PHILIPS MODEL EL3549A

Modifications to the apparatus

During the course of the production the apparatus has been modified as follows :

WR-00	original version
WR-01	identical to WR-00, but with entirely new rewinding mechanism
WR-02	identical to WR-01, but the front side of the chassis and the cover plate have been fitted with rubber supporting pieces.
WR-03	identical to version WR-02 but with new switches SK11, SK12, SK13 and SK14.

WR-00

The original version has a different rewinding mechanism, with respect to version WR-01 see fig. 3a. See the special column in the "List of Mechanical Parts" for those parts of the WR-00 version which are still deliverable.

WR-01

This documentation applies to the version WR-01.

WR-02

The chassis and the cover plate have been fitted in a different way in order to reduce mechanical vibrations of the recorder. The front of the chassis has been fitted with four rubber supporting pieces (292); the cover plate 290 of the chassis with three, see fig. 3b
The rubber pieces are supplied under code number WRB 905 TU/8x1.

WR-03

From this stamp on the manufacturing plate the switches SK11, SK12, SK13 and SK14 have been replaced by one standard switch, code number WY 849 09

Furthermore the material used for switch cam 106 has been modified to brass, because the cam could be easily deformed.

The new switch cam is supplied under code number WT 618 36.

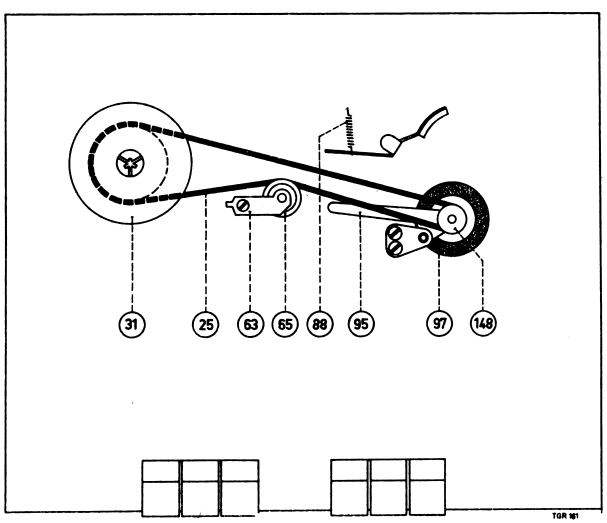


Fig 3a

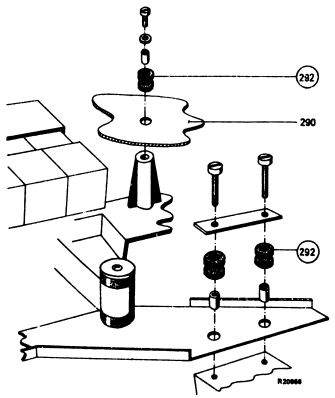


Fig 3b

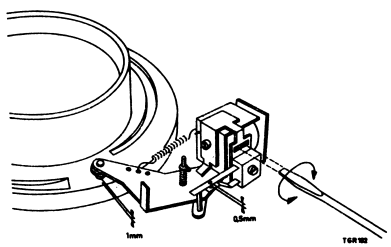


Fig 3c

THE MECHANISM

Taking chassis out of casing (see fig. 4)

- Remove the cover of the apparatus.
- Remove the covering cap 265 (this cap is clamped).
- Remove the knobs of the volume controls 262.
- Remove the screws 257 with which the ornamental cap 258 is affixed.
- Remove the knobs 254 by pushing them upwards by means of a screw driver.
- Wrap a piece of cloth around the tip of the screw driver in order to prevent damage being done to the ornamental cap 258.
- Remove the ornamental cap 258.
- Remove the 5 screws with which the metal covering plate is affixed, and then remove the latter.
- Remove the 8 screws with which the chassis has been affixed in the casing.
- Lift the rear side of the chassis out of the casing and then the complete chassis. (Mind the mains flex and the connecting wires of the loudspeakers.)
- The chassis is mounted into the case in reverse order.

N.B.: - When the chassis is taken out of the casing and the apparatus is then switched on again, make sure that no short-circuit can occur between the cooling plate of the output transistors and the chassis. (See also PART I -2-,

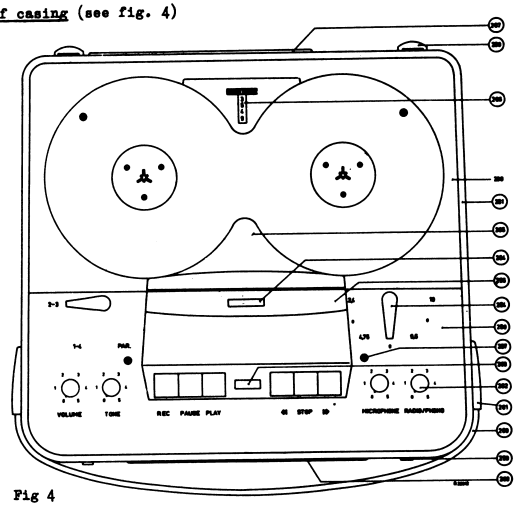


Fig 4

2. Description of the working of the mechanism

Consecutively are described :

- The driving mechanism and speed switch mechanism.
- The position "playback".
- The position "recording".
- The position "stand-by" (rapid stop).
- The position "winding".
- The position "rewinding".
- The automatic cut-out mechanism.

