V1 via R13, R12, R4 and R3. It is also applied via R20, R13 and R12, to the A.V.C. diode anode of V4 so that this diode is prevented from rectifying any signal which, at V3 anode, has a lower peak value than 1.5 volts. On any stronger signal the diode passes a current through R12, R13 and the voltage drop in these gives an added bias to V1 and V3.

S5A and B is the double-pole on-off switch, which breaks the L.T. circuit and disconnects the negative side of the H.T. battery from the receiver. Notice the method of coupling the oscillator to the grid circuit of V1. L9 and L10 are two coils of very low resistance, (so that a negligible filament voltage drop occurs in them) but they have a high impedance at radio frequencies as they are wound in the form of an H.F. choke with an iron dust core. The oscillator voltage on the coupling coils L11, L12 is applied to the filament of V1 by direct connection and the chokes L9 and L10 prevent the short circuit of this voltage to chassis by the L.T. leads.

B23 MODEL

The B23 is a three valve battery operated receiver, with a "straight" H.F. stage. V1 is a variable mu H.F. pentode, V2 is a triode acting as a leaky grid rectifier and L.F. amplifier, and V3 is a high efficiency output pentode.

From the circuit diagram on Sheet 5 you will see that the aerial is coupled through R1 (which is shorted by S1 in the "distant" position) to an H.F. transformer L1, L2, L3, the secondary of which feeds the grid of the H.F. valve. The primary is of comparatively high inductance, and, tuned by the aerial capacity, forms a circuit resonating above the medium wave band. This offsets the falling off in coupling which normally occurs towards 500 metres, and at the same time makes the selectivity greatest with a total aerial length of about 80-100 feet.

On the long wave band a small condenser (C2) is introduced in series with L1, making the coupling circuit suitable for long wave reception. The grid circuit consists of L2, L3 and C1A, the inductance L3 being short circuited on medium waves by S3. The low potential end of L3 is returned to chassis through a condenser (C3) to complete the H.F. circuit, while a D.C. path is provided through the resistance R2 and the volume control R19, which varies the bias applied to the grid of V1.

The signals are applied to the grid of V1 from the high potential end of L2. After amplification this signal develops a voltage across the tuned anode circuit L4, L5, C1B which is passed by C9 to the grid of V2, the leaky grid detector. The H.T. for V1 anode is decoupled by C7 and R4, while the screen grid is decoupled by R3 and C5. An H.F. choke in the anode circuit of V2 prevents H.F. currents from reaching the output valve, and gives smooth reaction. The coils, L6, L7, are reaction windings. Reaction is controlled by the variable condenser C8. The rectified signal, amplified by V2, is developed across the anode resistance R6 and applied through C12 to the 3:1 step-up transformer (T1) which supplies the signal voltage to the grid of the output valve, V3. This valve feeds the speaker through an output transformer (T2). Fixed tone correction is provided by C13 across the primary of T2.

Grid bias for V1 and V3 is provided by the voltage drop across R8, R9, R10, which are connected between the H.T. negative lead and chassis and give 10 volts bias. The bias applied to V1 is regulated by the volume control R19 and as it is a variable mu valve the H.F. gain is controlled in this way. From the junction of R9 and R10, bias is applied to the grid of V3, via the secondary winding of T1. As R8 and R9 are common to the grid and anode circuits of V3, anti-phase feedback occurs, which, if no precautions were taken, would reduce the L.F. gain by about 50 per cent. To overcome this, the primary of T1 is returned to a point on the bias resistance across which one-third of this anti-phase L.F. voltage is developed, and by connecting the transformer so that the phase is reversed, the additional voltage in the primary then cancels the feedback. You will see that as all the bias voltages are dependent on the anode current of the set, when the H.T. battery voltage drops, they are reduced in proportion to

the reduction in current, and correct bias is therefore automatically maintained.

The H.F. and detector valves are decoupled from the output valve by R7 and C10, which prevent the high resistance of an exhausted H.T. battery from causing instability. The double-pole on-off switch, S6A and B, is arranged to disconnect both H.T. and L.T. batteries when the set is not in use.

Part II
SERVICE DATA

DISMANTLING

A30 CHASSIS

To remove the chassis from the cabinet, first remove the knobs by unscrewing the four dome nuts holding them, taking care to keep the shakeproof washers, loosen the four holding screws and remove the fibre back, unplug the loud-speaker leads from the sockets and the field leads from the socket panel on the mains transformer. Then, with a $\frac{1}{4}$-inch Whitworth box spanner or a large screwdriver remove the three hex.-headed holding-down screws from the base of the cabinet. This should be done with the set in an upright position and projecting over the side of the bench. The chassis can then be withdrawn from the cabinet.

LOUD-SPEAKER. The speaker is held in position by a single fixing bolt, which passes through the cabinet cross bar. Provided the chassis has been removed, the loud-speaker may be lowered to clear the bar and withdrawn if the fixing bolt is unscrewed. No attempt should be made to remove the bar.

A30C CHASSIS

The procedure is the same as in the table model with two exceptions. Firstly, the chassis is connected to the loud-speaker by an earthing wire, which must by removed before the chassis is withdrawn. Secondly, the loud-speaker field wires must be passed through the hole in the chassis mounting shelf.

LOUD-SPEAKER. The speaker is held in position by four bolts, which may be unscrewed from below. Before removing the speaker, disconnect the earthing lead, unplug the field leads and withdraw them through the hole in the chassis mounting shelf.

A30RG CHASSIS

Remove all the control knobs, keeping the shakeproof washers, and unplug the loud-speaker leads from their sockets at the rear. Then loosen the four fixing screws from the fibre back, disengage the back from the lower screws, and move it sufficiently to allow the flexible leads and plugs which are attached to be disconnected from the chassis; the back can then be completely removed. Take out the field and motor plugs from the socket panel on the mains transformer and the pickup plugs from the sockets on the right-hand side of the chassis. Then unclip the metal rod from the radio-gramophone switch by pulling the bottom of the rod backwards. With a $\frac{1}{4}$-inch

Whitworth box spanner or a screwdriver, remove the three holding-down screws, these can be reached from the loud-speaker compartment working from below. The chassis can now be removed.

LOUD-SPEAKER. Unplug the loud-speaker leads from the chassis, and the field leads from the transformer, passing the field leads down through the hole in the cabinet shelf. Unscrew the earth lead from the speaker chassis, and remove the four holding-down screws from beneath the speaker. Next slide out the wooden block and lift out the speaker.

MOTOR BOARD

This may be removed as follows: unplug the pickup and motor leads from the receiver, and unclip the metal rod from the radio-gramophone switch. Next remove the twelve wood screws securing the motor board. If a good short screwdriver is used it is possible to unscrew the three at the rear edge quite easily. If only a long screwdriver is available, it is necessary to detach the lid stay from the lid; two screws hold this in position; if the upper one is removed first, the second can be reached more easily. **The lid should be lowered gently into a horizontal position, as, if released and allowed to fall at all heavily, serious damage will result.** The motor board can now be lifted out, care being taken not to scratch the cabinet or foul the metal connecting rod.

