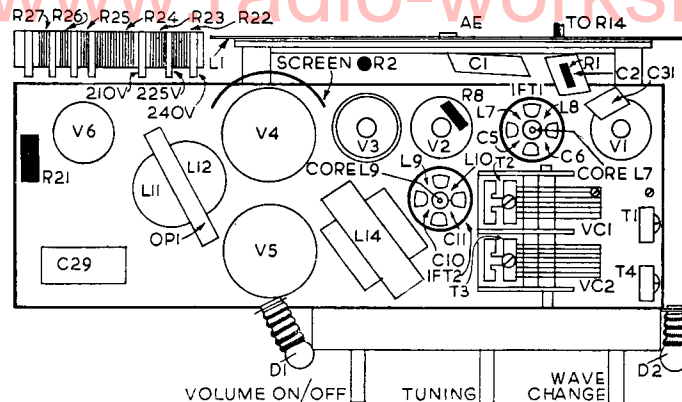


HMV MODEL 1604

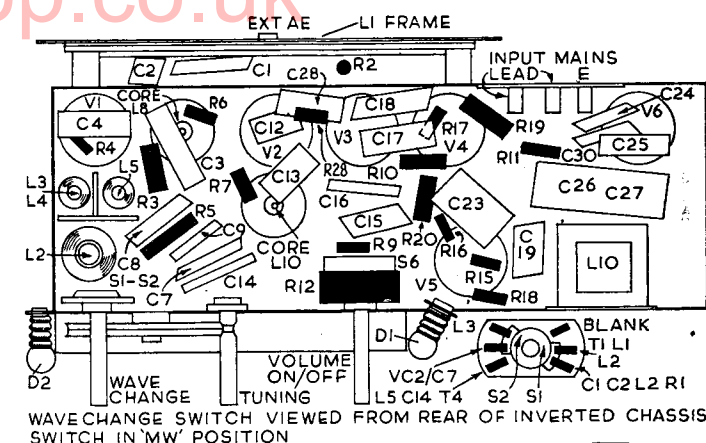


Table model radiogram for 195-255V 50 c/s AC mains. Six-valve two-waveband radio with push-pull output stage. Automatic record changer fitted with lightweight pickup operating with up to ten 10 or 12 in. records at one loading. Walnut veneered table cabinet.



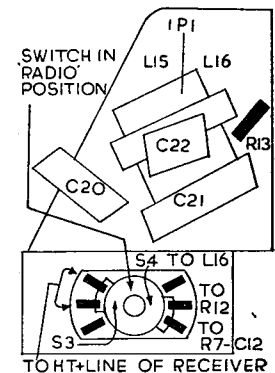
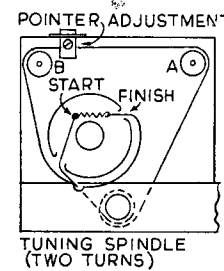
RESISTORS

| R | Ohms | Watts | R | Ohms | Watts | R | Ohms | Watts |
|-------|-------|-------|-------|-------|--------------------------|-------|------|-------|
| 1 .. | 22 k | 1 W | 11 .. | 10 k | 1/2 W | 20 .. | 160 | 1/2 W |
| 2 .. | 470 k | 1/2 W | 12 .. | 500 k | Pot. r. with SPST Switch | 21 .. | 47 | 1/2 W |
| 3 .. | 10 k | 1/2 W | 13 .. | 150 k | 1/2 W | 22 .. | 60 | 1/2 W |
| 4 .. | 100 k | 1/2 W | 14 .. | 500 k | Potentiometer | 23 .. | 60 | 1/2 W |
| 5 .. | 10 k | 1/2 W | 15 .. | 100 | 1/2 W | 24 .. | 160 | 1/2 W |
| 6 .. | 1.5 m | 1/2 W | 16 .. | 100 | 1/2 W | 25 .. | 35 | 1/2 W |
| 7 .. | 47 k | 1/2 W | 17 .. | 10 k | 1/2 W | 26 .. | 35 | 1/2 W |
| 8 .. | 4.7 k | 1/2 W | 18 .. | 10 k | 1/2 W | 27 .. | 65 | 1/2 W |
| 9 .. | 10 m | 1/2 W | 19 .. | 160 | 1/2 W | 28 .. | 100 | 1/2 W |
| 10 .. | 100 k | 1/2 W | | | | | | |