The driving mechanism and speed switch mechanism

The motor pulley 152 has four steps of different diameters, one for each tape speed.
In order to drive the flywheel for each of the four speeds with one idler wheel it is necessary that the idler wheel 175 can be moved both in the horizontal and in the vertical direction.
The idler wheel 175 is mounted on strip 179 (fig. 6).
This strip can slide in horizontal direction in the guide bracket 181; the latter can be moved in vertical direction.
For switching the idler wheel in both directions (horizontal and vertical) use is made of the switch cam 146. The latter has an unconstant diameter (see fig. 5) and the vertical height of the cam is not constant either.

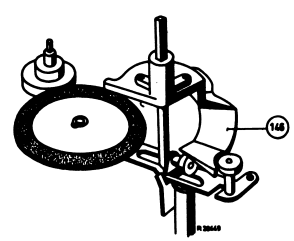


Fig. 5

EL3549A/00

1. Technical data

This recorder is a four-speed recorder with the four-track system.
The amplifier is fully transistorised and suitable for:

- Stereo playback with amplifier EL 3787
- Mono recording and playback
- Multiplay and duoplay with amplifier EL 3787
- Public Address amplifier

Tape speeds	:	7 1/2"/sec ... 19 cm/sec
		3 3/4"/sec ... 9.5 cm/sec
		1 7/8"/sec ... 4.75 cm/sec
		15/16"/sec ... 2.4 cm/sec
Maximum reel diameter	:	7" ... 18 cm
Maximum playing time	:	Stereo ... 2x8 hours (2.4 cm/sec)
		Mono ... 4x8 hours (2.4 cm/sec)
		tape length 720 metres (1800 ft)
Output power	:	2,5 W
Headphone output	:	200 mV
Line output (radio output)	:	1 V
Loudspeakers	:	AD 3574M
Frequency range on 7 1/2"/sec	:	60 ... 16000 c/s
3 3/4"/sec	:	60 ... 13000 c/s
1 7/8"/sec	:	60 ... 10000 c/s
15/16"/sec	:	60 ... 4500 c/s
Winding and rewinding time	:	540 metres in less than 180 sec
Transistors	:	TS1 - - OC58
		TS2 - - OC58
		TS3 - - OC75
		TS4 - - OC44
		TS5 - - OC75
		TS6 - - OC74
		TS7 - - OC26
		TS8 - - OC79
Diodes		GR2 - GR3 - OA81
		GR4 - - OA70
Signal: noise ratio	:	better than 40 dB

Power consumption	:	approx. 55 W
Mains voltage - 50 c/s	:	110-127-220-245 V
Dimensions of the apparatus	:	16½" x 15½" x 8½"
		42 x 39 x 21 cm
Weight	:	approx. 13 kg

Sensitivities		Input impedance
Microphone (BU4)	:	2 x 0.5 mV at 5000 ohm
Gramophone (BU2-BU3)	:	2 x 100 mV at 680 kohm
Radio input (BU1)	:	2 x 2 mV at 20 kohm

Accessories

EL 3782-00 ... Electro-dynamic stereo microphone
EL 3768-04 ... Radio connecting cable
EL 3768-01 ... Radio connecting cable
EL 3992-38 ... Headphone
EL 3756-00 ... Electro-dynamic mono microphone
EL 3962-01 ... Mixing box for two microphones
EL 3769-00 ... Slide synchronizer
EL 3963-01 ... Endless tape
EL 3911-00 ... 7" reel empty
EL 3914-50 ... 7" reel with 540 metres tape
EL 3914-80 ... 7" reel with 720 metres tape
EL 3912-00 ... 5" reel empty
EL 3882-10 ... 5" reel with 270 metres tape
EL 3882-50 ... 5" reel with 360 metres tape
EL 3918-65 ... Start tape - red
EL 3917-65 ... Start tape - green
EL 3916 ... Adhesive tape
EL 3880-00 ... Switching tape
EL 3787-00 ... Pre-amplifier
EL 3984-15 ... Foot switch

Important data, repair hints

- For the adjustment of the recording/playback head a new tool has been developed (see fig. 1). This is because the height of the head is adjustable by means of slotted nuts.
- Springs and belts can be inserted very easily with the other part of the tool.

Code number

A9 600 54 - Slotted nut spanner
A9 600 55 - Handle (for this the handle of the tool kit 968/0X can also be used).

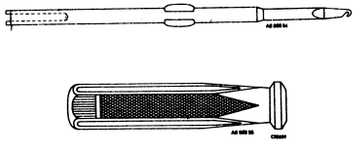


Fig. 1

- For the replacement or the measuring of a great number of electrical parts it is not necessary to remove the chassis from the casing. By removing the large bottom plate 269 (see figure 2) the print plate can be swung outwards (see figure 3) after removing the two screws which affix the print plate to the chassis so that most parts are easily accessible.
After replacing or measuring, the print plate should again be affixed to the chassis.
The recording/playback switch SK1 should be adjusted, however, according to PART II-4 (see page 22).

- Warning

The output transistor TS7 is mounted on an insulated cooling plate.
The collector of this transistor is interconnected with the cooling plate.

For that reason it is necessary that no short-circuit is made between the insulated cooling plate and the chassis during repairs to the recorder, (for in this case the high tension would be practically short-circuited whereby the rectifying cell GR1 could become defective).