THE MOTOR. Removing the motor and fitting a new one does not present any difficulty as there are only three fixing screws to be released. It is, however, most important, if the auto stop mechanism is to function correctly and without undue noise, that the motor should be refixed so that the spindle is in the centre of the hole in the motor plate. It is also essential that the rubber washers are all replaced in their correct positions, otherwise gramophone reproduction will be seriously affected and the auto stop mechanism will not work correctly.

D30, D30C AND D30RG

The D.C. models may be dismantled in the same way as their A.C. equivalents after the rubber covers for the fixing-down bolts have been removed. These covers are sprung into position and can be removed by prising them out with a screwdriver. **It is important to replace these covers on reassembly.** Apart from this, the only difference between the A.C. and D.C. receivers as far as dismantling is concerned, is that the mains transformer is replaced by a mains tapping panel on which there are two sockets for the loud-speaker field connections, and two for the motor leads on the R.G. model.

B27 CHASSIS

To remove the chassis from the cabinet, first take out the H.T. battery and accumulator. Remove the knobs, keeping the shake-proof washers, and unplug the loud-speaker leads. Loosen the four back fixing screws and lift off the back. Unscrew the three chassis fixing bolts, working with a box spanner or a long bladed screw-driver, with the cabinet projecting over the edge of the bench. The chassis can then be removed.

B23 CHASSIS

Follow instructions under A30 dismantling, with the exception that the loud-speaker leads, instead of being unplugged, must be unsoldered from the output transformer. *Do this quickly with a very hot iron.*

ARRANGEMENT OF COMPONENTS

The plans and inverted views of the various chassis are shown on Sheets 2 to 5. Coils, condensers and resistances are drawn diagrammatically for clarity and for the same reason wiring has been omitted.

In addition to the usual reference numbers for components, two other methods of location have been adopted. Firstly, the diagrams have been divided into squares, and these have been lettered horizontally and numbered vertically. The numbers and letters in the square brackets in the lists below give the square in which each component is located.

Secondly, in place of the wiring, all junction points have been given a key number which is also indicated on the circuit diagram. Reference between the circuit and layout diagrams is thus simplified. These numbers are also quoted as test points in the fault-finding charts and in the tabulated lists of components and also in the trimming instructions. They are given in round brackets.

A30 AND A30RG

The diagrams on Sheet 2 are common for the A30, A30C and A30RG and differences in the components and wiring for the different models is indicated. The sequence of valves reading from left to right looking at the back of the chassis is as follows:

V1	Mazda valve	AC/TP (Met)
V2	,, ,,	AC/VP1 ,,
V3	,, ,,	AC/2/PEN.DD (Clear)
V4	,, ,,	UU3 (Clear)

CONTROLS. The controls on the set are four in number.

(1) Upper central knob — Tuning Control.
(2) Left-hand knob — Volume control and on/off switch.
(3) Lower central knob — Tone Control.
(4) Right-hand knob — Wave-change switch.

In the case of the A30RG there is also a push-pull switch on the motor board for changing to gramophone from radio.

It should be noted that on certain sets separate electrolytic condensers are fitted in place of the W.3010 bank. These are located in the squares indicated below.

C29. 8mfd. [2B]
C28. 8mfd. [5B]
C26. 8mfd. [15E]
C25. 25mfd. [9F]

Where a condenser bank is fitted to the chassis, single replacement condensers may be fitted in these places if a breakdown occurs in the bank. A condenser of 500 volts working must be used for C26, 28 or 29.

D30 AND D30RG MODELS

The general layout of the D30 corresponds to that of the A30 as will be seen from Sheet 3. The components and wiring which are not included in the Table model are given in a list below the diagram.

The sequence of valves reading from left to right, looking at the back of the set, is as follows:

V1	Mazda Valve	TP.2620 (Met)
V2	,, ,,	VP.1321 ,,
V3	,, ,,	PEN.DD.4020 (Clear)
V4	,, ,,	U4020 (Clear)

B27 MODEL

Sheet 4 shows the layout of the B27 receiver which is similar in most respects to the A30.

The sequence of the valves reading from left to right, looking at the back of the chassis, is:

V1	Mazda Valve	VP.210 (Met)
V2	,, ,,	HL21DD ,, (This valve is behind V1)
V3	,, ,,	VP.210 ,,
V4	,, ,,	L21DD ,,
V5	,, ,,	PEN.220 (Clear)

The same system of numbering and lettering has been adopted as in the other models and the controls are also the same.

B23 MODEL

The diagrams for the B23 receiver are shown on Sheet 5. The valve sequence reading from left to right, looking from the back of the receiver, is:

V1	Mazda Valve	VP.210 (Met)
V2	,, ,,	HL2 ,,
V3	,, ,,	PEN.220 (Clear)

VOLTAGE TABLES

The following table of voltages is given as a guide only; variation may occur without necessarily detracting from the efficiency of the receiver.

As all the sets except the B23 have A.V.C., voltages depend to some extent on the strength of the applied signal. For this reason, certain readings are given with and without signals in order to give an idea of the changes to be expected under working conditions. Variations in the strength of the signal applied, will, of course, vary the voltages from those given.

Under the title "gram" voltages are given with the instrument switched to the gramophone position. Except where otherwise stated, voltages are to chassis, and are obtained with "1000 ohms-per-volt meter," using the 250 volt range wherever possible.

The first bracket number is the junction number and the second bracket number and letter gives the position on the layout drawing

A30, A30C AND A30RG

Valve or Component	*Testing Point*	*Strong Signal Volts*	*No Signal Volts*	*Gram. Volts*
	Anode (13) [15G]	240	168	255
V1 Pen.	Screen Grid (16) [15G]	270	168	255
	Cathode (14) [15H]	0.8	4.2	34
V1 Triode	Anode (15) [14G]	82	82	90
V2	Anode (29) [24T]	280	250	270
	Screen Grid (24) [10G]	283	215	160
	Cathode (28) [10H]	0.5	3.0	2.5
V3	Diode Anode 1 (33) [5G]	—	—	—
	Diode Anode 2 (31) [5H] (A.V.C.)	21	—	—
	Pentode Anode (44) [6G]	265	265	265
	Screen Grid (30) [5G]	285	250	270
	Cathode (35) [6H]	19	16	16
Loud-speaker field	Tag. F. (45) [6E]	–105	–130	–140
H.T. Volts across C28	Tag. B. (30) [4E]	285	250	270
	All above are to chassis.			
H.T. Volts across C29	Tags B & F. (30 & 45) [4E & 6E]	400	390	410

