

DISK REPRODUCERS RP2/1 AND RP2/1B

General Description

Disk reproducer RP2/1 is a twin-turntable reproducing desk which can be used to replay coarse-groove pressings and disks up to 13 inches in diameter at 78 r.p.m., or for fine-groove mono at either $33\frac{1}{3}$ r.p.m. or 45 r.p.m. Pickup cartridges of the turnover type are used, mounted on pickup arms RP2B/1 to which are coupled optical pickup position indicators on the turntable units RP2C/1. These units are built around the Garrard transcription motor Type 301, and incorporate quick-starting arrangements.

A general view of the reproducer is given in Fig. 1. The equipment is housed in a wooden desk-type cabinet CT3/3, the upper surface of which is filled by the two turntable units; a hinged lid is fitted which covers both units. A script-rest is hinged to the lid along its upper edge; the lower edge is coupled to the lid stay in such a manner that the rest is thrust forward to a convenient position when the lid is raised.

The sloping front of the cabinet is filled by a desk panel PA8/21A, hinged at its lower edge so that it can be opened (as shown in Fig. 2) for maintenance purposes. The panel carries twin sets of controls and indicating devices, headphones jacks, two amplifiers AM16/1 (one for each turntable unit), and a combining unit RP2A/1.

A shelf inside the cabinet, level with the bottom of the desk panel, supports the power supply and control unit RP2A/2.

The lower part of the front of the cabinet is a removable panel, carrying the double-pole mains isolator of the reproducer near its upper left-hand corner. On the inner surface of the panel are mounted two mains outlets. One of these, a standard 3-pin 5-amp type, supplies the RP2A/2; the other, a three-pin D. & S. type, supplies the second desk when two or more desks are installed together. This second mains outlet is not controlled by the mains isolator. The reproducer is connected to the main supply and earth by a three-way flexible lead.

Differences in Type RP2/1B

The RP2/1B enables stereo as well as mono fine-groove recordings to be played monophonically. The two turntable units have modified pickup arms fitted with pickup cartridges different from those used in the RP2/1. A twin-channel pickup amplifier, Type AM16/6, is included to compensate for the lower sensitivity of the pickup cartridges.

The pickup cartridges are not suitable for playing 78 r.p.m. disks and the turntable units have been made inoperative at this speed.

As well as the added AM16/6 amplifier, the RP2/1B includes the following units modified relative to those in the RP2/1:

- Two RP2B/1B pickup arms,
- Two RP2C/1B turntable units,
- One RP2A/2A power supply and control unit,
- One PA8/21B desk panel,
- Two AM16/1A reproducing amplifiers,
- One RP2A/1A combining unit.

Rubber pads are added to the CT3/3 cabinet to serve as supports for the turntable units.

Turntable Unit RP2C/1 (Figs. 1 to 6)

The turntable unit is built on a 3/16-inch aluminium alloy motor plate on which the transcription motor is mounted. The motor is modified by the drilling of a number of additional holes and the enlargement of some existing ones to enable various components of the unit to be mounted on it, as well as on the motor plate.

The unit is supported resiliently on plywood corner pieces of the cabinet CT3/3 by four conical springs (item 29) attached to studs on the underside of the motor plate. These studs project downward through holes in the corner pieces and have extensions which form legs (30) on which the turntable unit can be stood when necessary.

To provide quick starting, a stroboscopic disk (10) on which the record is placed is supported a little above the turntable, and the turntable (already rotating) can be raised when required so that it lifts and turns the stroboscopic disk and record.

In the RP2C/1 this arrangement is motor-operated. The motor employed (33) is a Plessey tuning motor Type 2521/4, referred to as the 'control motor' in this Instruction. The 'control motor' and some of the circuit components associated with it are mounted on the control motor bracket (34) attached to the underside of the motor plate. A separate control plate (7) to the right of the motor plate carries the *Stop/Start* key (6) by which the control motor is operated. When the key is thrown, the control motor is started; it is stopped, after a length of run sufficient to complete the raising or lowering of the turntable, by one of the two cam-operated microswitches (26, 28) on the control motor bracket.

Apart from the quick-starting arrangements, the turntable motor is operated by means of its own *On/Off*, 78/45/33 $\frac{1}{2}$ and fine speed adjustment controls. A switch wafer (38) is ganged to the 78/45/33 $\frac{1}{2}$ control to operate pilot lamps in a lamp housing and, in conjunction with a microswitch in the pickup head, to operate an alarm circuit if an attempt is made to run the equipment with an inappropriate combination of turntable speed and pickup stylus. Fine adjustment of the turntable speed is facilitated by the stroboscope disk (10) which is pierced with a series of holes for each of the three standard speeds, and illuminated by a neon lamp (G.E.C. Button Tuneon) supported in an S.E.S. holder (37) fixed in the motor plate near the front of the unit, below the edge of the disk. The neon lamp is supplied from the 50-Hz a.c. mains (via a resistance-capacitance network in the power supply and control unit).

The pickup position indicator employs an optical display system. A glass slide, supported by a scaleholder (31), is attached to the lower end of the pickup arm spindle. The image of a moving scale is projected from this arrangement onto a frosted panel (1) beside the turntable speed indicators. The projector lamp (39) is a G.E.C. 12-volt, 24-watt type, Cat. F/3.

A sloping-fronted sheet-metal box (the lamp housing) extends across the greater part of the width of the motor plate, to the rear of the turntable. It is held by two screws through its upper surface, tapped into the ends of pillars (8) mounted on the motor plate. On the sloping front of the housing, over suitable apertures, is fastened an index frame containing the frosted perspex panel (1) on which is displayed the projected image of the moving glass slide of the pickup position indicator.

The index frame also contains three smaller panels (2) inscribed 33, 45 and 78, and a further small panel (3) coloured red. The four small panels are all illuminated at appropriate times by pilot lamps (40); the lamps behind the numbered panels are operated by the switch wafer (38) ganged to the 78/45/33 $\frac{1}{2}$ control of the motor unit, and the lamp behind the red panel by the auxiliary contacts of the fader associated with the turntable unit. The faders (Type PN/12M1) are mounted on the desk panel PA8/21A. The supply to the pilot lamps behind the numbered panels and to the projector lamp of the pickup position indicator is controlled by a microswitch (35) on a bracket mounted on the underside of the motor unit and actuated by one of the moving parts of the turntable motor *On/Off* control. The supply to the lamps is made when the control is set to *On*. The function of the switch when the control is set to *Off* is described later.

The lamp housing covers the base of the pickup arm RP2B/1, and is pierced with an inverted L-shaped slot to enable the housing to be fitted and removed, and the arm rotated about its pivot. A pickup raise/lower mechanism is fitted at the right-hand end of the housing, consisting of a spindle, supported in a spindle housing, carrying at one end a knurled hand wheel (4) and at the other an eccentrically mounted ballrace which, over part of the cycle of rotation of the spindle, presses on a plate (44) attached to the overhanging rear end of the pickup arm and thus raises the stylus from the turntable. The handwheel is fitted with a weight, so that the mechanism has a top dead centre position occurring between the Up and Down conditions of the pickup arm. A stop is fitted which gives a definite location of the handwheel for the Up condition.

A pickup rest of thick perspex and a post providing stowage for a 45-r.p.m. adaptor (25) are mounted on the upper surface of the motor plate.

A circuit diagram of the RP2C/1 is given in Fig. 6. The connections to the unit are via a flexible lead terminating in a 33-way male Painton connector (21) Type 313272 which mates with one of a pair of corresponding female connectors Type 311531 on the chassis of the power supply and control unit. On the turntable unit, the lead terminates at three tag strips and a terminal block on a tag board (36) mounted on brackets attached to the underside of the motor unit, near the front edge. The terminal block carries the mains connections to the turntable motor and the stroboscope