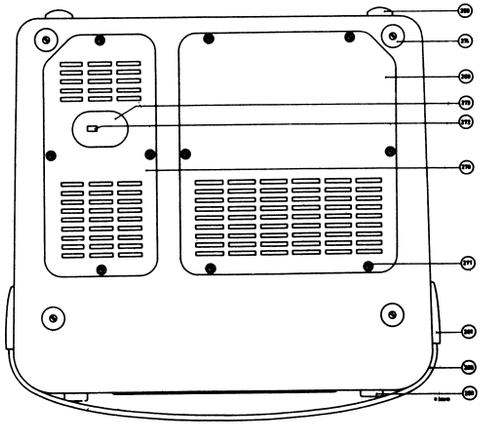


Fig 2

- Warning

When the apparatus is switched off, the tape speed switch should be placed in an "OFF" position at all times. Therefore never switch off the apparatus by only pulling out the mains plug!
If this is done, annoying mechanical noises may occur because the idler wheel is then dented.

If, however, the apparatus is switched off by only pulling the mains plug out then it is necessary to let it operate in position "STOP" at the tape speed 19 cm/sec. (7½"/sec) for approx. 2 hours.
Then the dent in the idler wheel and the mechanical noise will have disappeared.

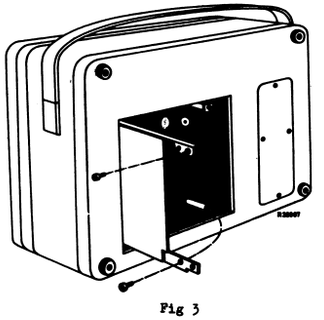


Fig 3

List of figures

The roller 183a is mounted on guide bracket 181. This roller is pulled against the lower side of the switch cam 146 by the tension spring 149. If the switch cam 146 is now turned, the height of the guide bracket 181 will vary and thus the idler wheel 175 too.
A roller 177 is also mounted on strip 179. The tension spring 178 pulls the roller against the outer side of the switch cam 146. If the switch cam is turned, the idler wheel will therefore move in horizontal direction.
All these variations in horizontal and vertical direction are so chosen that the idler wheel is put each time at the relevant pulley step and the flywheel.
The switch cam 146 is so designed that the idler wheel is released from the motor pulley in the positions "OFF" (fig. 8).
Stop plate 142 is affixed at the top of the switch cam 146. The roller in bracket 78 falls into one of the hollows in the stop plate 142.
By this, the speed switch mechanism is locked in all positions.
The mains switch SK0 (pos. 185) is controlled by the switch disc 183 which is affixed onto the shaft of the switch cam 146 (see fig. 7).
On this disc are three notches which correspond to the three recesses on switch cam 146.
If the apparatus is now disconnected (position "OFF") then the control pin of the mains switch SK0 is liberated by the notch in the switch disc 183. The switch is then open and therefore no voltage is applied to the apparatus.
If the speed switch is put into action (at any speed) then the control pin of the mains switch is depressed, as a result of which the switch closes. The motor gets voltage and the motor pulley drives via the idler wheel 175 the flywheel and, consequently, the capstan.

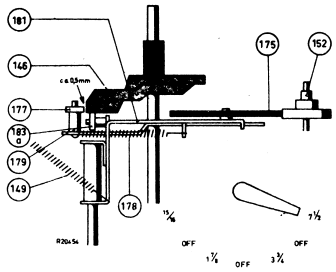


Fig. 6

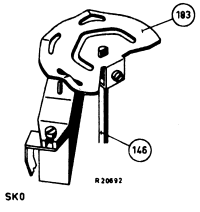


Fig. 7

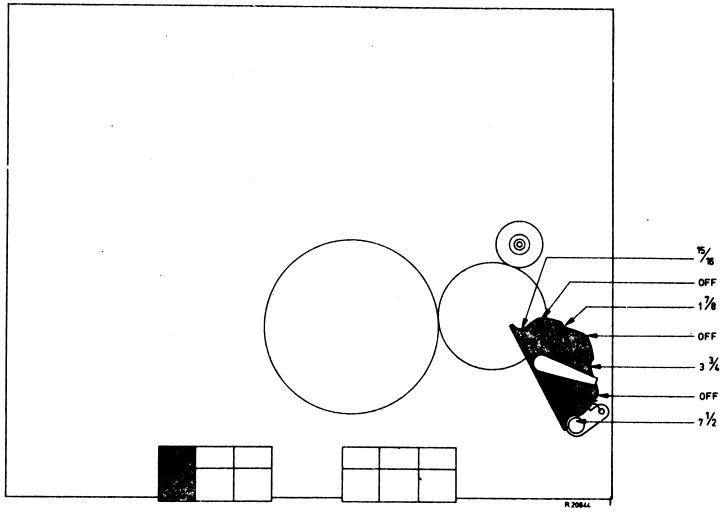


Fig. 8

The position "playback"

- When the playback key is depressed the start strip 50 moves backwards. Consequently, the control bracket 117 of the pressure roller lever 113 also moves backwards, so that the pressure roller is pressed against the capstan and the tape can be transported along the heads K1 and K2. The pressure felt in bracket 81 presses the tape adequately against the recording/playback head K1 (see fig. 10).