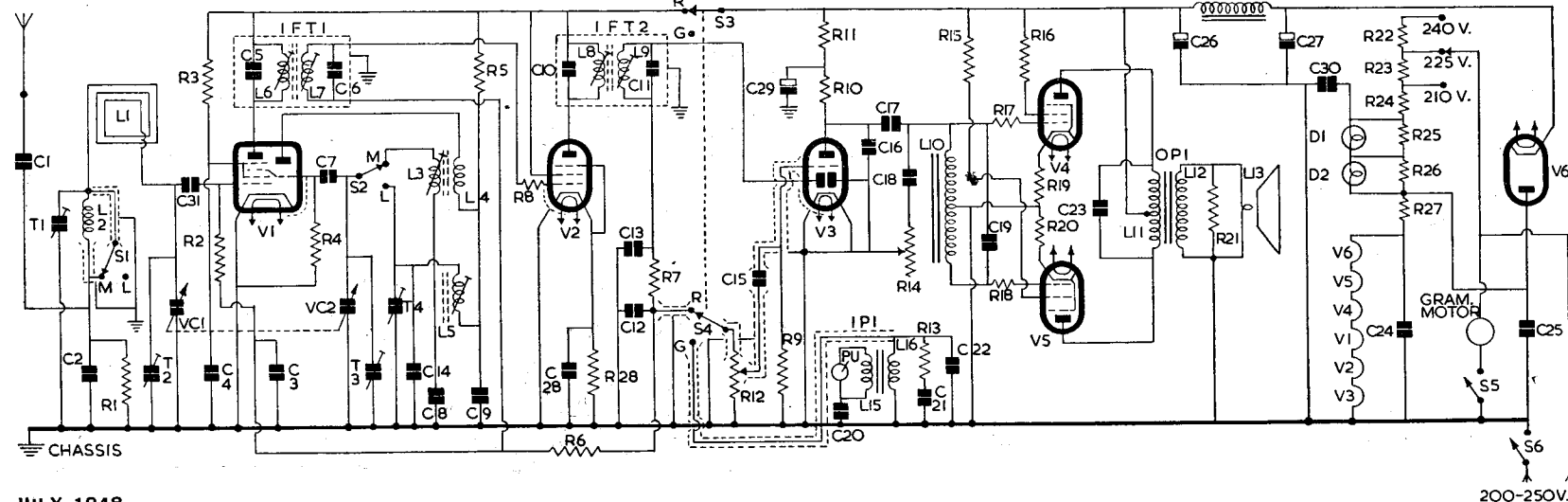
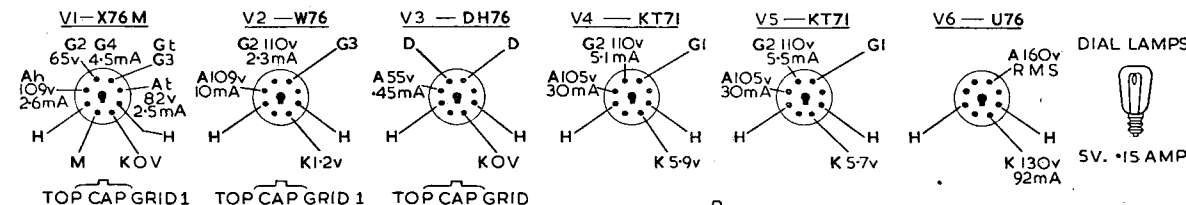
INDUCTORS

| L | Ohms |
|-------|-------|
| 1 .. | 1.5 |
| 2 .. | 11 |
| 3 .. | 4.4 |
| 4 .. | 3.5 |
| 5 .. | 7 |
| 6 .. | 6.5 |
| 7 .. | 6.5 |
| 8 .. | 6.5 |
| 9 .. | 6.5 |
| 10 .. | 800 |
| 11 .. | 400 |
| 12 .. | 1 |
| 13 .. | 2.7 |
| 14 .. | 175 |
| 15 .. | 15 |
| 16 .. | 2.2 k |
| PU .. | 1.15 |