Fig. 1. Disk Reproducer RP2/1: General View

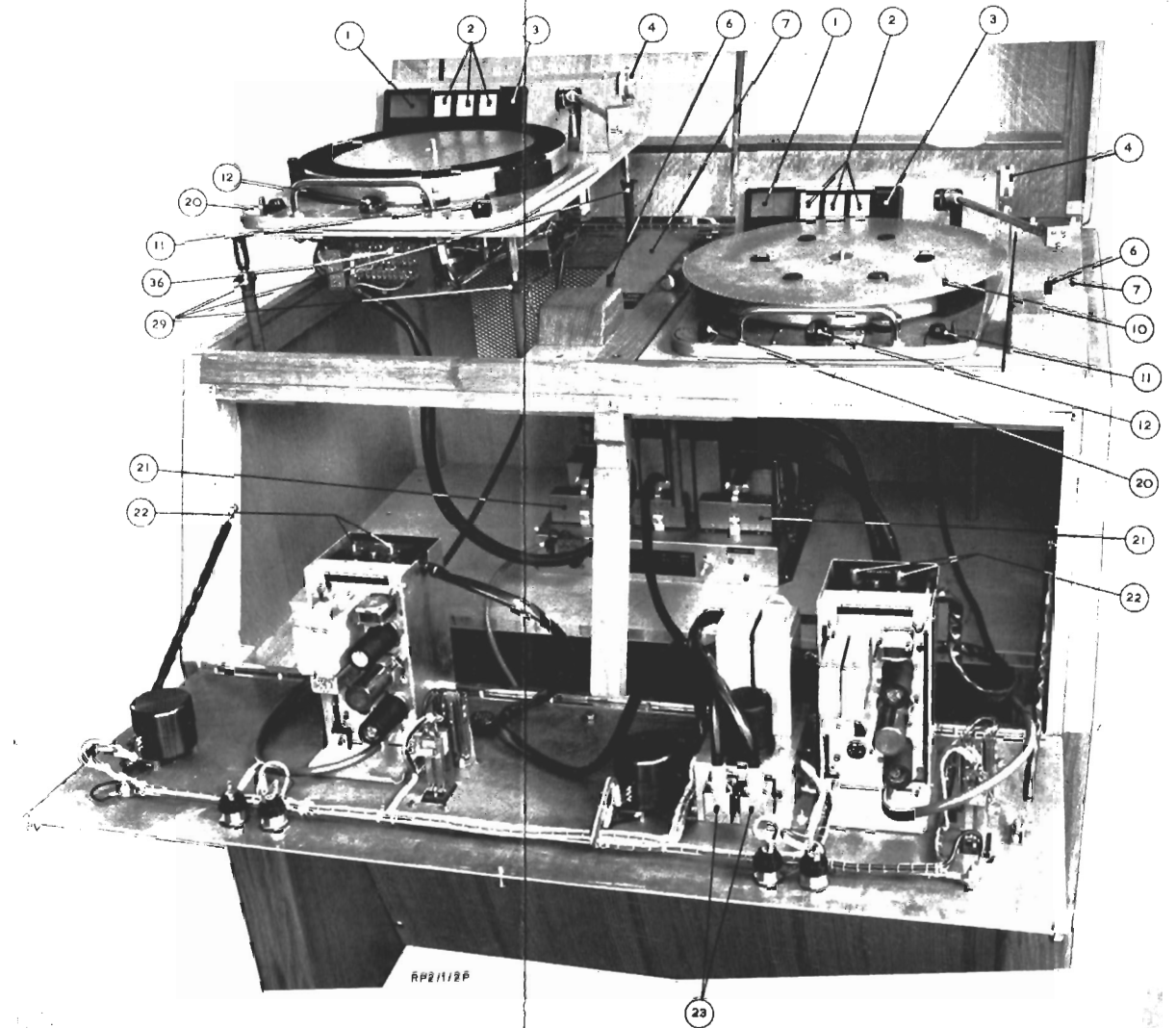


Fig. 2. Disk Reproducer RP2/1: View with One Turntable Unit Raised and Desk Panel Open

KEY TO FIGS. 1 AND 2

- | | |
|-------------------------------------|---------------------------------------|
| 1. Frosted panel | 15. Prog. P.F.L. Key |
| 2. Turntable speed indicator panels | 16. Top cut switch |
| 3. Fader indicator panel | 17. P.F.L. Volume control |
| 4. Pickup raise/lower handwheel | 18. Mains isolator |
| 6. Stop/Start key | 19. Programme fader |
| 7. Control plate | 20. Turntable motor On/Off control |
| 10. Stroboscope disk | 21. Connector (PLI of RP2C/1) |
| 11. 78/45/33 1/2 control | 22. Set Level controls |
| 12. Fine speed adjustment control | 23. Connectors (PLI of AM16/1) |
| 13. Motor pilot lamp | 29. Turntable unit suspension springs |
| 14. Amplifier pilot lamp | 36. Tag board |

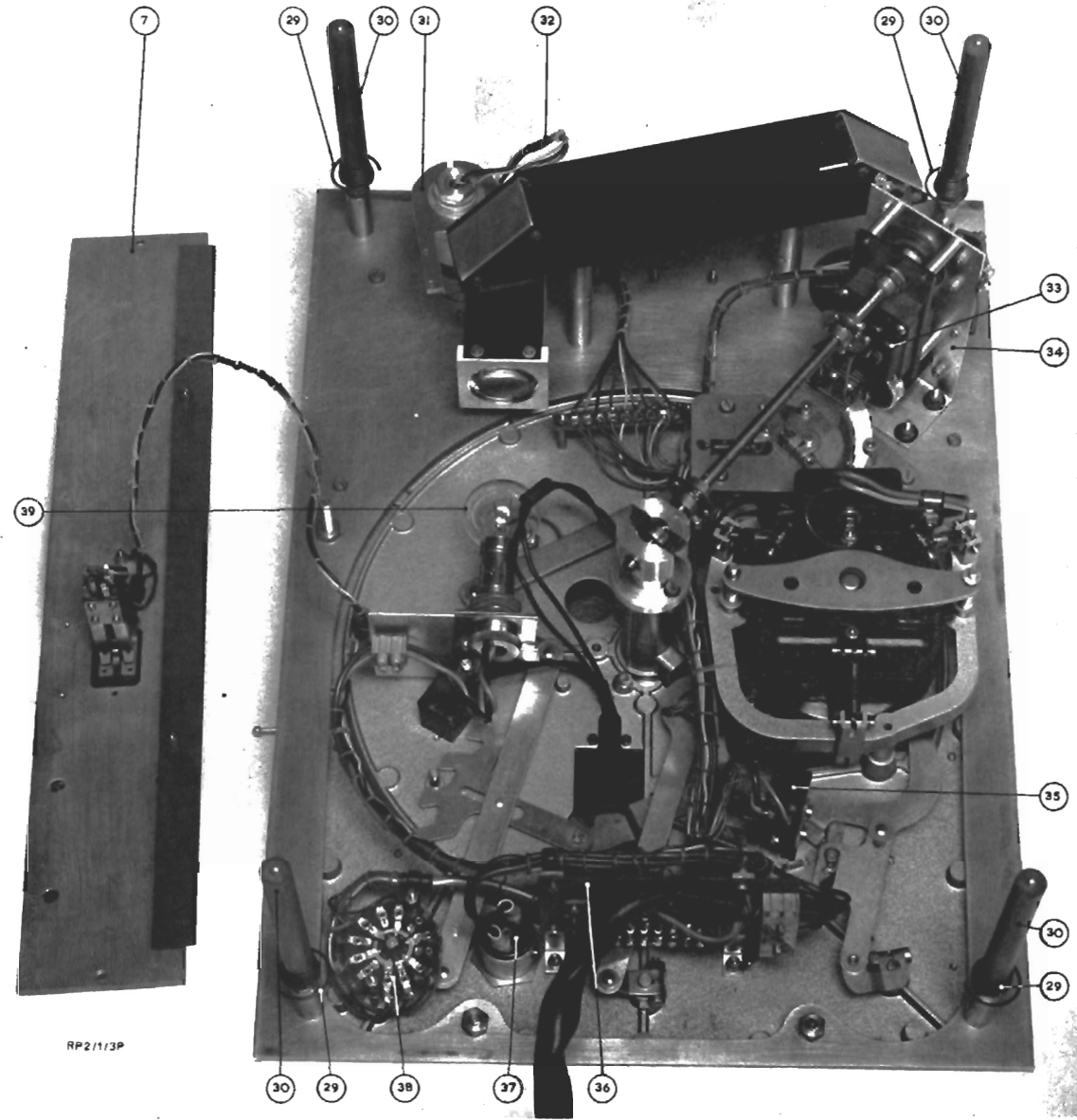


Fig. 3. Underside of Turntable Unit RP2C/1

- 7. Control plate
- 29. Turntable unit suspension spring
- 30. Turntable unit leg
- 31. Scaleholder
- 32. Leads to pickup
- 33. Control motor

- 34. Control motor bracket
- 35. Microswitch (SB)
- 36. Tag board
- 37. Holder for stroboscope lamp
- 38. Switch wafer (SC)
- 39. Projector lamp



Fig. 4. Disk Reproducer RP2/1, Showing Pickup Arm RP2B/1

- 8. Lamp housing pillar
- 9. Saddle
- 10. Stroboscope disk
- 11. 78/45/33 1/2 control
- 12. Fine speed adjustment control
- 20. Turntable motor On/Off control
- 24. Pickup cartridge turnover key

- 25. 45-r.p.m. adaptor
- 40. Pilot lamps
- 41. Pedestal
- 42. Housing for pickup ballraces
- 43. Tension springs
- 44. Rear plate of pickup arm
- 45. Stirrup