  N.B.: In order to have the tape run sufficiently taut along the heads K1 and K2 (especially K2), a slight brake action of the left hand reel disc is necessary. This is obtained by the cord (31a) and the brake bracket 78b (against the left-hand tape guide).

- Both brakes 56 and 68 are lifted from the reel discs by the lip on start strip 50.
- Bracket 34 is released by start strip 50. As a result, bracket 33 which is hinged to bracket 34 can move in the direction of tension spring 53. The idler wheel 57 is pulled between the wide part of the capstan and the driving ring 165 of the winding friction for the right hand reel disc.
  The driving ring 165 is pressed by pressure spring 168 between the felt ring under reel disc 164 and the felt ring on ring 157 (see fig. 9).
  If a tape is inserted into the apparatus the driving ring 165 between both felt rings will slip.
  The speed of revolution of the right-hand reel disc will therefore be determined by the supply of the tape.
- Bracket 117 is coupled with the control bracket 5. At the same time with the moving backwards of bracket 117, control bracket 5 will put the switch SK3 in the play position.
- When depressing the "stop" key, the playback key is unlocked.
  Tension spring 66 pulls start strip 50 back to the rest position so that the idler wheel 57 is pulled free of driving ring 165, the brakes 56 and 68 fall onto the reel discs, the pressure roller lever is pulled into the rest position and SK3 is put into "stop" position.

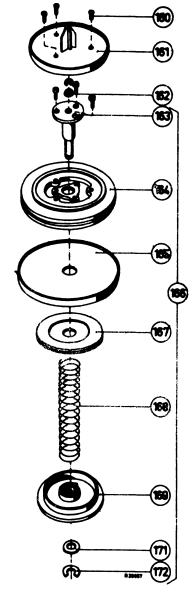


Fig. 9

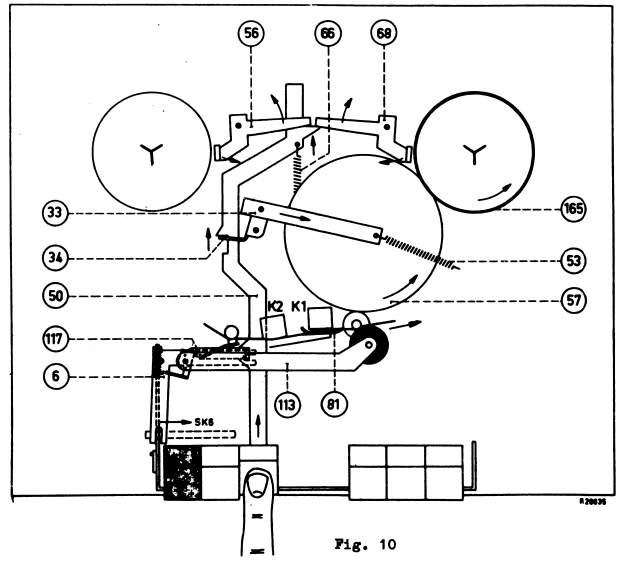


Fig. 10

The position "recording"

- For the recording, both the key "recording" and the key "playback" should be depressed simultaneously. When depressing the playback key, the mechanism comes into the position as described above. When depressing the recording key, part of the mechanism is switched over in order to control the recording-playback switch SK1.
- If knob 254 is put in the position 1-4 or 2-3 and the recording key is now depressed, only control bracket 36 is moved backwards, so that only switch SK1 comes into the position "recording".
- At the same time, stop bracket 2 is locked by the locking bracket 40.
  Now switch disc 9 can no longer be turned.
- If the recording key is unlocked, spring 11a pulls everything into the rest position again!

  N.B. The control cam of bracket 1 can move into the slot of switch disc 9 (see fig. 11) By turning the switch disc the control bracket 1 will put the switch SK4 in the required position. The switch has three positions, viz : 1-4
  2-3
  parallel

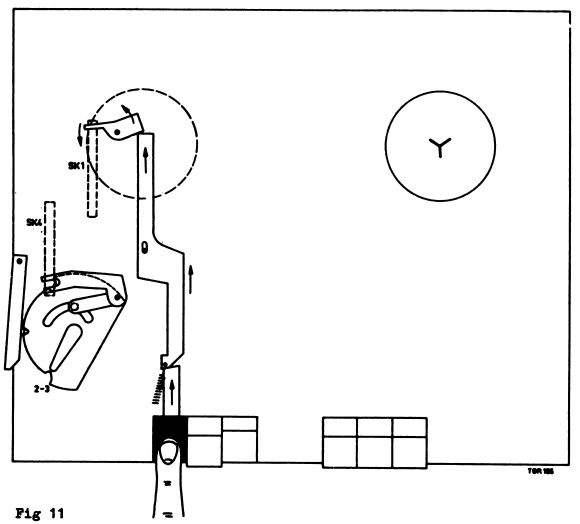


Fig 11

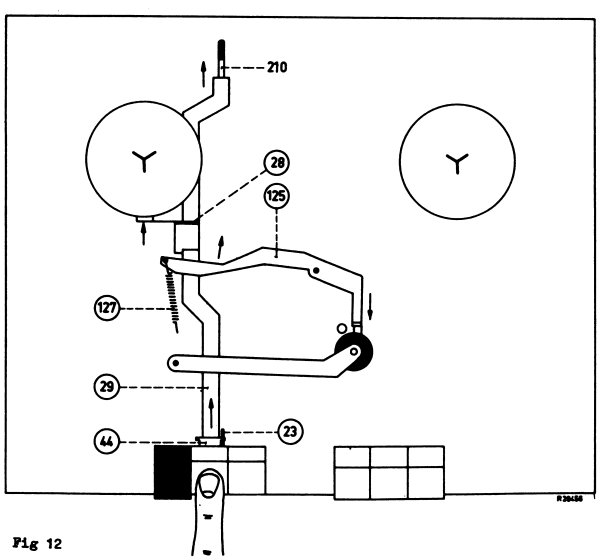


Fig 12

The position "stand by" (rapid stop), fig. 12

For the description of this position it is supposed that the apparatus is in the position "playback".