CAPACITORS

| C | Capacity | Type |
|-------|-----------------|-------------|
| 1 .. | 3500 pf | silver mica |
| 2 .. | 3500 pf | " |
| 3 .. | .047 tubular | 350 v |
| 4 .. | .1 | 350 v |
| 5 .. | 80pf | silver mica |
| 6 .. | 80pf | " |
| 7 .. | 75pf | " |
| 8 .. | 350pf | " |
| 9 .. | 200pf | " |
| 10 .. | 80pf | silver mica |
| 11 .. | 80pf | " |
| 12 .. | 100pf | " |
| 13 .. | 100pf | " |
| 14 .. | 75pf | silver mica |
| 15 .. | 2300pf | " |
| 16 .. | 230pf | " |
| 17 .. | .05 tubular | 350 v |
| 18 .. | 500pf | silver mica |
| 19 .. | 500 | " |
| 20 .. | .005 | " |
| 21 .. | .005 | " |
| 22 .. | 500pf | " |
| 23 .. | .0023 | " |
| 24 .. | .0023 | " |
| 25 .. | .05 tubular | 500 v |
| 26 .. | 32 electrolytic | 350 v |
| 27 .. | 32 | 350 v |
| 28 .. | .047 tubular | 350 v |
| 29 .. | 8 electrolytic | 200 v |
| 30 .. | .0023 | silver mica |
| 31 .. | 100pf | " |



HMV MODEL 1604—Continued

RECEIVER CIRCUIT consists of triode-hexode frequency changer V1 coupled by permeability-tuned IF transformer to a variable-mu pentode IF amplifier V2. A second permeability-tuned transformer leads to double-diode triode V3, used for signal rectification, AVC and AF amplification. Centre-tapped choke energises grids of push-pull output valves V4, V5, which feed a 6½ in. PM speaker. The pickup is coupled through a matching and step-up transformer, and via the radiogram switch, to the volume control in the receiver. HT is provided by a half-wave indirectly heated rectifier V5.

Aerial circuit. An internal frame aerial L1 is tuned by VC1 and trimmed by T2 on MW. On LW, loading coil L2 is switched in series with earthy end of L1 by S1. L1 and L2 are then tuned by VC1 and trimmed by T1. Aerial tuned circuit is coupled to g1 of V1 through C31. Provision is made for connection of an external aerial through C1 to bottom end of L2 or L1. C2 and R1 are bottom end coupling.

AVC is applied to g1 of V1 through R2 and decoupled by C3. Screen (g2, g4) voltage is obtained from R3 decoupled by C4. L6, C5, the primary of IFT1, is in the hexode anode circuit.

Oscillator is connected in a tuned grid circuit. L3 the MW coil and L5 the LW tuned coil are switched by S2 to tuning capacitor VC2 and, through C7, to oscillator grid (gt, g3). T3 is MW trimmer and C8 MW paddler. T4, C14 are LW trimming and C9 is padding. R4, C7 provide leak-condenser bias.

Anode reaction is developed inductively from L4 on MW band; on LW, however, it is obtained across the padding capacitor C9. R5 is oscillator anode load resistor.

IF amplifier operates at 465 kc/s. L7, C6, the secondary of IFT1, feeds the signal to g1 of V2, the variable-mu amplifier. AVC is fed to g1 from R6, through secondary winding L6. C3 is AVC decoupling and R8 a grid stopper. Screen (g2) voltage is obtained direct from HT line. Cathode bias is by R28 and C28. L8, C10, form the primary of IFT2.

Signal rectifier. L9, C11, secondary of IFT2, feeds signal to one diode of V3. R12, the volume control, is the diode load resistor and R7, C12, C13 form an IF filter. R12 is connected to R7 when S4 is in the Radio position. In Gram. position of S4, the pickup transformer secondary L16 is connected across R12.

Automatic volume control is obtained from the signal diode and is fed through R6 to g1 of V1 and V2. C3 is AVC line decoupling capacitor.