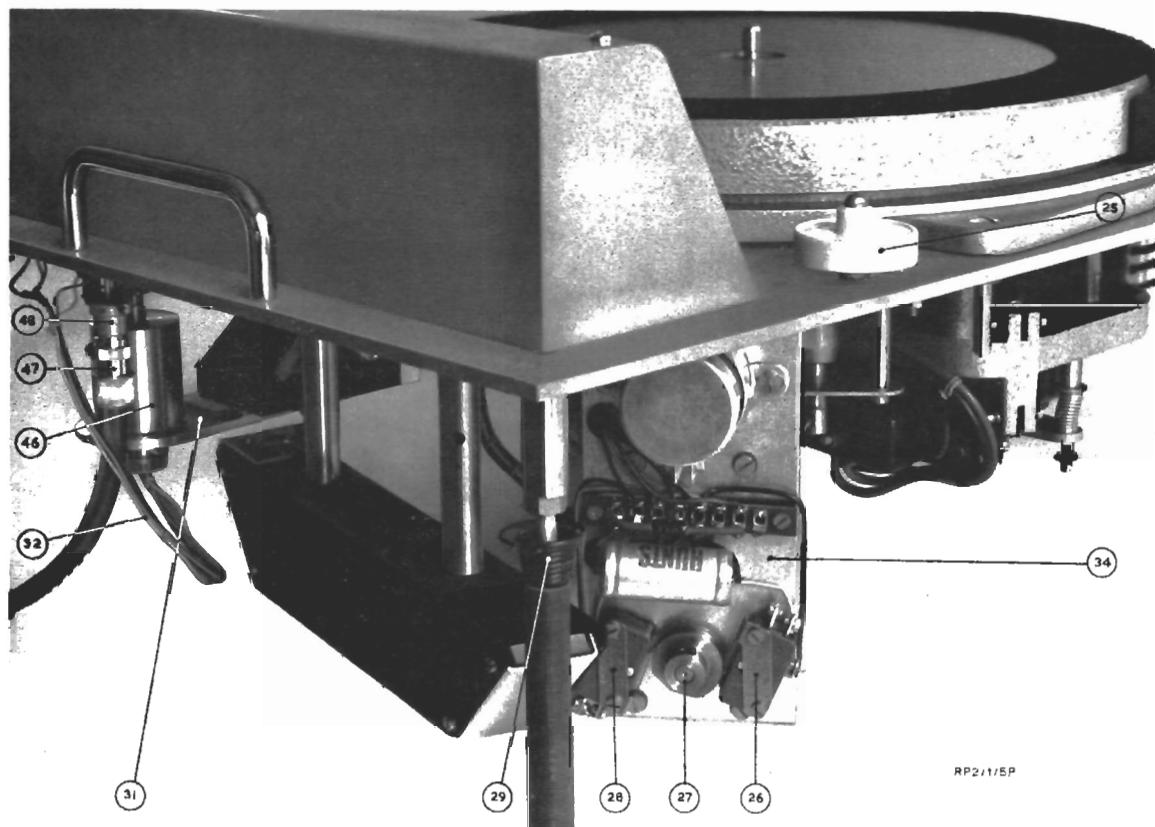


Fig. 5. Turntable Unit RP2C/1: Rear View Showing Details

- | | |
|--------------------------------------|-------------------------------------|
| 25. 45-r.p.m. adaptor | 32. Leads to pickup |
| 26. Start limit switch (SF) | 34. Control motor bracket |
| 27. Cam | 46. Scaleholder bush |
| 28. Stop limit switch (SE) | 47. } Coaxial connectors for pickup |
| 29. Turntable unit suspension spring | 48. } |
| 31. Scaleholder | |

lamp, and for safety its terminal screws are covered by a perspex insulating plate. The connections to the alarm circuit microswitch in the pickup head are made via a three-way tag strip screwed to the underside of the motor plate close to the base of the pickup. The pickup signal leads are connected to a Belling Lee coaxial socket (48), into which is plugged a lead that takes the signal away for amplification.

allow space for the mass counterbalance at the rear end of the RP2B/1B arm, and a different arm rest is fitted.

A stop is fitted on the motor plate to prevent use of the 78 r.p.m. position on the speed control and the switch ganged to it.

Pickup Arm RP2B/1 (Fig. 4)

A Tannoy Variluctance pickup cartridge is used; this is of the turnover type, having cantilever-mounted styli for coarse- and fine-groove records. It has an inductance of 285 millihenrys, and a resistance varying between individual cartridges from 685 to 1,000 ohms. The cartridge is mounted on a cartridge carrier specially supplied by the manufacturers with part of their usual engraving on the turnover key omitted. The carrier is further modified by the BBC to enable it to be used in the RP2B/1. The head of the pickup contains, as well as the cartridge on its carrier, a microswitch which is operated when the turnover key is set to its 78 position.

The arm is supported on pivot screws and bearings in a stirrup (45) silver-soldered to the top of the bearing spindle. The spindle runs in two ballraces in a tubular housing (42) which is gripped in the pedestal (41) of the pickup arm by two grub screws; this arrangement permits the height of the pivots above the motor plate of the turntable unit to be adjusted. The housing and the lower end of the bearing spindle project downward through a hole in the motor plate.

The pickup arm is counterbalanced by a pair of tension springs (43) which act between a saddle (9) mounted on the bearing spindle, below the stirrup, and the plate (44) attached to the overhanging rear end of the arm. The lower ends of the springs are anchored to the saddle by screws and nuts which allow adjustment of the tension in the springs and thus of the stylus pressure.

The connections to the pickup cartridge and the microswitch are via five flexible leads (32, Figs. 3 and 5) inside the arm and the bearing spindle, both of which are tubular.

Pickup Arm RP2B/1B

This is a modified RP2B/1 arm, designed for playing fine-groove disks, including stereophonic recordings. A pickup cartridge having a suitable vertical compliance, the Goldring 800, is fitted in an altered mounting and cover at the head of the arm. There is no cartridge turnover facility and the

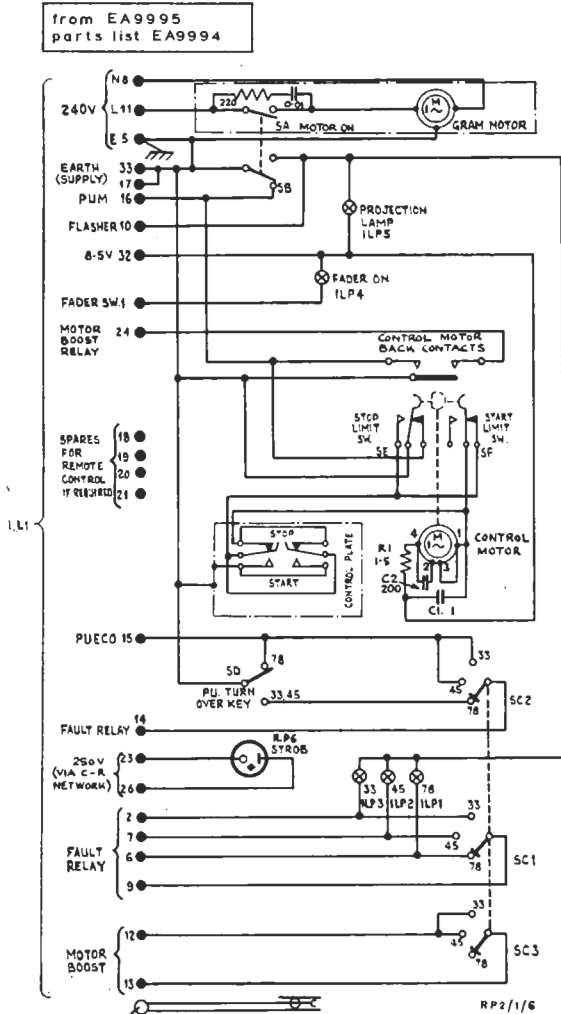


Fig. 6. Turntable Unit RP2C/1: Circuit Diagram

Turntable Unit RP2C/1B

This is a modified RP2C/1, fitted with an RP2B/1B pickup arm in place of the RP2B/1.

A portion of the lamp housing is removed to

arm cannot be used on coarse-groove, 78 r.p.m., disks.

The operating playing weight of the cartridge is 3.0 grams. To obtain this playing weight with the required stability, the spring counterbalance of the RP2B/1 arm is replaced by a mass counterbalance attached to the rear plate of the arm. Final weight adjustment is made by means of an added collar which can be positioned along the length of the arm.

The sensitivity of the pickup is lower than that used with the RP2B/1, and this necessitates the use of additional amplification in the programme chain to which it is connected.

of a repeating coil. The secondary winding of the repeating coil feeds the output plug of the reproducer.

It is sometimes necessary to introduce in series with the secondary of the repeating coil a pair of padding resistors of a value chosen to suit the impedance and signal level of the circuit into which the equipment is to operate.

A subsidiary output of the AM16/1 is connected to a *Prog.* PFL key on the desk panel; the key enables either the amplifier output or an incoming line carrying programme to be connected to two *Phones* jacks. A *PFL Volume* control is provided to enable the level of the signal from the PFL

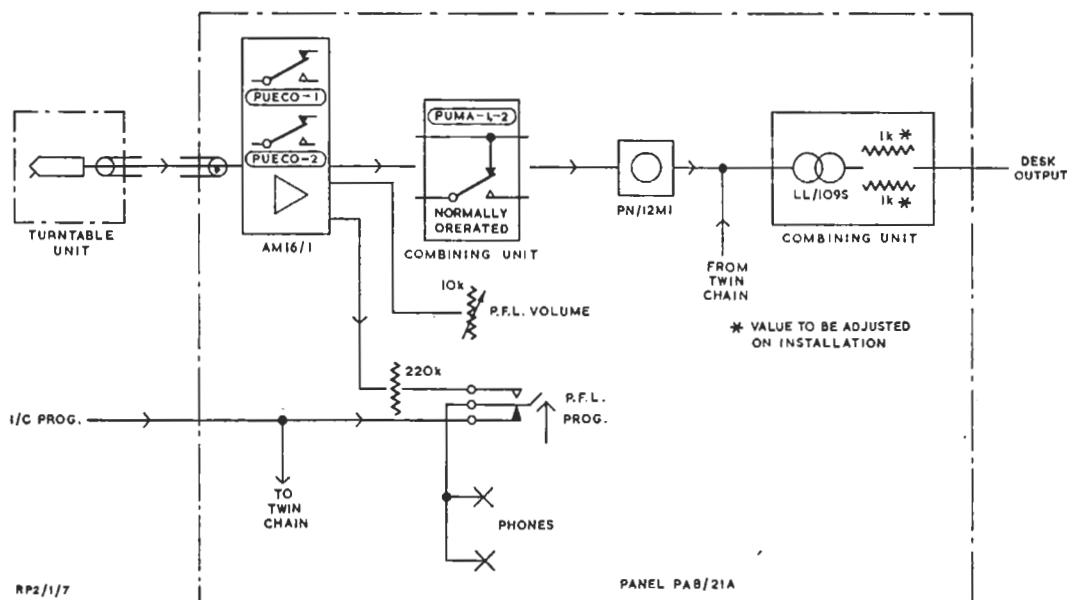


Fig. 7. Disk Reproducer RP2/1: Programme Chain

Programme Chain (Fig. 7)

In the Type RP2/1 disk reproducer, the pickup arm on each turntable unit is connected to its associated AM16/1 amplifier. The main output of the amplifier is applied to the contacts of a muting relay, PUMA (or PUMB in the twin chain) in the combining unit. (Fig. 8.) Under playing conditions this relay passes the signal to a PN/12M1 fader. The output connections of this fader and of the corresponding fader in the twin chain of the reproducer are paralleled to the primary winding

output of the amplifier to be varied; this control is described as part of the circuit of the amplifier.