- When the rapid stop key is depressed, rapid stop bracket 29 moves backwards.
  Lever 125 then also moves backwards so that the pressure roller lever moves forward. The pressure roller then comes free from the capstan.
- At the same time the left-hand reel disc is braked by the brake 28. The tape transport stops.
- When the rapid stop key is depressed far enough, stop bracket 23 will lock the rapid stop bracket.
- When the rapid stop is depressed again, the stop bracket 23 releases the rapid stop bracket. Tension spring 127 then pulls everything into the rest position again.
- The rapid stop can also be controlled from the outside by affixing a foot switch to shaft 210 (for instant, the EL 3984-15).

The position "winding"

- When the winding key is depressed, reel bracket 52 moves backwards. The cam on the reel disc lifts both brakes 56 and 68 from the reel discs (see fig. 13).
- At the same time, the control bracket of the winding wheel 144 is released. Tension spring 92 pulls winding wheel 144 between motor pulley 152 and driving ring 169 of the right hand reel disc. The right hand reel disc is now driven in an accelerated way.

  N.B.: In order to wind the tape sufficiently taut on the right hand reel, some brake action on the left hand reel disc is necessary. This is obtained by the cord 31a and the brake bracket 78b.
- When the stop key is depressed, tension spring 69 pulls reel bracket 52 back to the rest position. As a result, the brakes fall onto the reel discs and the winding wheel 144 is released from both the motor pulley and the driving ring of the right-hand reel disc.

  N.B.: In order to prevent looping of the tape, the left-hand reel disc will be braked first by brake 56 and then the reel disc by right-hand brake 68.
  This is possible because reel bracket 52 falls into the corresponding notch in brake bracket 56 (fig. 14).

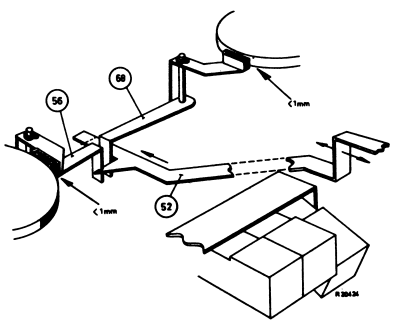


Fig 13

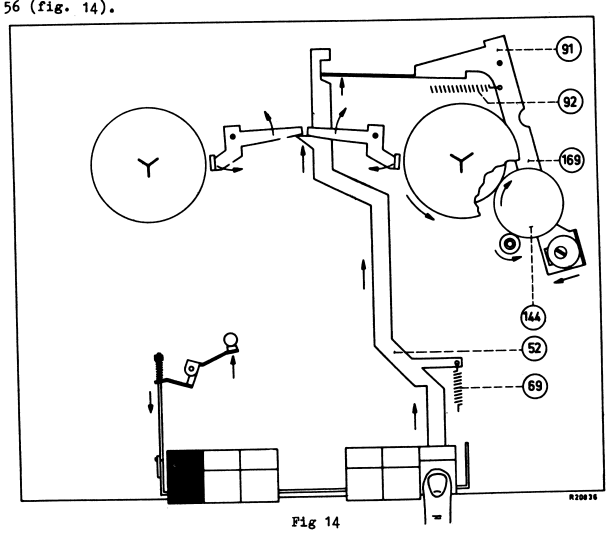


Fig 14

The position "rewinding"

- When the rewind key is depressed, the reel bracket 51 is moved backwards. The brakes 56 and 68 are lifted by a cam on the reel bracket from both reel discs (see fig. 15).
- The brake bracket 89 is released by a cam on the reel bracket so that tension spring 88 pulls the brake felt against the driving ring of the right hand reel disc.
  The brake bracket 78b is pressed against the left hand tape guide in order to brake the tape transport. This brake action is necessary in order to wind the tape sufficiently taut on the left-hand reel disc.
- Lever 97 is released by a cam on the reel bracket so that tension spring 93 pulls the rewind wheel 148 mounted on the lever against the motor pulley. The cord wheel mounted on the same shaft of the rewind wheel is coupled with cord 25 to the rewind roller 38b.
- Lever 38a is released by a bend in the reel bracket 51. As a result of this lever 38a releases the operation bracket 38d from the rewind roller 38b.
  Tension spring 9a pulls the rewind roller 38b with the cord 25 against the transport ring of the left hand reel disc. Now the tape is rewound in an accelerated way.
- When the stop key is depressed, tension spring 67 pulls the reel bracket 51 back to the rest position.
  The brakes 56 and 68 fall onto the reel discs, the brake bracket 89 is lifted from the driving ring of the right-hand reel disc just as is the rewind wheel 97 from the motor pulley.