Pickup is of the low-impedance type and a step-up transformer IP1, L15, L16, couples it to the receiver. A connecting network R13, C21, C22 is across L16. One side of the pickup is connected to the metal chassis of the motorboard which is directly earthed. The receiver, being an AC-DC type, is earthed to the motorboard chassis through isolating capacitor C20.

Output from secondary of IP1 is fed to S4, which in the Gram. position, switches it to R12, the volume control. S3, ganged to S4, breaks the HT supply to anodes and screens of V1 and V2 when in the Gram. position.

AF amplifier. C15 feeds either radio or pickup signals developed across R12 to grid of triode section of V3. Bias for grid is developed on C15 with R9 as grid leak. R10 is anode load

resistor and C16 anode RF bypass capacitor. R11, C29 provide decoupling of HT supply to anode.

Output stage. C17 feeds signal to auto-transformer L10, the centre tap of which is earthed. The opposite phase signals appearing across each half are applied to grids (g1) of push-pull output pentode valves V4 and V5 through grid stopper resistors R17 and R18. C19 is shunted across L10, and C18, R14 provide adjustable top cut tone control. Each output valve has its own cathode bias resistor—R19 for V4 and R20 for V5. No decoupling is provided, hence a degree of negative feedback is applied.

Screens (g2) obtain voltage from HT line through stoppers R15, R16. HT for anodes is fed to centre tap of primary L11 of output matching transformer OP1. C23 gives fixed tone correction.

L12, secondary of OP1, feeds a 6½ in. PM loudspeaker L13. R21 across L12 prevents damage to output valves and OP1 in the event of the LS becoming disconnected.

High tension is provided by a half-wave indirectly heated rectifier V6. Its anode voltage is obtained through section of mains dropper resistor R22-R27. L14, C26, C27 provide choke-capacity smoothing and C24, C25, C30 are filter capacitors.

Heaters of V1 to V6 are series connected and obtain their current through mains dropper resistor R22-R27. The two dial lamps are shunted across R25 and R26 of this resistor. S6, which is connected in the mains lead to chassis, is the on/off switch for both receiver and turntable motor. S5, which is mounted on the turntable chassis and is coupled to the auto-changer mechanism, is the motor on/off switch.

Dismantling. For replacement of valves dial lights and minor adjustments and alignment, the receiver chassis need not be removed from the cabinet. The auto-changer plate and panel on bottom of cabinet must be removed as follows:—

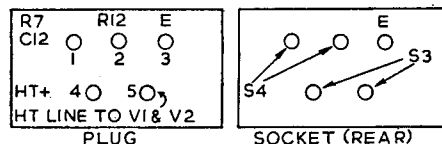
Set record retaining arm down and secure the pickup arm to its rest. Remove rear panel of cabinet and unfasten aerial and earth bracket and cleat from baseboard. Remove aerial plug from socket in centre of receiver frame aerial.

Remove the two motor leads (blue) from the "Motor" tags on panel on receiver chassis. Remove four large screws at corners of auto-changer plate. Lift front of plate by means of the pickup rest and record support pedestal and remove five pin plug from sub-panel just under the radiogram switch. The auto-changer plate is now free to be withdrawn from cabinet.

No provision is made on the plate for resting it on the bench. Place auto-changer plate in vertical position on bench (with record support pedestal edge of panel resting on bench surface) and insert suitable wood block under lifting handle and also under end frame of motor. The record retaining arm or pedestal should on no account be allowed to take any of the weight of the plate.

Connect pin 1 to pin 2 and pin 4 to pin 5 on plug on receiver lead. Receiver can now be operated in the normal way for testing.

Removal of chassis. Remove the three push-on knobs, the mains dropper resistor and three cable



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HMV MODEL 1604—Continued

its normal position by a stud on the underside of 5F.

So that the "Isle of Man" washer does not operate while the pickup is being fed in (Section 3), a stud on 7AG comes into contact with the clutch gear plate 5G.