In the Type RP2/1B reproducer, the pickup arms of the two turntable units are connected firstly to the two channels of an AM16/6 amplifier. The separate outputs of the AM16/6 are fed to AM16/1A amplifiers and the remainder of each programme chain is the same as in the RP2/1. The changeover relay PUECO in the AM16/1, shown in Fig. 7, has no use in the RP2/1B, which is employed to play fine-groove disks only.

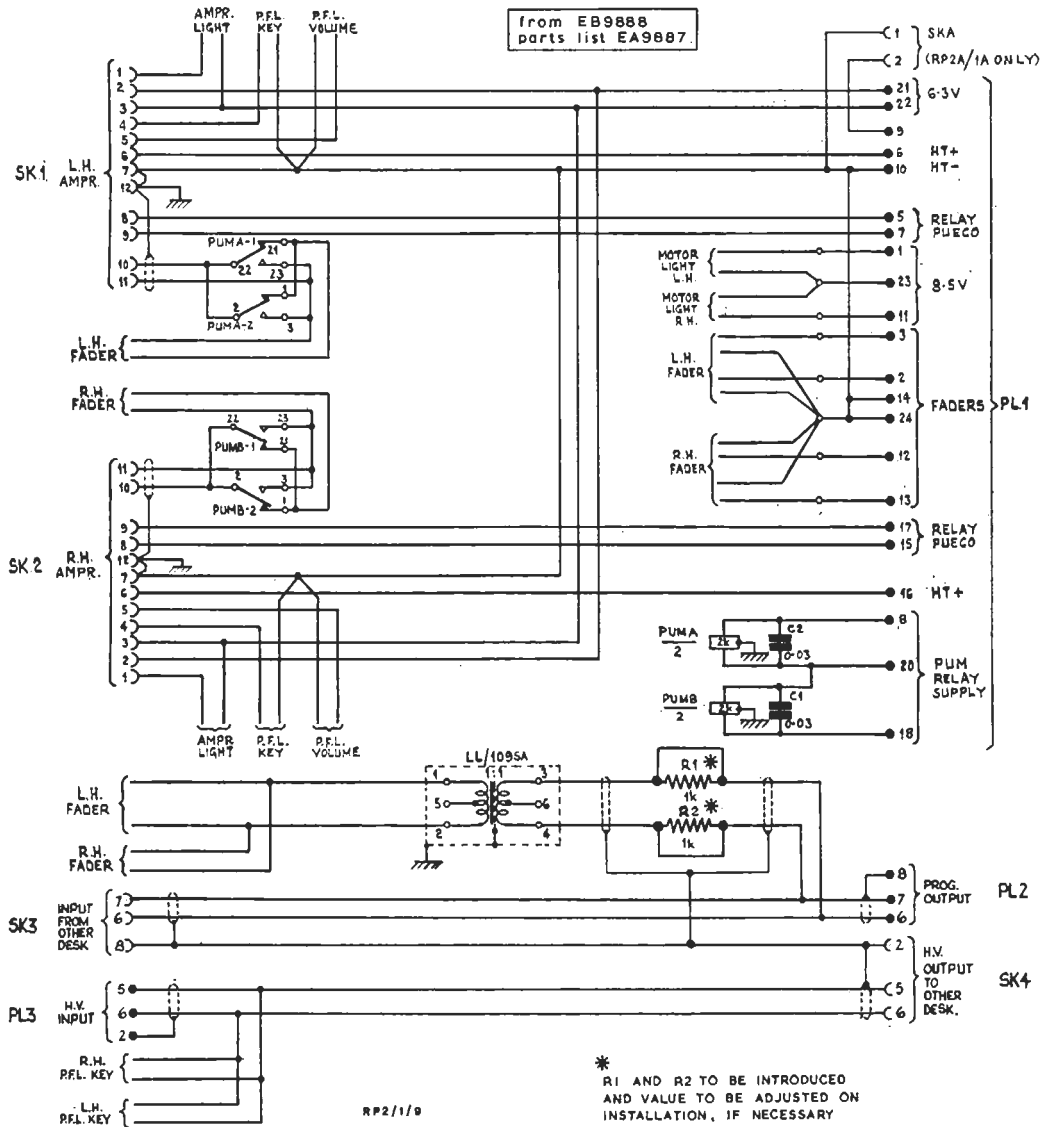


Fig. 8. Combining Units RP2A/1 and RP2A/1A: Circuit Diagram

Power Supply Circuits

All power supplies for the reproducer are obtained from the power supply and control unit RP2A/2 or RP2A/2A, a circuit diagram of which is given in Fig. 9 on page 13.

Amplifier Supplies

The h.t. and heater supplies for the amplifiers are obtained from secondary windings on the transformer T1. Metal rectifiers MR1, MR2 are employed to give full-wave rectification from a centre-tapped h.t. winding, in the conventional manner; the reservoir capacitors are C1A, C2A in parallel. Separate smoothing resistors R3, R4 and capacitors C1B, C2B are provided for the supplies to the two AM16/1 or AM16/1A amplifiers. The on-load voltage of each supply to these amplifiers is 310 volts.

The heaters of the valves, and the *Amplifier* pilot lamps ILP2, ILP4 on the desk panels are supplied from a 6.3-volt winding on T1. The supply is balanced with respect to earth by the resistors R1, R2.

Relay Supplies

The supplies for the relays by which various switching operations in the reproducer are performed are obtained from a 35-volt secondary winding on T1, which feeds a bridge-type metal rectifier MR3 to give a d.c. voltage of 48 across the reservoir capacitor C3. The positive side of the supply is earthed. This 48-volt supply operates most of the relay circuits; exceptions are the relays PUECO in the amplifiers AM16/1. These two relays are operated from separate 24-volt (on-load) supplies obtained from the 48-volt supply by the smoothing resistors and capacitors R5, R6 and C4, C5.

Pilot Lamp Supplies

The projector and pilot lamps, with the exception of the *Amplifier* pilot lamps, are supplied from an 8.5-volt secondary winding on T1. The *Amplifier* lamps are supplied from the 6.3-volt valve-heater winding, as already mentioned.

Mains Supplies

The mains input is connected via 1-amp fuses FS1, FS2 to the appropriate tapplings on the primary winding of T1. From the 240-volt and 10-volt tapplings of the same winding a 250-volt supply is taken for the neon stroboscope lamps on the turntable units. The neon lamps are fed via networks R102, R103, C102 and R202, R203, C202.

The mains supplies to the two turntable motors are fed via C101, R101 and C201, R201, which are normally short-circuited by the relay contacts MB101-1 and MB201-1 respectively. The purpose of this arrangement is described under the heading *Motor Boost Circuit*. Two 250-mA fuses FS101, FS201 are provided for the motors.

Control and Indicating Circuits

The power supply and control unit RP2A/2 or RP2A/2A, the combining unit RP2A/1 or RP2A/1A, and the desk panel PA8/21A or PA8/21B contain many pairs of corresponding components, identified by different but related numbers (e.g., R101, R201; connectors SK101, SK201; pins 1, 11 on connector PL1; relays PUMA, PUMB). Of these pairs of components, the first is associated with the left-hand turntable unit and the second with the right-hand unit. In the circuit diagrams to which reference is made in the following circuit descriptions, only one circuit is shown, but the components are identified by both sets of numbers, where two numbers are applicable. To simplify the text, only the set of component numbers for the left-hand unit are mentioned.

Motor Boost Circuit (Fig. 10)

When the quick-starting arrangements on a turntable unit are operated, the stroboscope disk and record are accelerated rapidly from rest to their required speed of rotation; this process imposes a brief increase of load on the turntable motor which causes the motor speed to fall momentarily. The function of the motor boost circuit is to apply extra power to the motor when a quick-start is initiated, so that its speed increases slightly and is then reduced to normal by the additional mechanical load. The extra power is withdrawn when the acceleration of the stroboscope disk and record is completed, leaving the motor running normally when the programme chain muting is removed.