N.B.: In order to prevent looping of the tape, the right-hand reel disc will be braked first by brake 68 and then the left-hand reel disc by brake 56. This is possible because reel bracket 51 falls into a corresponding hollow in brake bracket 68 (fig. 16).

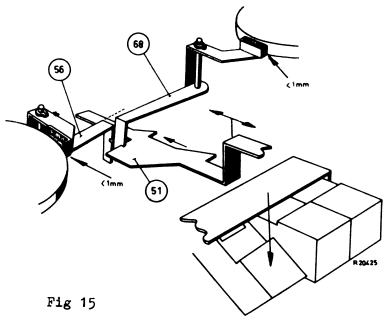


Fig 15

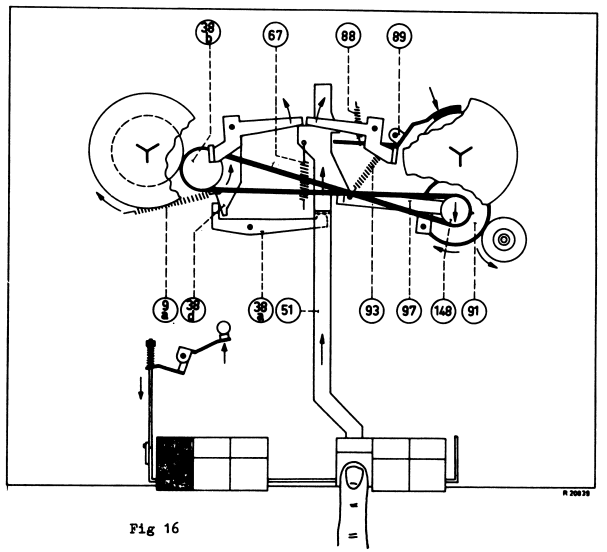


Fig 16

The locking of the control keys and the automatic switch-off

- The control keys are locked by locking bracket 62. This bracket is mounted under the keys, fig. 17. When the recording, playback, winding or rewinding keys are depressed, the cam hooks onto the lock bracket 62 behind the metal frame of the control key.
- When the stop key is depressed, this key will press the lock bracket 62 backwards as a result of which the other depressed keys are unlocked. The stop key itself cannot be halted, see fig. 18.
- Two eccentric grooves are provided in the flywheel rim. The automatic switching-off relay attracts because the switch tape short-circuits the tape contact TC1 or TC2 at the beginning and the end of the tape whereby the relay gets tension (apparatus in position "recording", "playback" or "winding").
  Bracket 107 is attracted by the relay and pulls switching-off bracket 105 downwards.
  Switch cam 106 is mounted on bracket 105. This can then come into the groove of the flywheel rim. The relay, which is hinged, will then move in the direction A so that the raised lip on switching-off bracket 105 also moves the lip of locking bracket 62 in the direction A.
  The depressed keys are then switched off.

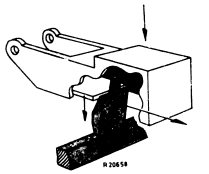


Fig 17

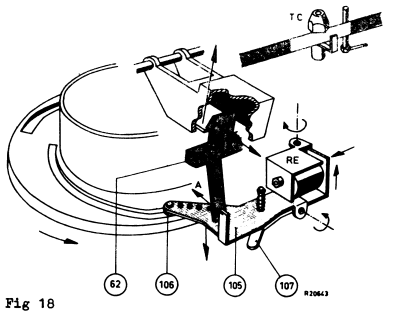


Fig 18

PHILIPS MODEL EL3549A

Mechanical adjustments

Adjustments of the brakes 56 and 68.

Adjustments for a proper tape drive.

- Control bracket 117
- Pressure roller lever
- Bracket 121
- Pressure bracket of the recording/playback head
- Idler wheel 57
- Winding friction 166
- Counter friction of the left-hand reel disc
- Recording/playback head
- Flywheel
- Erasing head 115
- Tumbler pin 116

Adjustment of the rapid stop

- Lever 123
- Brake 28

Adjustments for proper rewinding

- Rewind idler wheel 148
- Brake bracket 89 and 78b.

- Rewind roller 38b

Adjustments for proper winding

- Winding idler wheel 144
- Control bracket 91
- Eccentric 74
- Idler wheel bracket 147
- Counter friction of the left-hand reel disc

Adjustments for the automatic switching off relay RE

Adjustments of the lock bracket 61.

Adjustments of the driving mechanism

- Motor 155
- Tape-speed switch mechanism.

Adjustment of the brakes 56 and 68

- Put the apparatus into position "STOP".
- Both brake brackets should be in a line with each other. See fig. 19.
  If necessary, an adjustment can be carried out by bending the brackets.
- The distance between the vertical lips of the brake brackets and the reel strips 51 and 52 and the start strip 50 should now be about 1 mm (see fig. 20).
  If necessary, this can be adjusted by bending the kink in the reel strips 51 and 52 and in the start strip 50 a little (see fig. 21,22 and 23).
- When the key for rewinding is depressed, the left-hand brake should be lifted first.
  The reel strip 51 should slide into the notch of the right-hand brake bracket, see fig. 21.
  If the key is fully depressed, then the distance between the brake shoes and the reel discs should be greater than 1 mm, see fig. 21.
  If necessary, this can be adjusted by bending the kink in reel strip 51, see fig. 21.
- If the key for winding is depressed, the right hand brake should be lifted first. The reel strip 52 should slide into the notch of the left-hand brake bracket, see fig. 21.
  If the key is fully depressed then the distance between the brake shoes and the reel discs should be greater than 1 mm, see fig. 21.
  This can be adjusted, if necessary, by bending the kink in reel strip 52, see fig. 22.
- When the key for playback is depressed, both brakes should be lifted simultaneously, see fig. 23.
  The distance between the brake shoes and the reel discs should be greater than 1 mm, see fig. 23.
  This can be adjusted if necessary by bending the kink in the start strip 50, see fig. 23.