7. **Returning pickup to rest.** The pickup lifting rod 4B engaging on the top of the second vertical cam on 5C raises the pickup. 8H, engaging on the horizontal cam on 5C, forces the pickup to a position over its rest. The pickup is lowered on to its rest by 4B following the cam. While the pickup is being returned to its rest, the pusher tube 3A is rotated by 5B, spring loaded by 5Q, bearing on the cam on the underside of 5C, and locates in the next record by the action of spring 5M.

This complete cycle (sections 2-7) for playing one record is repeated until last record is dropped.

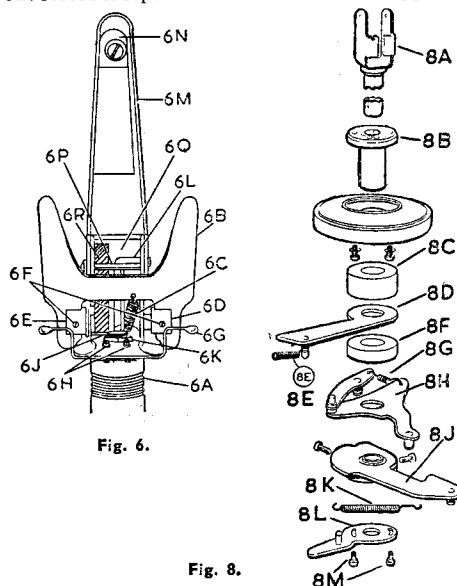


Fig. 6.

Fig. 8.

8. **Dropping and playing last record.** When the last record has dropped on to the turntable the record retaining arm 6M falls to the furthest length of its travel and in doing so raises the last record plunger 6L. As soon as 6L is withdrawn, 7AP and 7D are released, both adopting their original positions by the action of spring 7J. This movement of 7D causes the latch on 7AD to be withdrawn by spring 7K until it is held by the latch on the switch lever assembly 7AB, which is itself retained by the second spring 7AE.

The pickup is fed on to and plays the record in the method described in Sections 3 and 4.

9. **Automatic switching off.** At the end of the record the "Isle of Man" washer operates moving 7W and 7X as described above, 7AL engaging once again with 7AM. The pickup is returned to its rest in the normal way. At the same time the projection on the upper face of the horizontal cam on 5C strikes 7AB, releasing the latch holding 7E, thus allowing spring 7K to return 7E to its normal position. In doing so a stud on 7E moves 7AC,

which in turn rotates 7AA, allowing 7Z to be drawn in by spring 7AN, thus permitting 7X to disengage 7AL from 7AM. At the same time the switch plate assembly 7L disconnects the supply to the motor.

10. **To reject a record.** A record can only be rejected after it has started to be played. The "Auto" button is pressed and the movement of 7F is transmitted via the auto reject lever plate 7R and the reject lever and clutch 7T to 7W, which is thereby pushed away from the clutch on 5F. Lever 7X is withdrawn, allowing 7AL to engage with 7AM. The spring loaded plate closes, by spring 5H, so that 7W rests on the periphery of 5F. The sequence of operations for returning the pickup to its rest, dropping the next record and feeding the pickup in are described in Sections 7, 2, 3 and 4.

11. **Pressing the "off" button.** On pressing the "off" button, which must be done only when the pickup is on the record, the off lever 7N is drawn across the mechanism plate by means of the rocker 7B. This movement of 7N is transmitted via the off reject lever plate 7S and the reject lever and clutch connecting link 7T to 7W. 7X is withdrawn and 7AL engages with 7AM. 7W rests on the periphery of 5F. A stud on 7S withdraws 7AD, thus allowing 7E to be retained by the latch on 7AB. The pickup is returned to its rest and at the same time the latch on 7AB is released by the action of the projection on top of the horizontal cam on 5C. The movement of 7E returns all levers to their normal positions and switches off the supply to the motor.

12. **Safety clutch for pickup.** If the pickup is inadvertently knocked inwards towards the centre spindle, the safety clutch comes into operation to prevent damage to the pickup or its mechanism. The smaller lever of 8H, which is normally retained by spring 8G in the cut-away in 8J, is disengaged. To reset, the pickup is swung back until this stud re-engages in 8J.