D30, D30C AND D30RG

Valve or Component	*Testing Point*	*Strong Signal Volts*	*No Signal Volts*	*Gram. Volts*
V1 Pen.	Anode (13) [15G]	187	153	200
	Screen Grid (16) [15G]	198	153	200
V1 Triode	Cathode (14) [15H]	0.6	3.5	2.2
	Anode (15) [15G]	70	70	60
V2	Anode (29) [24T]	200	181	128
	Screen Grid (24) [10G]	203	183	128
	Cathode (28) [10H]	0.25	1.6	1.2
V3	Diode Anode 1 (33) [5G]	—	—	—
	Diode Anode 2 (31) [5G] (A.V.C.)	–15	—	—
	Pentode Anode (44) [6G]	200	192	198
	Screen Grid (23) [5G]	203	183	202
	Cathode (40) [6G]	22	21	22
Across C26	Tag B. (23) [7E]	203	183	202
Across C28.	Tag A. (46) [5E]	212	205	212
Across C29.	Tag D. (47) [5E]	235	232	238

The above voltages are measured to chassis on 240 volt mains.

APPROXIMATE CONSUMPTION FROM MAINS

Voltage	*D30C*	*D30RG*
250	70 watts	103 watts
200	50 watts	77 watts
Voltage	*A30C*	*A30RG*
50 cycles	59 watts	74 watts
25 cycles	61 watts	90 watts

B27 MODEL

Valve or Component	*Testing Point*	*Strong Signal*	*No Signal*
V1	Anode (13) [19Q]	110	100
	Screen Grid (16) [14G]	67	55
V2	Triode Anode (22) [15E]	56	56
	Diode Anode (21) [14F]	—	—
V3	Anode (32) [23P]	116	116
	Screen Grid (31) [10G]	70	52
V4	Triode Anode (41) [5H]	59	53
	Diode Anode 2 (A.V.C.) (52) [6H]	–10	—

V5	Anode (47) [2H]	113	113
	Screen (23) [3H]	116	116
H.T. negative plug (46)		–3	–3.3
Total anode current		9.75 mA	11 mA
Total filament current		0.86 A	0.86 A

All the above readings were taken using a full 120V H.T. battery with a 250V 1000 ohms-per-volt meter to chassis.

B23 MODEL

Voltages measured to chassis:

	V/C *at maximum*	V/C *at minimum*
V1 Anode (8) [6G]	70	92.5
Screen (9) [8G]	50	75
V2 Anode (19) [5G]	37.5	—
V3 Anode (31) [2G]	107.5	—
Screen (12) [3G]	100	105
Control (Grid) (26) [3G]	–3.1	
H.T. + (23 & 28) [6C]	110	
V/C centre tap (7) [6B]	–1	–8.2
H.T. – (24) [6B]	–9	

TRIMMING

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

A modulated oscillator is highly desirable for trimming, and if this is not available only the radio frequency circuits can be adjusted, and sets with faulty I.F. trimming must be returned to the factory.

A30 MODEL

APPARATUS REQUIRED

(1) A modulated R.F. service oscillator covering normal broadcasting and I.F. wave bands.

(2) (a) A rectifier type A.C. volt-meter with a range of 0-50 volts for use as an output meter. (If an A.C. volt-meter scaled from 0-5 volts only is available, a 50,000 ohm resistance may be connected in series with it in order to extend its range to the required value.) It is essential, however, that a rectifier type meter should be used, or
(b) a 0-5 D.C. volt-meter.

(3) A 1.0 mfd. condenser for use in series with the A.C. volt-meter.

(4) A screwdriver, the blade of which should be about one-eighth of an inch wide, and which is insulated to within one-eighth of an inch from the top.

The numbers and letters in brackets refer to the location of the components in the circuit and layout diagrams.

(A) METHOD WHEN USING A.C. VOLT-METER AS OUTPUT METER

(1) Connect the meter in series with the 1 mfd. condenser between V3 anode and chassis (44) [6G].

(2) Set manual volume control to maximum.

(3) Keep oscillator input as low as possible, consistent with obtaining a readable value on the output meter. (This will prevent the A.V.C. circuit coming into operation.)

(4) Trim for maximum reading.

I.F. TRIMMING

(1) Switch the receiver to long waves and tune to 2000 metres and stop V1 triode oscillating by shorting V1 triode grid to chassis (17) [14G].

(2) Connect R.F. (25) [10G] oscillator between V2 control grid and chassis using dummy aerial.

(3) Switch oscillator to I.F. range and internal modulation and tune it to 119 Kc/s.

(4) Adjust C17 [7H] and C18 [7G] in turn, for maximum meter deflection. Repeat process for final adjustment.
(5) Transfer the oscillator to V1 pentode grid (7) [12F] and chassis and reset oscillator attenuator to give convenient meter reading.
(6) Adjust C15 [12G] and C16 [12G] in turn for maximum reading. Repeat the process for final adjustment.
(7) Remove short circuit from V1 triode grid to earth.
(8) Retrim oscillator and R.F. circuits (see notes on R.F. trimming).

R.F. AND OSCILLATOR TRIMMING

(1) Switch the set to medium waves, connect aerial and earth and loudspeaker and adjust dial to the wavelength of a known broadcast signal, as near to 220 metres as possible.
(2) Adjust C6 [12E] to receive the station chosen at maximum volume—judged aurally.
(3) Without altering the setting of the receiver dial, apply the test oscillator in place of aerial and earth, switch to medium waves.
(4) Tune the service oscillator until the maximum reading is obtained in the output meter, ignoring the actual calibration.
(5) Trim C2 [12C] for maximum deflection.
(6) Trim C4 [14D] for maximum deflection.
(7) Retrim C2 and C4 as a final adjustment.
(8) Reconnect aerial and earth.
(9) Switch set to L.W. and adjust dial to wavelength of a known L.W. broadcast station (Droitwich at 1500 metres is suitable for the purpose).
(10) Adjust C7 [12E] to receive the station chosen at maximum volume (an aural test must be made for this adjustment).
(11) Tune the set to exactly 1000 metres.
(12) Switch the test oscillator to L.W. and apply in place of aerial and earth.
(13) Tune the oscillator until maximum reading is obtained in the output meter. (If the oscillator calibration is correct the setting will correspond with 1000 metres.)
(14) Trim C3 [12C] for maximum reading.
(15) Trim C5 [15C] for maximum reading.
(16) Re-trim C3 and C5 as a final adjustment.

(B) METHOD WHEN USING A D.C. VOLT-METER

(1) Connect the volt-meter between junction L10, R4 (18) [14-15E] and chassis. (A normal reading of a little more than 4V will be obtained.)