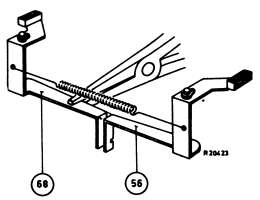


Fig 19

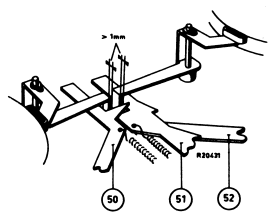


Fig 20

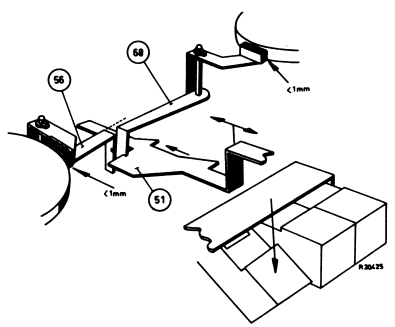


Fig 21;

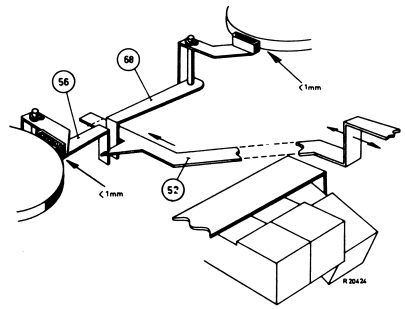


Fig 22

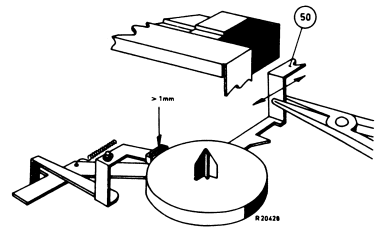


Fig 23

Adjustments for a proper tape transport

- Put the apparatus into the position "playback".
- A space of 0.5 - 1 mm, should be left between the control bracket 117 of the pressure roller lever and the pressure roller lever itself. See fig. 24.
  This can be adjusted if necessary by bending the vertical lip of control bracket 117 which falls into the hollow of start strip 50.
- The pressure roller should be pressed with a force of 1000 - 1300 grammes against the capstan.
  See fig. 24.
  This is ensured by pressure spring 118.
  If necessary adjust this spring by means of screw 114.
- If a tape is inserted into the apparatus the combination pressure roller/capstan should pull at this tape with a force of 500-1000 gr., see fig. 25. (Tape must be positioned behind the tumbler.)
  If this would not be the case, the pressure of the pressure roller against the capstan must be checked, and both the pressure roller and the capstan should be cleaned with alcohol.
- The distance between the pressure roller and bracket 121 should be 1-1.5 mm, see fig. 26.
  This can be adjusted, if necessary, according to fig. 26.
- The force with which the pressure felt presses against the recording/playback head should be 25-40 gr., see fig. 27.
  This can be adjusted with pressure spring 82 by shortening or lengthening same.

  Important: The pressure felt should properly lie against the recording/playback head.
  It should be in parallel with the front side of the head (self-positioning).
  The pressure bracket 81 of the pressure felt should be able to move smoothly.

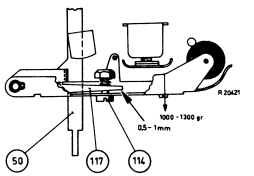


Fig 24

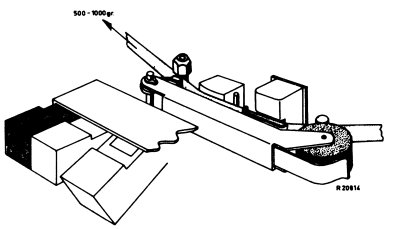


Fig 25

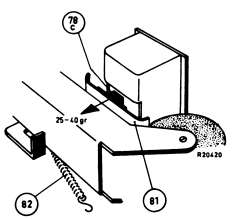


Fig 27

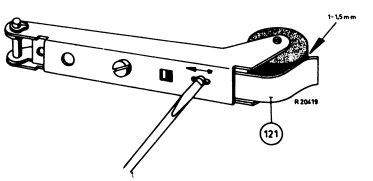


Fig 26

- A clearance (> 0.5 mm) should be between the control bracket 34 of the idler wheel 57 and the start strip 50, see fig. 28. This can be adjusted by bending lip A of the control bracket.
The idler wheel should come properly against the wide part of the capstan and the driving ring 165 of the winding friction of the right-hand reel disc, see fig. 29.
The idler wheel should also run free from the mounting plate of the heads. This can be adjusted by slightly bending idler wheel bracket 33, see fig. 30.
In the rest position, the idler wheel should be pulled free by means of control bracket 34 from the right-hand reel disc.
When the play back key is depressed the pressure roller must come against the capstan at the same time as the idler wheel 57 touches the trans port ring of the right-hand reel disc.
This can be adjusted by bending lip A of bracket 34 (see fig. 28).