MAINTENANCE

In the event of faulty behaviour, the instrument should be watched carefully to ascertain at what point trouble occurs. Do not use force when making adjustments and do not attempt to retard or hurry the pickup arm during the changing cycle—serious damage may result.

Two test records, TB11 and TC14, are available to facilitate the adjustment of this mechanism.

To adjust pickup landing position. With either TB11 or TC14 test record on the turntable, the needle must descend on the appropriate modulated groove for 10 or 12 in. records. Should the pickup lower at the wrong point in either case, disconnect the supply and adjust as follows:

With a 10 in. test record on the turntable, lower the record retaining arm and lower the 10 in. record support plate. Press "Auto" button, rotate turntable by hand until the pickup arm reaches its maximum inward travel. Continue to rotate the turntable until the pickup is within about $\frac{1}{4}$ in. of the surface of the record. Slacken locking nut 4C of the 10 in. PU control adjuster B on top of the mechanism plate and rotate slightly the eccentric pin 4D until the needle adopts the desired position. Secure the adjustment by retightening the locking nut.

With a 12 in. record, repeat the above operations, but with the 10 in. record support plate raised, and adjust by means of A.

To adjust pusher tube so that mechanism drops records correctly. Slacken screw in clamp block 5L. With cranked spindle in position, rotate pusher tube 3A, until its shaped end sits directly beneath the upper portion of the cranked spindle. Raise

PIFCO

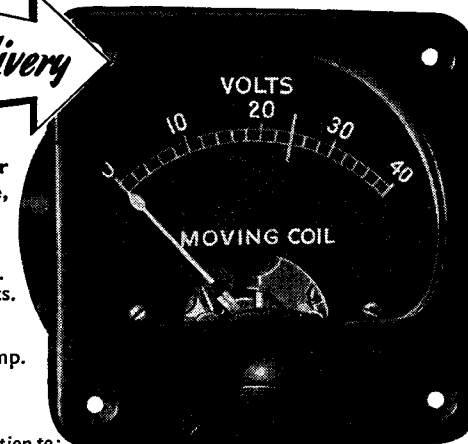
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HMV MODEL 1604—Continued

3A until the upper edge of the tube is flush with the "shelf" in the cranked spindle. A gap of approximately $\frac{3}{32}$ in. between the lower edge of tube 3A and top of the sleeve 3F should result. Re-tighten screw in 5L.

To adjust record support plates. For 10 in.: Remove cranked spindle and lower 10 in. record support plate 6B. Hold a 10 in. record horizontally so that the pusher tube 3A just passes through the centre hole. Slacken fixing screws 6F and adjust until a clearance of $\frac{1}{8}$ in. is obtained between 6B and the edge of the record. Re-tighten screws 6F.

For 12 in.: Remove the cranked spindle and raise fully the 10 in. record support plate 6B. Using a 12 in. record repeat as for 10 in. record, adjusting the 12 in. record support plate 6G by slackening screws 6H.

To adjust "Isle of Man" washer. Over a long period the setting of the friction washer may need adjusting. This can be obtained by tightening the adjustment nut (approximately a quarter turn at a time) and securing by means of the locking nut.

To adjust plate on clutch operating lever 7W. With the rubber wheel of the roller assembly 7AH resting against the projection of the hooked plate 5K, adjust the plate on clutch operating lever 7W until there is a $\frac{1}{8}$ in. gap between the edge of the plate and the stud on 7AH.

[Test records TB11 and TC14 and special tools Q/D 514/4, for removing the mechanism and adjusting the PU control adjuster are available from the manufacturers.]

MOTOR

The motor is an hysteresis synchronous type designed to operate on 200-250V 50 c/s AC mains. The speed of rotation of the turntable is maintained at 78 r/m.

Principle. The hysteresis motor is an induction type operating by virtue of the rotating magnetic field produced by the four-pole stator in conjunction with condensers. The rotor consists of a plain ring of magnet steel which, during starting, is magnetised by the eddy currents produced by the rotating field in such a way that torque is developed between the stator and the rotor field. As the motor reaches synchronous speed the rotor becomes polarized in a simple two-pole manner and consequently follows the rotating field set up by the stator.