The capacitor C101 and the resistor R101 are normally short-circuited by the relay contacts MB101-1; these contacts are caused to open while the stroboscope disk and record are being accelerated, placing C101 and R101 in series with the supply to the turntable motor. C101 is of a value which approximately resonates with the inductance of the turntable motor at the mains frequency; when resonance occurs, the voltage applied to the motor rises, and the motor therefore develops

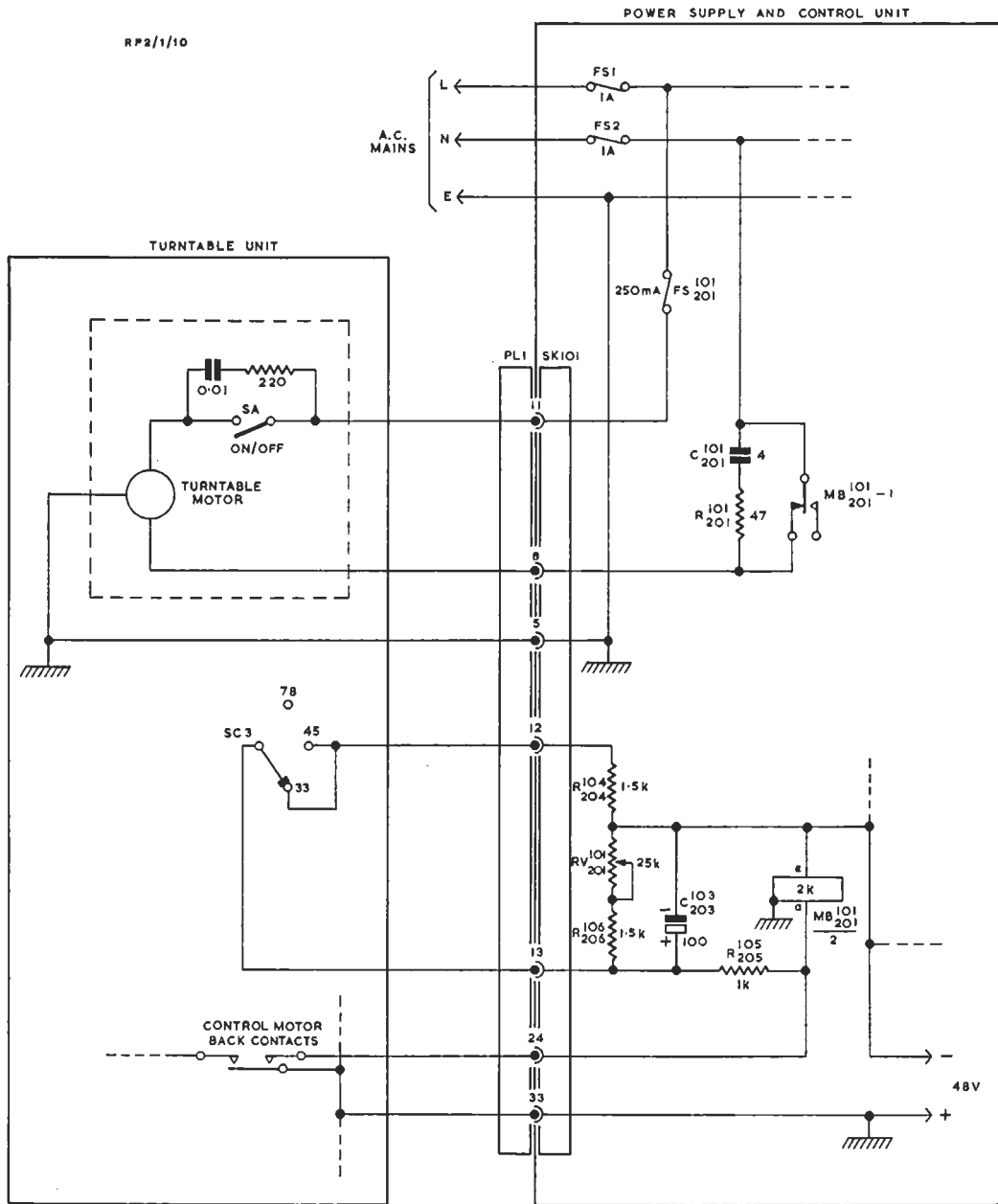


Fig. 10. Disk Reproducers RP2/1 and RP2/1B: Motor Boost Circuit

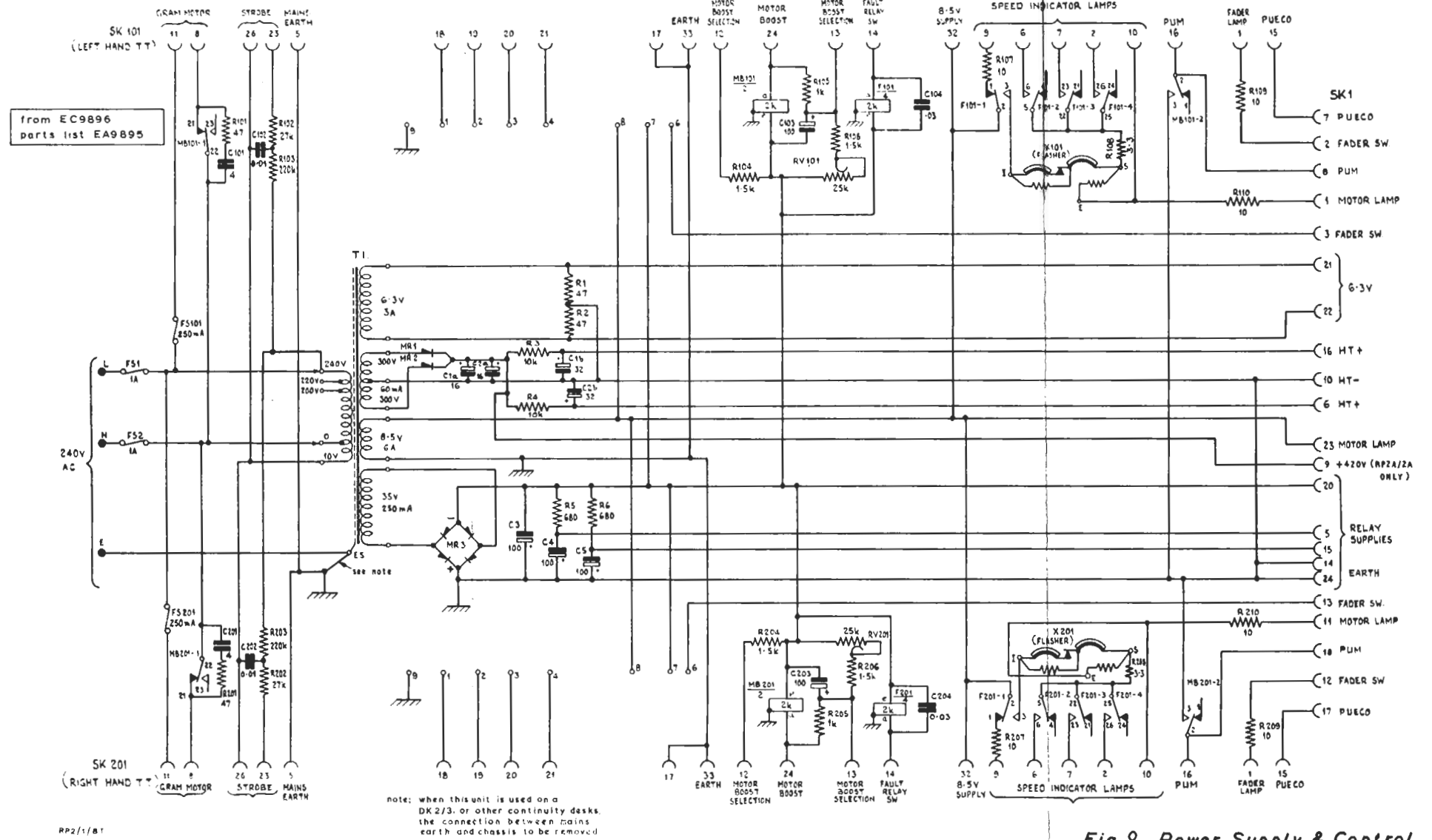


Fig.9. Power Supply & Control Units RP2A/2 & RP2A/2A

extra power. The function of R101 is to limit the discharge current of C101; in the absence of the resistor this current could be sufficiently large to burn the contacts MB101-1 if they were to close when the alternating voltage on the capacitor was at or near its peak value. Because the resistor is small, the loss of voltage across it when contacts MB101-1 are open is negligible.

The coil of the relay MB101 is connected to the 48-volt relay supply via one of the pairs of back contacts of the control motor, by which the turntable is raised and lowered. These contacts close when the control motor is running; thus the relay is operated, and a voltage boost is applied to the turntable motor, whenever the record is either started or stopped by means of the quick-starting arrangements. (The effect is, of course, irrelevant in the latter situation.)

Clearly, more energy is needed to accelerate the record and stroboscope disk to 78 r.p.m. (on an RP2/1 reproducer) than to either of the lower speeds; on the other hand, when the turntable speed is 45 r.p.m. or $33\frac{1}{3}$ r.p.m. a degree of boost which is correct for 78 r.p.m. operation would supply an excess of extra energy, and so disturb the even running of the turntable as badly as the uncorrected load imposed by a quick start. It is therefore necessary to provide boost impulses of different durations for the various turntable speeds; in practice, it is found satisfactory to employ pulses of two durations only, one for 78 r.p.m. operation and the other for both 45 r.p.m. and $33\frac{1}{3}$ r.p.m. operation. The appropriate pulse-duration is selected by means of S3C, which when set to 45 or $33\frac{1}{3}$ connects R104 in parallel with R106 and RV101, thus altering the total resistance shunting the coil of the relay MB101. Fine adjustments can be made by means of RV101, which is a screwdriver-operated pre-set control.