I.F. TRIMMING

(1) Switch the receiver to L.W. and tune to 2000 metres. Stop V1 triode oscillating by shorting V1 triode grid (17) [14G] to chassis.
(2) Connect oscillator between V2 control grid (25) [10G] and chassis, using dummy aerial.
(3) Switch oscillator to I.F. range and tune it to 119 Kc/s.
(4) Adjust input from oscillator until the volt-meter reading is slightly diminished.
(5) Adjust C17 [7H] for minimum reading and C18 [7G] for maximum reading. Repeat the process for final adjustment.
(6) Transfer the oscillator input to V1 pentode grid (7) [12F] and chassis. Reset attenuator so that the volt-meter will give nearly its full reading (4 volts).
(7) Adjust C15 [12G] and C16 [12G] to give minimum reading. Repeat process for final adjustment.
(8) Remove short circuit from V1 triode grid to earth.
(9) Retrim oscillator and R.F. circuits.

It may be a little confusing that while all the trimmers are adjusted for maximum reading when the A.C. volt-meter method of measurement is adopted, if the alternative method of using a D.C. volt-meter is used, three trimmers are adjusted for minimum and one for maximum reading. The second method is dependent on the A.V.C. voltage reducing the current taken by V1 and therefore reducing the voltage drop across R4. Trimming the three tuned circuits (L15, C15), (L16, C16), (L17, C17), increases the A.V.C. voltage and reduces the meter reading, but when the signal has reached (L17, C17) part of it is used to feed the A.V.C. line and the remainder is collected by the tuned circuit (L18, C18) to be passed to the diode for rectification.

When (L18, C18) is correctly tuned it will absorb a larger proportion of the signal than when it is incorrectly tuned and there will therefore be less available to feed the A.V.C. circuit—hence the increase in reading as the correct tuning point is reached.

R.F. AND OSCILLATOR TRIMMING

Follow instructions under R.F. trimming using A.C. meter, but trim for minimum instead of maximum reading.

D30 MODELS

Follow instructions under A30 trimming.

B27 MODELS

(a) Follow instructions under A30 trimming (a) or
(b) Follow instructions under A30 trimming (b) with the

exception that instead of using a D.C. volt-meter a D.C. milliammeter 0-3 or 0-5mA full scale reading, shunted by a 1mfd. condenser should be connected between L17 and H.T. line; *i.e.* disconnect the pink wire coming from the 2nd I.F. can (8E) from panel 2 and interpose the meter shunted by the condenser.

The normal current will be 1.3 milliamps and the signal should be adjusted to slightly reduce this reading.

As in A30 (b) trimming, adjust all trimmers for minimum reading with the exception of C18 which should be adjusted for maximum reading.

B23 MODELS

An R.F. oscillator is useful for aligning the circuits of the B23, but not absolutely essential, it being possible to utilize a reliable broadcasting station. Both methods are therefore described.

APPARATUS REQUIRED

(1) R.F. Service Test Oscillator.
(2) D.C. volt-meter reading from 0-100 or 0-250 volts and having a resistance of 1000 ohms per volt.
(3) A small insulated screwdriver.

(A) USING AN R.F. OSCILLATOR

(1) Adjust the test oscillator and receiver to exactly 220 metres, and then switch on both instruments.
(2) Set the receiver volume control to maximum, and place the "local distance switch" in the distant position.
(3) Connect the volt-meter between Tag F (on the condenser bank) (20) [9E-F] and chassis. A reading of about 45 volts should be obtained.
(4) Adjust C6 [12N] for maximum reading on the meter. If the increase in reading is small, increase the output from the oscillator. If the increase is large, and the tuning point flat, decrease the output from the oscillator.
(5) Adjust C4 [16M] for maximum meter reading.
(6) Turn the reaction control clockwise until the set oscillates. Then turn back the control slightly, till the set is stable.
(7) Re-adjust C6 [16N] for maximum meter reading, if necessary retarding reaction slightly to prevent oscillation.

(B) USING A BROADCAST SIGNAL

(1) Tune in a reliable station below 265 metres and look up its exact wavelength. Set the dial accurately to this figure.
(2) Set the volume control to maximum, and the local distant switch to "distant." If the volume is such as to cause over-loading, decrease the size of the aerial, or place a small condenser in series with the aerial lead.

(3) Connect the volt-meter between Tag F (20) [9E-F] (on the condenser bank) and chassis. A reading of about 45 volts should be obtained.
(4) Adjust C6 [16N] for maximum reading on the meter.
(5) Adjust C4 [16M] for maximum meter reading.
(6) Adjust the reaction control, and just below the oscillator point if necessary again reducing the aerial input to prevent over-loading.
(7) Re-adjust C6 for maximum meter reading turning down reaction if necessary to prevent oscillation.

ADJUSTING THE IMAGE FREQUENCY SUPPRESSOR. ON A30, D30 and B27

This operation differs from other balancing operations in two ways: in the first place, the greatest possible output is required from the test oscillator, and secondly, the adjustment is for minimum, and not maximum response.

The latter conditions make it necessary to use the ear as an indicator, as an aural test is more sensitive than one employing a meter. The actual adjustment is as follows:

(1) Adjust the service oscillator to 333 metres, and connect it by means of the dummy aerial between the aerial and earth sockets of the receiver, setting the oscillator output to maximum.
(2) Switch the receiver to medium waves, set the dial to about 453 metres and turn the volume control full on. Under these circumstances a weak "image" of the 333 metres signal should be heard. If it is not, slightly re-adjust the receiver dial between 440 and 460 metres, until the signal is found.
(3) With an insulated screwdriver, adjust the erinoid screw situated at the top of the band-pass secondary (grid coil) [18N] until the minimum signal is heard in the loudspeaker: this adjustment must be made with the can in position. When the operation is properly completed, any movement of the erinoid screw in either direction should cause the image interference to increase.

The image frequency suppressor circuit is adjusted in the factory to provide the maximum degree of suppression over a large portion of the medium wave band.

This is the best setting for most localities, but in cases where a particularly strong signal is received near the bottom end of the medium wave band, 2nd channel interference may still be apparent towards the middle of the band.

This being the case, carefully tune to the programme interfered with, and readjust the erinoid screw until the interference is at a minimum.

THE MOTOR BOARD

Sheet 6 shows the plan views of the motor boards as fitted to the A30 and D30 radio-gramophones. The turntable is omitted in order to disclose details of the auto stop mechanism, and the places where oil should be applied. The various parts are shown in the positions they occupy when a record has just been played and the pickup returned to its rest. Thus the switch lever is in the "off" position, and is in contact with the adjustable stop M. Here is a brief description of the action of the mechanism, making clear the function of each part.

The motor is switched on by moving the pickup to the right: this causes the pin H to engage with the switch lever, thus throwing the motor switch K to the "on" position. At the same time another pin O on the tracking link moves the tracking lever to the right, and this, acting through the friction device, moves the tracking arm back, withdrawing the switch lever from the motor spindle to the fullest extent of its travel.