Removal of motor. Remove the turntable (3 screws). Detach mains lead (blue) from the tag panel, and earth tag and cleat from underside of motor. Slacken off the grub screw on motor pulley 3C. Take out the three screws on top of the mechanism plate, at the same time supporting the bottom of the motor to prevent it from dropping. Withdraw the motor.

Removal of stator. Remove large bronze rotor bearing, and withdraw rotor carefully. Unsolder leads from condenser block. Remove stator assembly by unscrewing the four securing screws.

When re-assembling, care must be exercised to ensure that the end of the rotor spindle is located in the spring loaded bearing (at the worm end) before pushing the large bronze bearing home. Before finally tightening the stator securing screws assemble the rotor in position and ensure that an equal gap is obtained all round the magnet steel ring. A diagram of the coil connections is given in Fig. 2.

Removal of main spindle. Remove three screws securing the bottom plate of the motor. Spindle can now be withdrawn.

Adjustments. End play is catered for by the spring loaded bearing. Ball thrust bearings should be present at both ends of the rotor and at the lower end of the turntable spindle.

Motor should be oiled periodically with a fine machine oil. There are three lubrication points—two holes at extreme ends of motor, and the spindle bearing.

TEST REPORTS

ACOS GP-12 HIGH FIDELITY PICKUP

THE new Acos GP-12 crystal pickup is the outcome of a considerable amount of research carried out by the laboratory of Cosmocord Ltd. It provides a high fidelity instrument at a reasonable price. Disadvantages sometimes associated with crystal pickups, fragility and unreliability due to humidity have been overcome by a process which entails conditioning the crystal element and then completely sealing it in a three-ply coating. The coating protects the crystal from moisture and injurious gases or vapours. This special process is used on all types of crystal elements now marketed by Cosmocord.

The requirements of a high fidelity pickup are that it should faithfully reproduce the waveform impressed on the record with negligible wear on the surface of the record itself. This means that the pick-up has to be designed to keep the head and needle weight within certain limits and the tracking to hold good over the arc traversed by the head. These problems have been carefully considered in the design of the GP-12.

The crystal cartridge (Fig. 1) contains a twister crystal (A), formed of two slabs of piezo-electric salt cemented together with a common electrode between them and a second electrode in contact with both outer surfaces. The electrodes are brought out to two pins (K) at the rear end of the cartridge. The pins connect by push-on sockets attached to the ends of a screened lead.

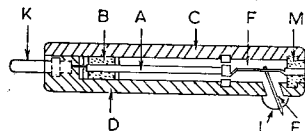


Fig. 1

Attached to the front edge of the crystal is a thin beryllium copper transmission strip (F) to which is welded a thin-walled metal tube (E) carrying the highly polished sapphire tip. The front end of the transmission strip is supported by a moulded rubber block (M). The rear end of the crystal assembly is also held in position by a moulded rubber block (B). An outer case of Bakelite is in two halves (C) and (D) riveted together. The lower section of the case (D) is provided with two blisters (L) to provide a degree of protection for the stylus against damage if the pickup should be dropped on the turntable or record.

The cartridge is mounted in a moulded Bakelite tone arm approximately 11 inches in length, the head being offset 25 degrees for accurate tracking. A slab of metal under the cartridge in the head

provides stability at low frequencies. An adjustable plate and a leaf spring, located under the tone arm near the pivot, provides a means of altering the downward pressure of the needle tip. It is factory adjusted to give half-an-ounce pressure. The pickup arm is pivoted on the Bakelite pedestal

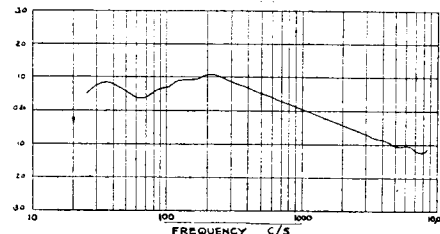


Fig. 2.

by means of a brass cone-shaped bearing spring loaded. Movement is very simple and noticeably free from friction.

The shielded pickup lead is threaded along underneath the tone arm and down through the centre of the bearing in the pedestal.