When the energising circuit of the relay MB101 is completed, the voltage developed across the coil of the relay is applied to the network R104 to R106, RV101 and C103, and the capacitor begins to charge through R105. The potential to which it charges is determined by R105, R106, RV101 and (for 45 r.p.m. and $33\frac{1}{3}$ r.p.m. operation) R104; these resistors form a potential divider across the coil of the relay. When the control motor stops and the energising circuit of the relay is broken, C103 discharges; part of the discharge current flows in R105 and the coil of the relay, which is thus maintained in its operated condition until the

voltage across the coil falls below the value necessary to maintain the hold current. The remainder of the discharge current of C103 flows in R106, RV101 and (for 45 r.p.m. and $33\frac{1}{3}$ r.p.m. operation) R104; thus the rate of discharge, as well as the initial voltage on the capacitor, depends on the value of this combination of resistors.

The relay MB101 has a further set of contacts MB101-2, the function of which is described under the next heading.

Pickup Muting Circuit

The main output of the AM16/1 is short-circuited by the normally-open contacts PUMA-1 and PUMA-2 (Fig. 7) of the relay PUMA in the following situations:

- (a) When the turntable motor is not running.
- (b) When the turntable motor is running, but the quick-starting arrangements are in the Stop condition.
- (c) During the operation of the quick-starting arrangements.

The coil of the relay PUMA is connected to the 48-volt relay supply via alternative circuits corresponding to the various conditions set out above. The circuits are shown in Fig. 11.

When the turntable motor is not running, the circuit is completed by the microswitch SB, which is mechanically coupled to the turntable motor On/Off switch SA.

When the turntable motor is running but the quick-starting arrangements are in the Stop condition, the circuit is completed by the normally-closed contacts of the Stop limit switch SE of the control motor circuits.

During the operation of the quick-starting arrangements, the circuit is completed by one pair of the back contacts of the control motor, and also by the contacts MB101-2 of the relay MB101, which in turn is operated by the closing of the other pair of back contacts of the control motor. Both of these circuit paths are necessary, the first pair of motor back contacts to cover the operate lag of the relay MB101, and the relay contacts MB101-2 to cover the duration of the boost impulse to the turntable motor after the control motor has stopped and its back contacts opened.

Lamp and Alarm Circuits (Fig. 12)

The projector lamp of the pickup position indicator (ILP5 on the turntable unit) is controlled only by SB, the microswitch mechanically coupled

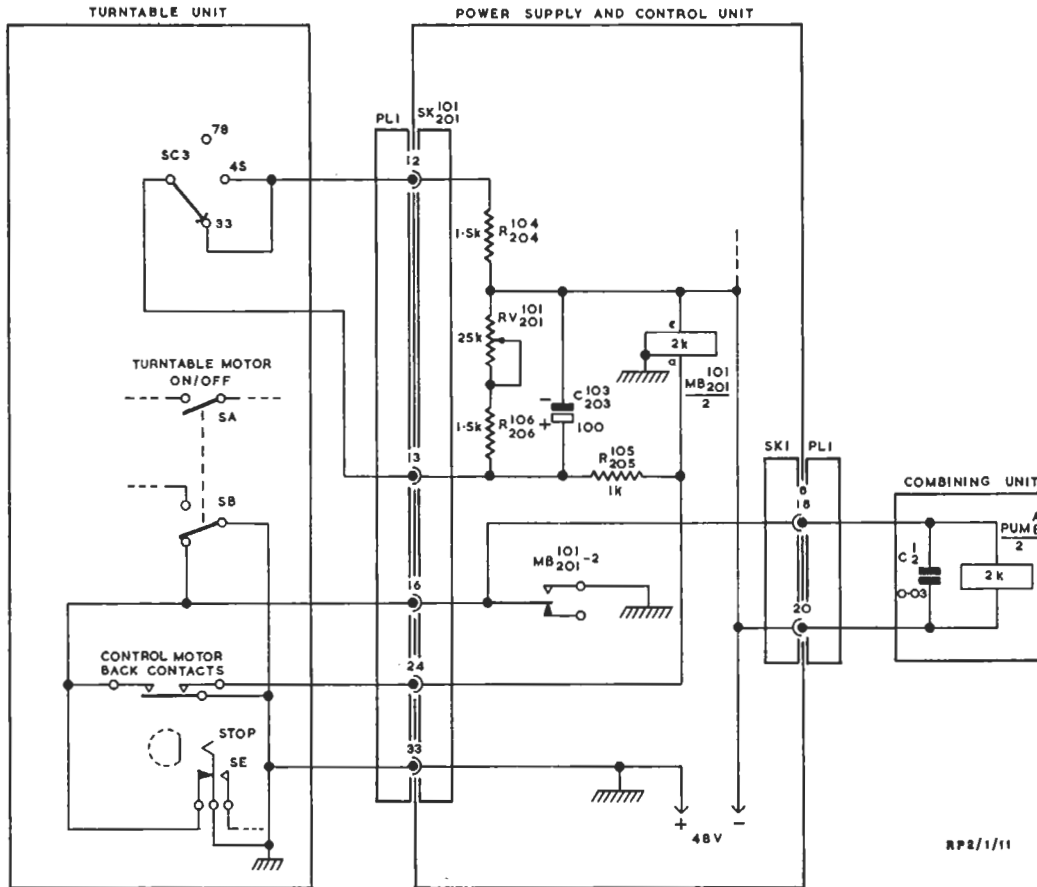


Fig. 11. Disk Reproducers RP2/1 and RP2/1B: Pickup Muting Circuit

to the turntable motor On/Off switch. Thus the lamp is alight whenever the turntable is running. The lamp is rated at 12 volts, and is thus considerably under-run; it is for this reason that the projected image of the moving scale of the indicator appears to lack brilliance. The lamp is operated in this manner to increase its length of life.

The pilot lamps ILP1, ILP2 and ILP3 on the turntable unit are those in the lamp housing which indicate the turntable speed. They are controlled by the normally-closed contacts F101-1 of the relay F101, the switch SC1, and the switch SB. The relay F101 is part of the alarm circuit; its function is described later. SC1 selects the appropriate lamp, and the action of SB has already been described. Thus one of the three lamps is alight whenever the turntable is running. R107 in the RP2A/2 is a voltage-dropping resistor which

reduces the voltage across the lamp to slightly below the rated value of 6.5 volts.

The pilot lamp ILP4 on the turntable unit is that in the lamp housing which illuminates the red panel (3, Figs. 1, 2), indicating that the fader associated with the unit is open. The lamp is controlled only by the auxiliary contacts on the fader, which is on the desk panel. R109 is a voltage-dropping resistor.

The pilot lamp ILP1 on the desk panel, labelled *Motor*, is controlled only by the microswitch SB, and is therefore alight whenever the turntable is running. R110 is a voltage-dropping resistor.

The pilot lamp ILP2 on the desk panel, labelled *Amplifier*, is supplied from the 6.3-volt a.c. source which feeds the valve heaters in the AM16/1 or AM16/1A. The lamp is connected via a strap between pins 1 and 2 of the connector of the amplifier, and thus cannot give a spurious indication