When the pickup is moved to the left and the needle placed on the record, the tracking link is carried to the left also, and, due to the action of the radius arm, moves away from the pin L on the switch lever. During the playing of the record this action is continued until about two-thirds of the record has been played, when a third pin R on the tracking link engages with the tracking lever, and acting through the friction device as before, but in the opposite direction, causes the tracking arm to slide the switch lever slowly towards the motor spindle.

After a few more revolutions the switch lever shoe has arrived at a position where its right-hand corner comes in the path of the striker mounted on the turntable, although its left-hand corner is still clear: the striker therefore pushes the lever back slightly. By the time the striker has completed a further revolution, the lever has again moved up, and is again pushed back sufficiently to allow the striker to pass. This action also forces back the tracking arm: but as the tracking lever is held by the pin R, slipping takes place in the friction spring washer device. This process continues until the final groove is reached, where the inward movement of the needle is greatly accelerated. This time the switch lever moves so far inwards that the left side of the shoe engages with the striker, and the lever is pushed over, thus switching off the motor. Although the striker is immediately brought to rest, the turntable is able to continue for a further half revolution as slipping occurs between the two parts, so that no sudden jar occurs at the moment of stopping.

When the pickup is returned to its rest the tracking link moves to the right and pushes upwards on the pin L, thus withdrawing the switching lever from engagement with the striker. The mechanism is now re-set for playing the next record.

Speed Regulator. A speed regulator is fitted to all motors other than the standard A.C. model which is of the synchronous type.

THE MOTOR. Three types of motor are used on the A30RG and D30RG. These are the YLC, the YDD and the YDD Special. The first of these is the standard 50 cycle synchronous type, and is adaptable for 200 volt or 100 volt mains by means of a movable link which places the windings in series or parallel. Two paper condensers of 0.5mfd. are contained in a bank mounted in the motor casing: these are phasing condensers to make the motor self-starting.

The YDD motor is used on the D30RG, also on all the non-standard A.C. models except in cases where the mains are 100-120 volts 40-100 cycles. Three alternative panel assemblies are used with this motor. One has two resistances and an H.F. filter and is suitable for all high voltage supplies (200-250 volts); for 25-33 cycles both resistances and the filter are employed: for 40-60 cycles, one resistance and the filter: and for 80-100 cycles the filter only. The second panel carries a filter only, and is suitable for mains of 100-120 volts, 25-33 cycles. The third carries one resistance only and is used for the D30RG.

The YDD Special is mechanically identical with the standard YDD, but the windings are of lower resistance, so that the requisite current may flow with a low voltage mains supply (100-120) volts of high periodicity (40-100 cycles).

The motor is fitted with a filter only for supplies of 80-100 cycles but with an additional resistance when the frequency of the supply is between 40 and 60 cycles.

MAINTENANCE. The YLC motor is provided with an adjustable spring-loaded bearing at one end. If it becomes necessary to adjust this to cure chattering or because the motor fails to start, the clamping screw should be loosened and the bearing moved slightly inwards or outwards until the position which gives the best running conditions is obtained. Before any attempt is made to adjust a motor which fails to start, particularly in cold weather or when the motor has not been used for some time, the turntable should be revolved by hand for a short time, in order to free the lubricant which may have become thick.

The YLD type motor is provided with a detachable cover plate at the end remote from the driving spindle. If this is removed, it is possible to examine the commutator and brushes for arcing, or to clean the commutator with a piece of rag, while the motor is running.

The brushes can be removed for inspection by turning the bakelite holders through 90 degrees and withdrawing. They should be carefully examined as they are taken out, so that they may be returned in the same position; failure to observe this point will result in arcking taking place until the brushes are again bedded down. The brushes will, in any case, require renewing in the course of time, since, when they have worn down beyond a certain limit,

the pressure upon the commutator will become too low to maintain proper contact.

The regulator can easily be adjusted if a piece of paper is pinned to the turntable, so that the number of complete revolutions made in a minute can be counted. This should be done while a record is being played, to allow for the slight drag of the needle. The result should be 78. If it is either above or below this figure the regulator must be adjusted to correct this.

OILING. A small amount of oil should be applied at the points indicated from time to time (every six months or so), but on no account should the friction joint be oiled. If the latter is found to be out of adjustment, the spring washer should be removed, slightly bent so as to exert more or less pressure as required, and replaced. A little lubricant may with advantage be applied to points A, E and T, in order to keep these bearing surfaces quite free. Attention to this will often correct faulty action of the auto-stop mechanism without adjustment of the friction spring washer. A good quality car engine oil is suitable for all lubrication purposes.

N.B.—As each oiling hole on the motor is closed with a spring loaded ball, it is necessary to exert a slight downward pressure on the can while oiling.

AUTO STOP MECHANISM FAULTS

Failure to switch off at end of records. Presuming that an unsuitable size or type of record has not been used, this fault may be due:

(a) To the friction joint being out of adjustment.
(b) To lack of lubrication where the switch lever passes through the switch bracket.
(c) To the pin on the tracking arm having ridden out of the hole in the motor board.

To make sure on these points, remove the turntable, move the pickup arm to the right so as to switch on the motor, and move the arm slowly back again to the left. This should cause the switch lever to move downwards as soon as the pin R has engaged with the tracking lever. If this does not occur, the three points mentioned above must be checked and adjusted if necessary. The friction joint, which should be attended to last, since it is unlikely to lose its correct setting, may be adjusted as follows:

Remove the retaining clip from the friction joint by sliding it to one side—this will enable the other five component parts to be lifted off. Now clean the fibre washer and the metal parts with a piece of cloth. If the parts are re-assembled with all the washers reversed, the joint may function correctly without further attention. If not, the spring washer may be bent slightly so as to exert greater pressure against the tracking arm.

The correct order in which to replace the various parts, starting from the bottom, is as follows:

(1) Tracking lever.
(2) Fibre washer.
(3) Tracking arm.
(4) Spring washer.
(5) Plain metal washer.
(6) Retaining clip.

Motor stops before end of record. This can be caused by:

(a) The motor being incorrectly mounted. The turntable spindle should be central with the hole in the motor board.
(b) A damaged or badly worn switch lever shoe.
(c) The friction joint being too stiff.

This fault cannot be investigated with the mechanism in action because the striker is mounted on the turntable. Consequently, it will be necessary to proceed by trial and error with the three points mentioned above. The motor spindle should be moved, if necessary, to lie exactly in the centre of the hole in the motor board, while the spring washer in the friction joint may be bent slightly to exert less pressure.

The D30RG motor board is fitted, in addition, with a hum neutralising potentiometer, R28, fitted beneath the motor board but adjustable from above. In order to do this put S7 in the gramophone position and connect the receiver to a supply whose positive lead is earthed. Take off the turntable and remove the bakelite cover over the adjusting screw by removing the two hexagonal nuts (Sheet 6). Set the volume control to maximum, and with an insulated screwdriver, such as that used for trimming, adjust the screw to the position which gives minimum hum. It should be noted that this adjustment is carried out at the factory, and will not need to be changed. However, if the potentiometer should by any chance be accidentally moved, the above instructions should be followed in order to reset it.