A response curve of the pickup is shown above in Fig. 2. It will be seen that from 30 to 250 c/s. the output is reasonably level and that from

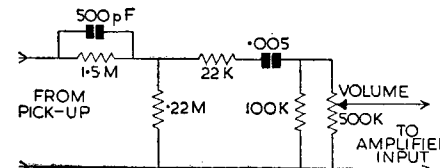


Fig. 3

250 c/s to 8,500 c/s there is a gradual falling off. To level out the response curve an equalisation circuit (Fig. 3) should be used. It reduces output considerably, but the improvement in performance fully justifies the further components and additional amplification required.

On test we found the GP-12 gave excellent reproduction. There appeared to be no objectionable resonances anywhere and the transient response was exceedingly good. Reproduction generally was of a very high standard and compared well with that of a moving coil pickup. Manufactured by Cosmocord Ltd., Enfield, Middlesex, the price is £5 4s. including PT.

TAYLOR CIRCUIT ANALYSER MODEL 20A

The Taylor Model 20A circuit analyser is designed for checking radio receivers by tracing the signal through the various stages of the receiver. The instrument consists of an aperiodic detector stage, using a miniature button base type RF pentode valve 9D6, followed by an amplifier stage using a 6J5 medium impedance triode valve.

A magic eye valve type Y63 is fitted to provide visual indication of amplitude of signals, etc. An internally mounted 5-inch PM speaker is fitted to provide audio output. Provision is also made for connection of headphones for greater sensitivity when required. HT to operate the instrument is

supplied by a 6X5 type rectifier coupled as a half-wave rectifier.

A mains transformer tapped for input voltages 100-120 and 200-250 volts AC 40-100 cycles provides the rectifier anode voltage and the heater current for the valves. Resistance-capacitance smoothing of the HT supply is employed.

The detector is contained in a metal casing (shaped to fit the hand) at the end of a flexible cable which plugs into the main unit. A probe projecting from the end of the detector housing is used to pick up the signals for the grid of the detector. The detector is used only for RF signals of 100 kc/s upwards. In the SIGNAL TRACER position of the selector switch, the detector output is coupled to the audio amplifier valve and is then reproduced on the loudspeaker. The input signal from the probe is also applied to the control grid of the magic eye. With the selector switch in AUDIO ANALYSER position the probe detector and magic eye indicator are switched out and a lead plugged into the INPUT sockets is used to feed the audio frequency signals, via a volume control, to the amplifier valve and thence to the loudspeaker.

The AC CHECK position on the selector switch applies the audio signal to the magic eye and silences the speaker. The DC CHECK position applies the DC voltage to be checked to the grid of the magic eye and removes the HT supply to the amplifier valve. The final two positions of the selector switch, namely LR and HR SPEAKER enables the internal speaker to be used for substitution in the receiver under test, either as a high resistance speaker (through matching transformer capable of passing up to 40 mA DC) or as low impedance type.

The instrument is excellently constructed. All the valves and components, with the exception of the mains tapping panel, are mounted on the rear of the front panel. The instrument is housed in a black crystalline-finished metal cabinet fitted with carrying handle.

On test the circuit analyser was used to check a standard 5-valve superhet receiver. It appears to operate quite satisfactorily on all the specified tests and should prove to be very useful in speedy location of faults. A detailed instruction book is supplied with the instrument.

Manufactured by Taylor Electrical Instruments Ltd., Slough, Bucks, the price is 15 guineas.

SWITCHMATIC REMOTE CONTROL UNIT

TYPE MM.55 (circuit over) enables a receiver to which it is connected to be switched on and off from an extension loudspeaker position without additional wiring to the remote loudspeaker. Furthermore, no high voltages are present in the extension speaker leads.

The unit consists of a relay, a switch and a low voltage power pack to energise the relay coil. The relay operating coil is in series with the extension loudspeaker speech coil, and audio frequencies are fed from the secondary of the output transformer in the receiver to the extension loudspeaker through a 50 microfarad condenser. This isolates the DC current flowing in the relay circuit from the receiver output transformer. Contacts, operated by the relay, are in series with the mains supply lead to the receiver. A manually