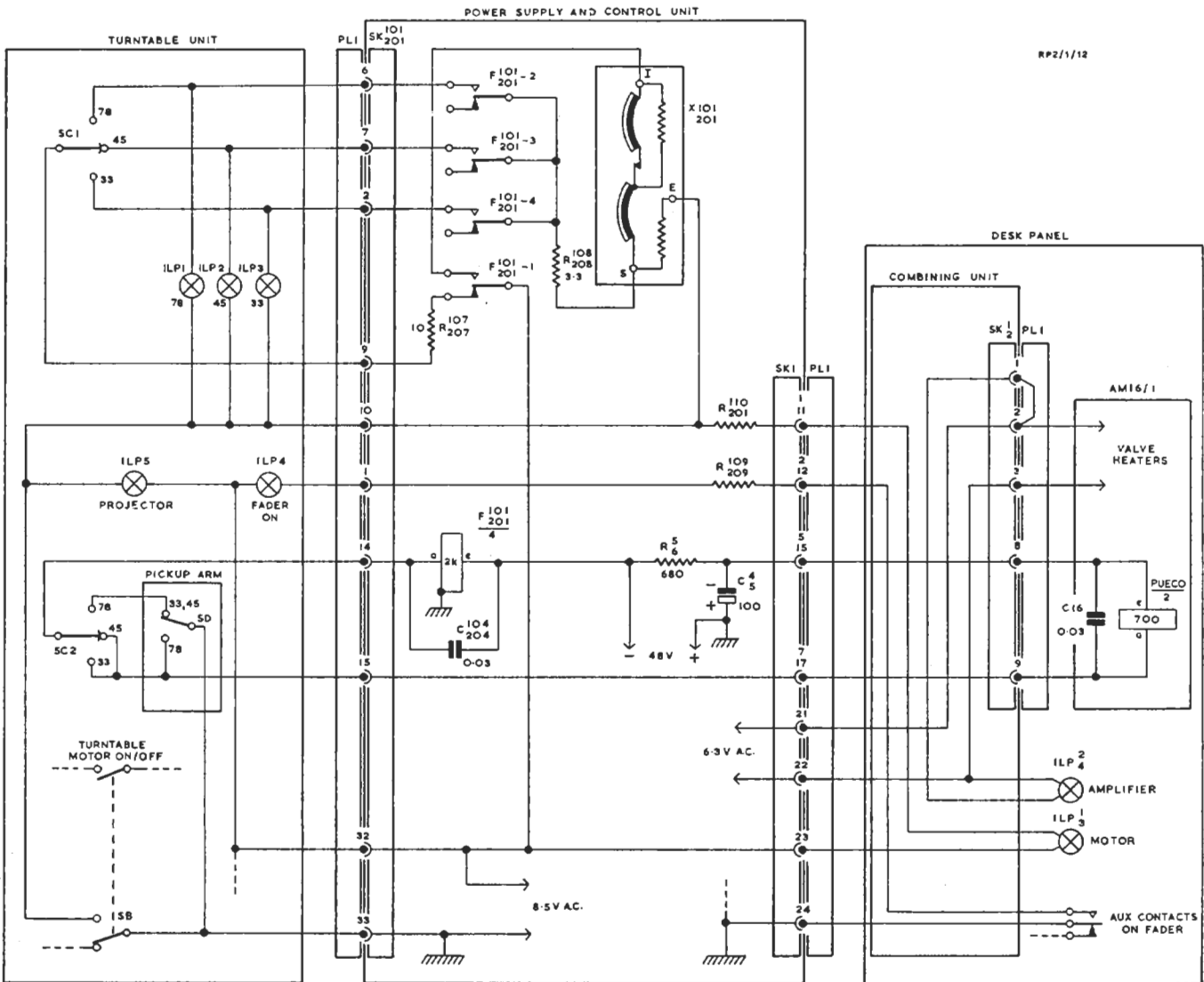


Fig. 12. Disk Reproducer RP2/1: Lamp and Alarm Circuits

RP2/1/12

should the amplifier inadvertently be left unconnected; apart from this, the lamp is not controlled, and is alight so long as the reproducer is switched on and the fuses are intact.

On an RP2/1 reproducer, the alarm circuit comes into action if an attempt is made to run the turntable motor when the combination of turntable speed and pickup stylus is inappropriate. The energising circuit of relay F101 is then completed via SC2 and SD. SD is the microswitch in the pickup head.

When the relay F101 operates, one set of contacts, F101-1, changes over, and the normally-open pairs of three other sets, F101-2, F101-3 and F101-4 close. This breaks the normal connection via R107 and SC1 to one of the lamps ILP1, ILP2, ILP3 on the RP2C/1, and completes an alternative connection via the flasher X101 and R108 to all three lamps in parallel, with one of the flasher heaters (between terminals E and S) in parallel with R108 and the lamps. Thus all the lamps are alight, and power is applied to the heater. The remaining heater of the flasher (that connected to terminal I) is short-circuited by the flasher contacts. After a brief interval, the compound bar associated with the flasher heater E-S bends, opening the flasher contacts. The other heater is thus placed in series with the circuit, and the voltage across the lamps and the heater E-S therefore falls. The lamps are dimmed, and heater E-S and its compound bar begin to cool; simultaneously, the other heater and compound bar becomes hot. As a result of these effects, the flasher contacts close, restoring

the conditions immediately following the operation of relay F101. The cycle is repeated indefinitely, the flashing of the lamps ILP1, ILP2 and ILP3 giving the required alarm.

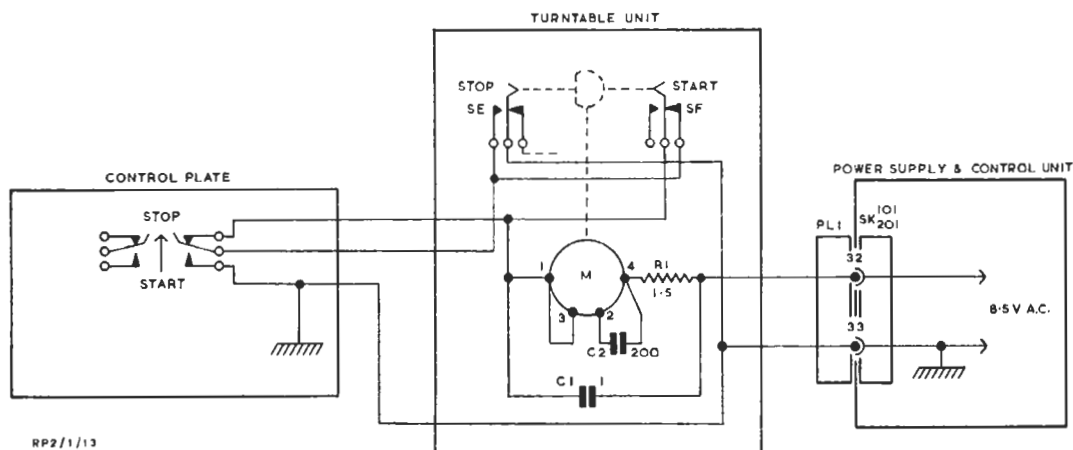
Control Motor Circuits (Fig. 13)

The control motor is designed for operation from a 6-volt supply; the 8.5-volt a.c. supply is used, connected via a series resistor R1 to reduce the terminal voltage to the correct value. The motor is controlled by the *Stop/Start* key on the control plate and by the two limit switches SE and SF of the turntable raise/lower mechanism. The shape of the cam (27, Fig. 5) is such as to hold SE and SF in their operated conditions except when the turntable is fully raised or fully lowered; the Start or Stop limit switch SF or SE respectively is then released.

If the *Stop/Start* key is thrown to *Start*, a circuit is completed from the live side of the supply, through the motor, the contacts of SF and the key to the earthed side of the supply. The motor begins to run. SE is operated by the movement of the cam, but this merely places a further circuit path in parallel with the contacts of the *Stop/Start* key, and therefore has no effect at this stage of the cycle of operation.

When the motor has run sufficiently to complete the raising of the turntable, the cam releases SF, breaking the motor circuit. The motor stops, and the quick-starting operation is complete.

If the *Stop/Start* key is now thrown to *Stop*, a circuit is completed from the live side of the supply,



RP2/1/13

Fig. 13. Disk Reproducers RP2/1 and RP2/1B: Control Motor Circuit

through the motor, the key and the normally-open contacts of SE to the earthed side of the supply. The motor begins to run. SF is operated by the movement of the cam, but this merely places a further circuit path in parallel with the contacts of the key, and therefore has no effect at this stage of the cycle of operation.

When the motor has run sufficiently to complete the lowering of the turntable, the cam releases SE, breaking the motor circuit. The motor stops, and the operation is complete.

The normally-closed contacts of the Stop limit switch SE are part of the pickup muting circuit.

Controls

Mains Supply

The mains supply is controlled by an isolator (18, Fig. 1) at the upper left-hand corner of the lower front panel of the cabinet. When this isolator is closed, the stroboscope lamps of the turntable units and the *Amplifier* pilot lamps on the desk panel will light.

Motor Controls (Fig. 4)

The motor controls are immediately in front of the turntable. On the left is the motor on/off lever (20) which both switches the supply to the motor and engages a rubber drive wheel with the turntable. It is therefore essential that the turntable should always be switched off by means of this lever. If the supply were switched off externally and the desk allowed to stand with this lever in the On position, flats might be formed on the rubber wheel and serious wow result.

The motor on/off lever also switches on the projection lamp for the pickup scale and illuminates the appropriate motor speed indicating panel. The fact that one of these panels is illuminated shows that the turntable is running, though the record and the disk on which it rests may be stationary. The turntable speed required is selected by the speed change lever (11) which can be operated only when the on/off lever is in the Off position.

The turntable can be set to exact speed by means of the fine control (12).

Pickup Controls

The pickup is raised and lowered by means of the knurled handwheel (4, Figs. 1, 2) which is biased to the Up and Down conditions by an internal weight moving past top dead centre. When raised, the pickup can be moved laterally by hand, but the arm must not be allowed to jar

against the edge of its slot on the lamp housing because this might disturb the setting of the moving scale of the pickup position indicator; any error thus introduced would be magnified by the optical system.

On an RP2/1 reproducer, the appropriate stylus for coarse- or fine-groove records is selected by means of the turnover key 24 (Fig. 4) on the pickup head.

Disk Start/Stop

The quick-starting and stopping arrangements are operated by means of the *Stop/Start* key (6, Fig. 2).

The programme output from the reproducer, but not the PFL output, is muted while the record is at rest; when playing is started, the mute is removed after a delay sufficient to allow the record to attain full speed. The delay is equivalent to about a quarter, one-third and two-thirds of a revolution of the record at speeds of $33\frac{1}{3}$, 45 and 78 r.p.m., respectively. The mute is re-applied as soon as the key is thrown to *Stop*.

Programme Fader

The programme fader, which is in the main programme circuit, has no effect on the pre-fade listen chain. The auxiliary contacts operate a red indicating light whenever the fader is not at zero.

Because of the mute circuit associated with the disk start/stop arrangements the pickup can be faded-up to line only when the record is actually rotating steadily.

Top-cut Switch

The top-cut switch (16, Fig. 1) introduces a loss at high frequencies and is intended for use only on worn or distorted records.

Pre-fade Listen

The pre-fade listen key and jacks (15, Fig. 1) are conventional except that jacks are provided for two sets of headphones. In the central position the key connects the phone jacks to the studio ring main; in the down position it connects them to the PFL output. A PFL volume control (17, Fig. 1) is provided. The operation of the PFL circuit is quite independent of the programme fader and of the mute circuit.

Operating Procedure

General

It is assumed that the reproducer is ready for use, that is, it has been switched on long enough for

the amplifiers to have warmed up and the desired speed has been selected and adjusted if necessary. It is also assumed that the scale reading of the approximate location of the start of the wanted passage has been found. This is best done, not by jumping the pickup across the disk but by using the handwheel (4, Fig. 1) to raise it, then moving the arm to a new place and lowering it again.