FITTING PICKUP CONNECTIONS TO THE A30 AND D30 TABLE AND CONSOLE MODELS

A30

(A) USING A CRYSTAL PICKUP

Essentially the modifications are similar to those which applied to the A26 receiver and were described in the MURPHY NEWS of May 4th, 1935, but the wiring to the components concerned is slightly different.

The pickup is connected directly across the volume control, and at the same time the connection between the latter and the signal diode output is broken to prevent radio break-through. The actual procedure is as follows:

First drill a half-inch diameter hole in the bakelite panel carrying the mains lead, to correspond with the hole in the metal chassis behind it. The centre of this hole is 5/8th inch from the left-hand edge of the *panel*, and one inch from the bottom edge of the *chassis*.

Mount a P72 type jack in this hole, and wire it as follows:

Disconnect the blue wire from the right-hand tag of the volume control (36) and transfer it to the single tag on one side of the jack. Then run a new blue-tracer wire from the tag immediately opposite, to the vacant right-hand tag of the volume control.

Finally, run a white-tracer lead from the remaining tag on the jack to Tag 35 on Panel 2.

The pickup may now be connected to a standard jack-plug, and the action of plugging in will automatically disconnect the radio side of the receiver. If when using the gramophone radio signals are faintly heard, switch over to long waves and alter the setting of the wavelength dial to about 900 metres, when the interference should disappear.

This completes the modification to the chassis, but it will be necessary to extend the slot on the right-hand side of the cabinet back in order to allow the jack-plug to be inserted. This may be done by cutting with a fine hack-saw blade or a fret saw, extending the existing slot towards the left until it is four inches long.

(B) USING A MOVING IRON OR NEEDLE ARMATURE PICKUP

This method converts the A30 chassis into an A30RG chassis precisely as it is done in the factory. The pickup is connected in the grid circuit of the I.F. valve (V2), which is made to act as an L.F. amplifier by the inclusion of a resistance of 50,000 ohms in its screen circuit. The amplified signals are then applied through a coupling condenser (0.05mF) and the volume control to the grid of the output valve.

At the same time a resistance is introduced into the cathode circuit of V1 and into the oscillator circuit, to prevent the break-through of radio signals during the reproduction of records.

A three-pole switch is used, and the pickup is plugged into sockets fitted to the receiver, where it may be left permanently connected.

The complete list of materials required is as follows:

1 four-pole gramophone change-over switch.
1 A30RG pickup socket panel assembly.
1 A30RG V.3205 assembly, complete with resistance, condenser and four spacing washers.
1 0.05mfd. tubular condenser type 1618.
1 50,000 ohm $\frac{1}{4}$-watt resistance.
1 20,000 ohm $\frac{1}{4}$-watt resistance.

4 6BA $\frac{1}{4}$-inch round-headed screws with nuts.
2 4BA $\frac{1}{2}$-inch round-headed screws with nuts.

These can all be obtained from the Service Department at the inclusive cost of 10s. 0d. less the usual discount.

We will now deal with the practical side of the question. First remove the existing panel which carries the mains lead. To do this, drill out the four aluminium rivets and unthread the mains lead from the rubber grommet. Then transfer the rubber grommet to the corresponding hole in the new pickup panel, fix the latter in position with the four 6BA screws and nuts, and mount the four-pole switch. The panel carrying the resistance and condenser must next be fixed in position with the two 4BA screws and nuts, using the two spare holes in the back of the chassis. The panel must be spaced from the chassis by placing two bakelite washers over each fixing screw.

Next mount the 0.05mfd. tubular condenser and the 50,000 ohms resistor on the back of the large sub-panel (Panel 2). The correct positions are shown on Sheet 2, being referred to as C30 and R24.

Finally the 20,000 ohms resistance is mounted on Panel No. 1—(next to V1 valve holder), the exact position being shown on Sheet 2. The circuit is now ready for wiring, which should be carried out as follows:

1. Run a white tracer wire from the junction of R4 (Panel 1) and the new 20,000 ohms resistance to contact 12 on the gramophone switch.
2. Run a black tracer wire between the Tag 10 on No. 1 Panel and contact 10 on the gramophone switch.
3. Remove the green tracer wire between V2 S.G. and No. 3 Panel (23).
4. Run two yellow tracer wires from V2 S.G.—one to contact 24 on the gramophone switch, and the other to Tag 24 on Panel 2.
5. Run a blue tracer wire from Tag 36 on Panel 2 to contact 36 of gramophone switch.
6. Run a blue tracer wire from Tag 58 on Panel 2 to contact 58 of gramophone switch.
7. Run a green tracer wire from Tag 23 on Panel 2 to contact 23 of gramophone switch.
8. Remove from Tag 27 on Panel 2 the orange lead which comes from L16 in 1st I.F. can, and transfer to the near side of the additional 0.001mfd. condenser and 100,000 ohms resistance (26). Then take an additional orange tracer wire from this point to socket 26 on the pickup panel.
9. Run a violet tracer wire from the remaining side of the 0.001 mfd. condenser to Tag 27 on Panel 2, and a second violet

tracer wire from the same point to socket 27 on the pickup panel.

10. Connect socket 10 on the pickup panel to earth Tag on No. 3 Panel.
11. Join Tag 23 on Panel 2 to the middle tag on the right-hand side of Panel 3 (23).

In all these alterations, if "push-back" wire is available, this should be used, preferably keeping to the colour code mentioned in the preceding descriptions. Failing this, 20 S.W.G. tinned copper wire, covered with sleeving, will be found satisfactory.

D30

The modification of these models for gramophone reproduction involves considerations not present in the A.C. models, and to meet these it is strongly recommended that no alterations to the method set out are attempted, and that the pickup adopted by us with its appropriate matching transformer is used. We cannot accept responsibility for the results obtained by any variation of the standard method, nor can we undertake the design or supply of transformers to suit other types of pickups.

The method of conversion is similar to that adopted in the case of the A30 model, with the exception that a transformer is introduced into the pickup circuit. The complete list of materials required is as follows:

1 4-pole change over switch.
1 D30RG pickup socket panel assembly.
1 D30RG pickup transformer panel assembly (with spacing washers).
1 0.05mfd. tubular condenser. Type 1618.
1 20,000 ohms $\frac{1}{4}$-watt resistance.
1 10,000 ohms 1 watt resistance.
4 6BA $\frac{1}{4}$-inch round-headed screws and nuts.
2 4BA $\frac{1}{2}$-inch round-headed screws and nuts.
1 D.C. pickup with A.C. leads and plugs.

These can be obtained from the Service Department at the inclusive price of £3 less the usual discount.

The first step is to remove the existing bakelite panel which carries the mains lead, by drilling out the four aluminium rivets, and thread the mains lead through the hole in the new pickup panel. Fix this in position with the four 6BA screws and nuts, and mount the four-pole switch. The switch must be insulated from the chassis, and this is done by putting narrow washers on the switch before it is put into the hole in the chassis.

The panel carrying the transformer, and a 0.0005mfd. condenser must be next fixed in position with the two 4BA screws and nuts, using the two spare holes in the back of the chassis. The panel must be spaced from the chassis by placing two bakelite washers over each fixing screw.

Next mount the 0.05 mfd. tubular condenser and the 10,000 ohms resistance on the back of panel 2. Wire the condenser between Tags 42 and 24, the wire ends being taken through the holes in the panel to prevent any possibility of short circuits. Connect the resistance between Tag 24 and 23 and it will be necessary to cover the wire ends with sleeving, so that they cannot make contact with other components or wiring.

Finally mount the 20,000 ohms resistance on panel No. 1. The wire link between Tag 12 and the tag connecting to chassis on panel 1 must be removed and the 20,000 ohms resistance mounted in its place.

The wiring can now be carried out.

1. Run a white tracer wire from the junction 24 (panel 1) and the new 20,000 ohms resistance to contact 12 on the switch.
2. Run a black tracer wire between chassis Tag 10 on Panel No. 1 and contact 20 on the switch.
3. Remove the green tracer wire between V2 S.G. and Panel No. 3 (23). In doing so leave in place the wire between V2 S.G. and the 2nd I.F. coil.
4. Run two yellow tracer wires from V2 S.G., one to contact 24 on the gramophone switch, and the other to Tag 24 on the panel 2.
5. Run a blue tracer wire from Tag 36 on Panel 2 to contact 36 of the switch.
6. Run a blue tracer wire from Tag 42 on Panel 2 to contact 42 of the switch.
7. Run a green tracer wire from Tag 23 on Panel 2 to contact 23 of the switch.
8. Remove from Tag 27 on Panel 2 the orange lead which comes from L16 (1st I.F. secondary) and transfer to one tag of the 0.0005 mfd. condenser on transformer panel (26).
9. Run a violet tracer wire from the other tag of the 0.0005 mfd. condenser to Tag 27 on Panel 2.
10. Connect socket "C" (10) on the pickup panel to the earth socket (62).
11. Connect "P" (63) and "U" (64) sockets on pickup panel to the two tags on the side of the pickup transformer panel (63 and 64).
12. Join Tag 23 on Panel 2 to the middle tag on the right-hand side of Panel 3 (23).

FAULT FINDING

Rather than give a cumbersome table covering every conceivable fault on this range of receivers, we have decided to give a general outline of the methods to adopt when diagnosing faults in the range of receivers, together with a table of suggestions which will cover most of the troubles which are likely to occur. A preliminary check of all the voltages which are easily accessible is advisable as this will often give a quick indication of the particular circuit in which to look for trouble.

For all faults which are not obvious from this test, apart from crackles and interference which will be dealt with separately, the set should be checked stage by stage commencing with the output stage and working towards the aerial until the trouble is localised to one particular circuit. The components in this circuit can then be tested individually, particularly those which are likely to cause the symptoms complained of. The table on Sheet 1 will be of assistance in this direction. The actual method of carrying out the tests is as follows:

1. Apply the output from a gramophone pickup or any A.F. source between the grid of the output valve and chassis. A 1 mfd. condenser in series with the pickup will prevent it from carrying D.C. and thereby upsetting the D.C. voltages applied to the valve.
   If the symptoms of a fault are evident, the components subsequent to the grid of the output valve (including the valve itself) should be tested. Reference to the fault-finding chart will give suggestions of the probable cause of the breakdown. (If output stage is O.K. proceed to 2, or to 5 in case of B23.)
2. Connect Service Oscillator tuned to 119 Kc/s, between grid of I.F. valve and chassis. If a fault is indicated, check components subsequent to grid of I.F. valve and preceding grid of output valve (including the I.F. valve and diode circuits of output valve). Refer to the fault-finding table.
   If output and I.F. stages are O.K., proceed to
3. Connect Service Oscillator tuned to 119 Kc/s between the control grid of the oscillator valve and chassis.
   If the fault becomes evident check all components and voltages between this point and the grid of the next valve Refer to the table for faults in this section.
   If the set is O.K. from this point onwards
4. Localise the various R.F. circuits by feeding the modulated oscillator tuned to 1200 metres into the set at the control grid of V1 and then at the high potential end of the band-pass primary (point 4 in diagrams) and finally between the

aerial and earth terminals. The set should, of course, be tuned to 1200 metres for this test.
When the fault appears, suspect the components between the point at which the set is being fed and the point previously chosen for introducing the signal. Reference can be made to the fault-finding chart for suggestions of probable causes of failure.

5. In the B23 model feed a signal from the service oscillator into the various stages commencing with the detector grid and working back to the aerial. Suspect components between the test point at which the fault appears and the point previously chosen for feeding the set.

SUPPLY COMPONENTS. Faults in this side of a receiver usually give very definite indications of their cause and fault locating is therefore comparatively elementary. For this reason we are confining our remarks to points which are peculiar to the particular receivers in this range.

A30

The heater of the output valve and the scale lamp are fed from a 4-volt heater winding one side of which is earthed, while the remaining valves are fed from another heater winding which is connected to the cathode of V3. Otherwise the supply arrangements are quite standard and the usual tests can be applied for locating trouble.

D30

The D30 mains equipment is quite orthodox in arrangement and no trouble should be experienced in locating trouble in this part of the circuit. The following points are enumerated for the benefit of those who are not familiar with D.C. design.

1. The scale lamp and valve heaters are wired in series so that the breakdown of a valve heater or scale lamp will make the receiver completely inoperative.
2. If a valve heater short circuits to another electrode or to the chassis, the other valves may be damaged if the set is not switched off immediately.
3. Damage to the other valves will result if a replacement valve is not of the same current and voltage rating as the one removed.
4. An actual earth must *not* be connected directly to the chassis for test purposes.
5. The motor board in the D30RG is connected to actual earth and must not be connected to the chassis of the receiver.
6. The polarity of the mains must be correct for the receiver to operate on D.C. mains.

B27 AND B23

The battery arrangements of these two receivers is quite normal and should present no difficulty provided the usual attention is given to the H.T. and L.T. batteries.

INTERFERENCE

In all cases of interference with reception it is necessary in the first place to ascertain whether the trouble is due to outside causes or to a defect in the instrument.

If, when the aerial and earth are removed and the volume control is turned to maximum, the interference is considerably reduced, it can be taken as a reasonable indication that the receiver is not at fault. An outstanding exception is the case in which there is a high resistance or badly soldered joint in the tuned circuits; a condition which usually causes crackle only when strong signals are being received. Substituting another receiver under identical conditions is probably the quickest way of verifying the presence of a suspected fault of this type. Crackles will usually be due to dry joints, bad plug and socket connections or intermittent breakdowns in components.