Precise Location of Passage

1. With the programme fader faded down and listening on PFL, the record is allowed to run until the start of the passage is heard, when the record is stopped by the disk start/stop lever.
2. The record is then turned backwards and forwards by means of the stroboscope disk until the exact start of the passage is under the pickup stylus. This process may be facilitated if a mental note is made of the angular position of the record label at the instant the start of the passage is heard. The record is stopped at once and turned back until the label is once more in this position, which brings the start of the passage under the pickup stylus.
3. The record is now turned backwards for about a quarter of a revolution for $33\frac{1}{3}$ r.p.m., a third of a revolution for 45 r.p.m., or two-thirds of a revolution for 78 r.p.m.
4. Having opened the fader the record is started at the appropriate moment by a touch on the start-stop key.

Maintenance

Turntable Units

For maintenance and inspection purposes, either turntable unit can be raised and stood on the plywood corner pieces as shown in Fig. 2; before this can be done the screw securing the script rest to the lid stay must be withdrawn, allowing the rest to swing back into the lid so as not to be fouled by the unit. This screw is a round-headed one on the forward surface of the stay, slightly above the level of the lower edge of the script rest, which obscures it in Fig. 1. Handles are fitted at front and rear of the turntable unit, to facilitate lifting.

It is undesirable to remove the turntable itself from a turntable unit except, for example, when replacing the intermediate rubber wheel, but if its removal is required the following procedure should be adopted:—

- (a) Take off the stroboscope disk.
- (b) Lift the turntable manually by a small amount.

- (c) Strike the turntable spindle lightly, and just sufficiently to release the turntable, with a wooden mallet; this operation should be performed by a second person.

When replacing the turntable it is important that no foreign matter should be trapped between the tapered mating surfaces, and that the turntable should not be dropped on the spindle. **On no account should the turntables from different units be interchanged.**

Attention should be paid to the following points:—

- (a) The *pickup* movement should be quite free in both directions and should exhibit no slack or stiffness.

On an RP2/1 reproducer, the counter-balance spring anchorage must be adjusted so that the playing weight of the stylus is between 5 and 7 grams.

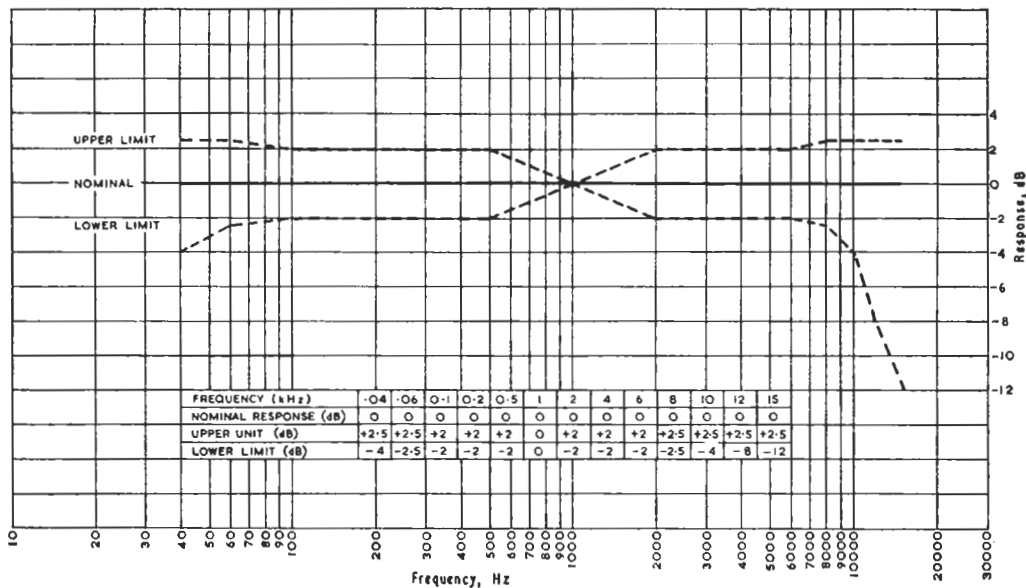
On an RP2/1B reproducer, the collar on the pickup arm must be positioned so that the playing weight is 3 ± 0.5 grams.

- (b) The *groove indicating scale* should give the same scale reading for the same relative position of the pickup on all desks. A calibrating groove is engraved on the top surface of the stroboscope disk, and with the pickup resting in this groove the scale reading in the indicator housing should be 100 ± 2 .

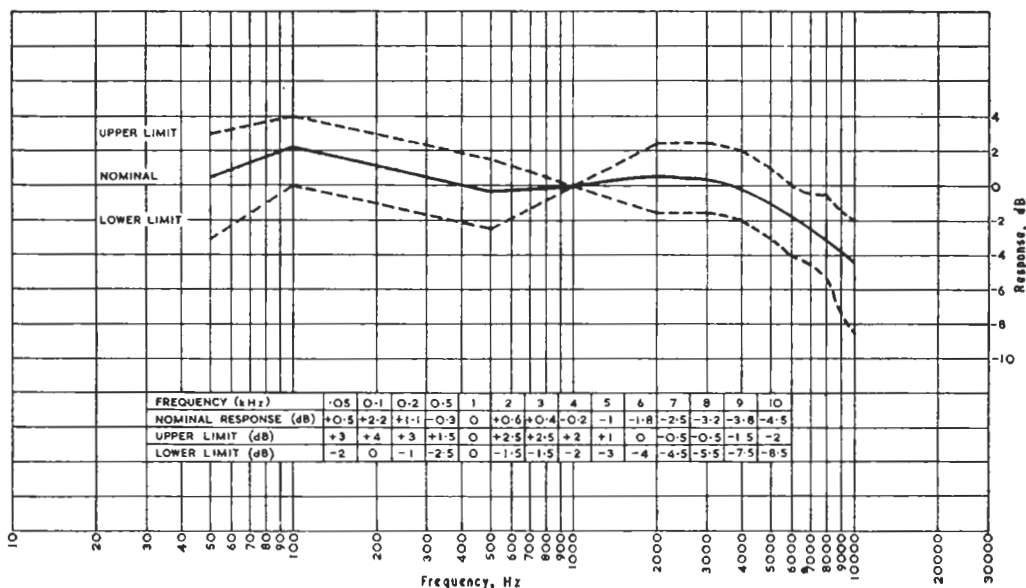
Any adjustment required can be obtained by rotating the scale holder at the extreme lower end of the pickup axis. The scale holder is coupled frictionally to the pickup arm spindle and should not be slackened.

The scale holder should be freed and repositioned up or down the pickup arm spindle, if necessary, to focus the image of the scale.

- (c) *Muting* of the programme output should cease when the disk is up to speed. This can be assessed either by listening on the desk output to the 1 kHz band on the test disk FOM2 or by carefully watching the stroboscope pattern at the instant the relays cease to be energised. Adjustment is provided by a variable resistor associated with each programme chain, RV101 and RV201, on the power supply and control unit.
- (d) The *intermediate rubber wheel* should be free from cracks and flats. Provided the turntable and motor are not misused, the wheel should



TEST RECORD FOM 2



RP2/1/14

TEST RECORD DOM 85

Fig. 14. Disk Reproducer RP2/1: Reproducing Tolerances

last a long time. Evidence of any defect is given by undue wow or flutter so that visual inspection is not normally necessary. The wheel runs in self-lubricating bearings and therefore no lubrication is necessary except at, say, yearly intervals.

- (e) *Lubrication* of the main turntable shaft is provided by a screwed brass reservoir cap on the side of the bearing housing; screwing this cap forces grease into the bearing, and one half-turn over a month should be sufficient. Use Garrard Special Grease for Model 301 Transcription Motor.

Output Level and Frequency Response

(a) Reproducer Type RP2/1

If the 1-kHz bands on test records FOM2 and DOM85 are played on either turntable, outputs of -62 dB and -56 dB, respectively, should be measured across a 1,200-ohm load on the secondary of the repeating coil in the combining unit. If necessary, adjust the fine-groove and coarse-groove preset level controls, respectively, on the AM16/1 amplifier associated with the turntable to obtain these outputs. The top-cut circuit should not be switched into use in these tests.

To reduce the output to a required level in individual installations, insert resistors in series with the two terminals of the secondary of the repeating coil in the combining unit.

The frequency response curves of the reproducer are given in Fig. 14.

(b) Reproducer Type RP2/1B

If a 1-kHz band on test record FOM2 is played on either turntable, an output of -54 dB should be measured on a 600-ohm amplifier detector connected to the secondary winding of the repeating coil in the combining unit, which should be otherwise unterminated. If necessary, adjust the fine-groove preset level control on the AM16/1A associated with the turntable to obtain this output. The top-cut circuit should not be switched into use in this test.

If a lower level is required in an installation, insert resistors in series with the secondary of the output repeating coil.

Adjust the *H.F. Eq.* control associated with each turntable on the AM16/6 amplifier, if necessary, so that the frequency response of each reproducing chain lies within the limits for an RP2/1 reproducer. See Fig. 14.

References

1. *Production Test Schedule for Disk Reproducing Desk Type RP2/1*, Designs Department Specification 1.26(59).
2. *Reproducing Desk RP2/1B*, Designs Department Specification 1.43(68).
3. *Noise Tests on Reproducing Desk RP2/1B*, Designs Department Technical Memorandum 1.45(69).

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