The test to apply is to localise the trouble to one particular circuit by working from one end of the set to the other in a similar manner to the method adopted for locating ordinary faults. In this case, however, instead of feeding signals into the various circuits the signals are eliminated from each circuit in turn by connecting a 1 mfd. condenser between the control grids of the respective valves, the other side of the condenser being connected to chassis. If it is found that the interference disappears when the condenser is applied to one particular grid and it is still present when the next grid is by-passed, the components and wiring between the two points should be minutely examined for dry joints or intermittent breakdowns. If the fault proves difficult, use should be made of such expedients as: physically distorting component assemblies; applying pressure to the outer cases of condenser blocks or transformer windings; lightly tapping valves with a piece of india rubber. A piece of india rubber is also useful for applying pressure to the contacts of switches as a check upon their efficiency. Intermittent faults in quick break toggle switches can often be provoked by moving the control slowly when switching on and off.

SHEET 1

FAULT FINDING CHART

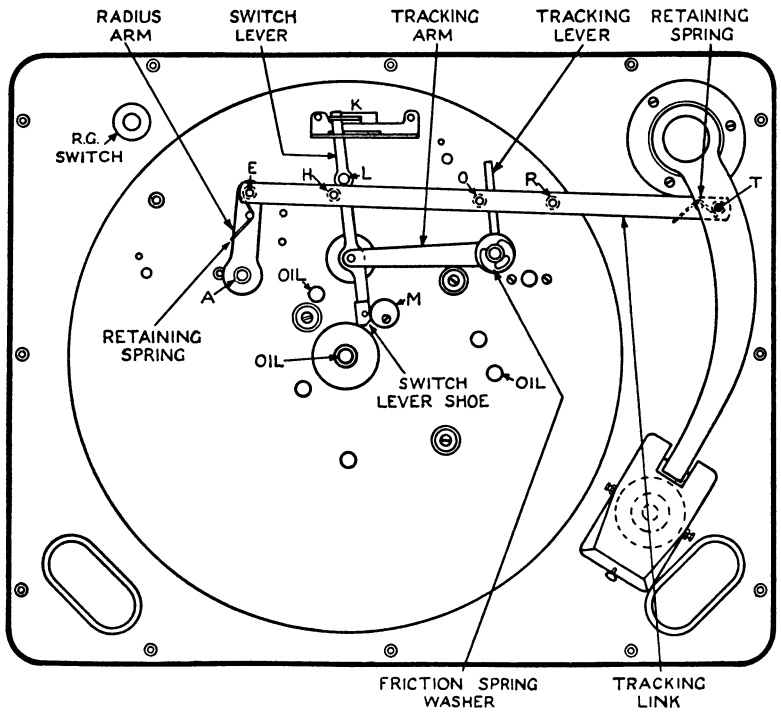
FAULT FINDING TABLE

SUGGESTED CAUSES FOR FAULTS WHEN APPLYING SIGNALS TO THE VARIOUS STAGES

	Output Stage	I.F. & Det. Stage	Frequency Changer Stage	R.F. Stage
NO SIGNALS	Speech coil o/c or s/c. Field Coil o/c Output Trans. prim. or sec. o/c. Main smoothing cond. s/c.	Screened lead to output grid s/c to case. Filter coils o/c.		
WEAK SIGNALS	Field Coil s/c. Output Trans. shorted turns.	L.F. coupling cond. o/c. 2nd I.F. trimmers out of adjust.	I.F. trimmers out of adjust.	R.F. & I.F. trimmers out of adjustment.
DISTORTION	Bias decoupling cond. s/c or o/c. Pickup out of adjustment. Bad connection in grid cap of output valve.	Volume control high resistance. L.F. coupling cond. o/c.		
INSTABILITY	Bias decoupling cond. low capacity.	Cathode decoupling cond. o/c. Main smoothing cond. o/c. Valve metallising disconnected.	Valve metallising disconnected.	
CALIBRATION				R.F. & I.F. trimmers out of adjustment. Condenser gang faulty. Series condensers in oscillator tuning circuit low capacity.
CRACKLES	Faulty pilot lamp.	Faulty v/c. valve heater intermittent. Filter coils intermittent. Faulty pilot lamp.	Valve heater intermittent Faulty pilot	Var. Con. faulty (dirty bearings or dust between vanes). Faulty pilot lamp.
HUM	Bad connection in grid cap of output valve. Main smoothing condensers open circuit. Mains trans. shorted turns.	Volume control o/c.		

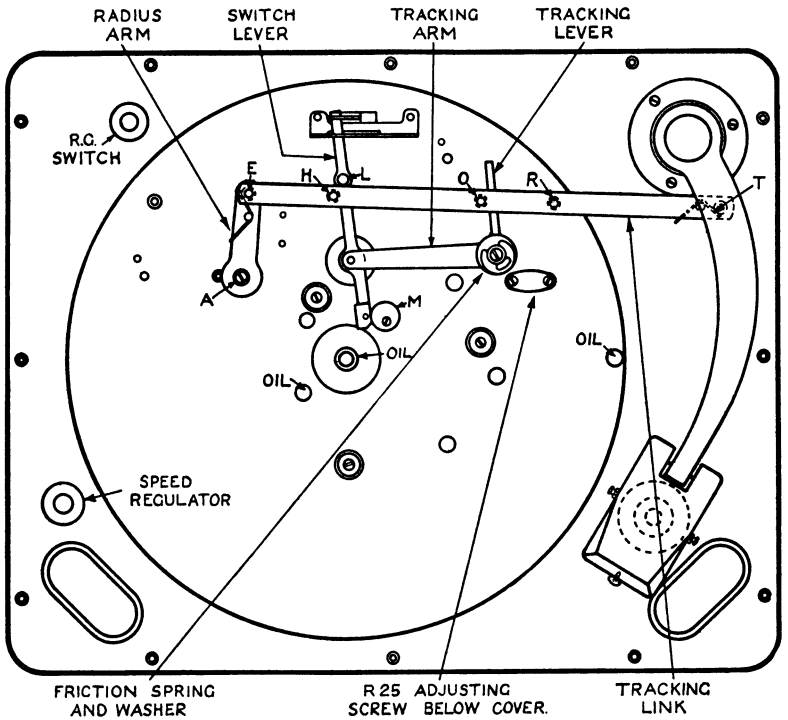
GRAMOPHONE MOTOR BOARDS

A30RG MOTOR BOARD



BLOCK LETTERS REFER TO KEY POSITIONS MENTIONED IN THE TEXT

D30RG MOTOR BOARD



BLOCK LETTERS REFER TO KEY POSITIONS MENTIONED IN THE TEXT