- The force with which the winding friction 166 pulls the tape should be 20-30 grammes, measured with a reel with 120 mm tape (full 5" reel), see fig. 32a and at 9.5 cm/sec ($3\frac{3}{4}$"/sec) tape speed.
This force can be adjusted with pressure spring 168.
If the friction is too great then spring 168 should be shortened a little, see fig. 31.
If the friction is too small, then spring 168 should be stretched accordingly.
If necessary, the felt ring under the reel disc 164 and the felt ring on ring 167 should also be cleaned with alcohol. Then the driving ring 165 should also be cleaned.

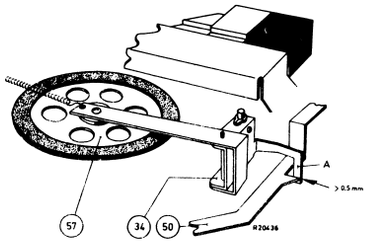


Fig 28

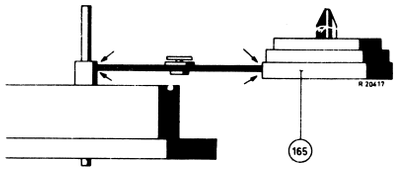


Fig 29

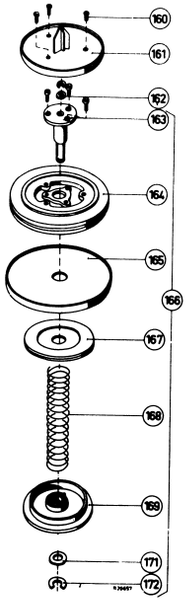


Fig 31

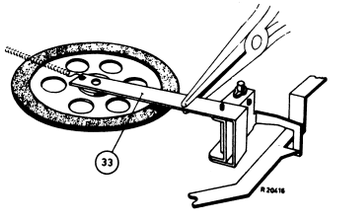


Fig 30

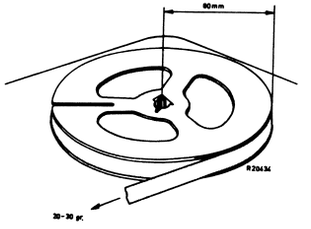


Fig 32a

- The force with which the tape is kept taut during playback should be approx. 20 gr, measured with a reel with 120 mm tape (full 5" reel), see fig. 32 b
This friction is obtained by the braking action of the driving cord of the counter and the braking action of brake bracket 78b, which presses the tape against the left-hand tape guide.
The apparatus must be switched to position "Winding" for measuring this force.
The bracking action can be adjusted by means of pressure spring 63.
Adjustment of this spring is effected by the screws A (see fig. 33).

- Recording/playback head 129. Apparatus in the position "STOP".
Remove the tumbler pin 116 and protecting cap 126.
Regulate the height of the head with the aid of the 3 screws A+B in such a way that this stands approximately at the correct height, and straight, (front side parallel to the capstan). See fig. 34.
Place a super long-playing tape (for instance, EL 3915/80) in the apparatus.
Push the pressure roller by hand forward and check that the tape is pulled against the head without touching the tape guide D. (Pressure felt may not come against the head.)
If, however, the tape is caught for a moment at the lower or the upper lip of the tape guide B, then the height of the head must be readjusted by means of the screws A+B until the tape is pulled against the head without being caught by moving the pressure roller lever forward. (Tape must be taut.)
Mount the screening cap 126 and place a test tape WT 939 15 in the apparatus. Switch the apparatus in the position "playback", track 1-4.
Connect a valve voltmeter to the diode output.
Regulate with screw A to maximum output voltage "I" (make a note of the output voltage).
Put track switch in position 2-3. Regulate with screw A to maximum output voltage "II". (Make a note of the output voltage.)
Switch to position 1-4 and read the output voltage "III" without turning screw A.
If no more than 2 dB difference exists between the output voltages "I" and "III" then the adjustment is in order. If the difference is however greater than 2 dB, then track 1-4 must be adjusted again to maximum output voltage "I" with screw A.
Switch to track 2-3 and read the output voltage "IV" (without turning screw A).
If between the output voltages "II" and "IV" there is no more difference than 2 dB then the adjustment is in order. If this is not the case, then the head is defective and must be replaced!

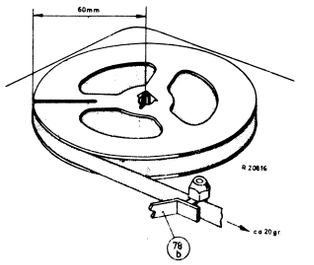


Fig 32b

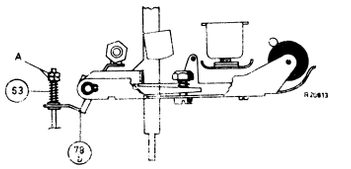


Fig 33

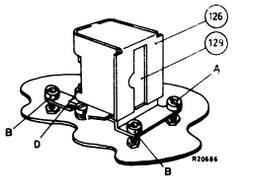


Fig 34

- Flywheel 98

When the adjustment of the recording/playback head 129 is in order, it may still happen that when the apparatus is switched to recording or playback the tape runs against the tape guide on the recording playback head.
This is due to the fact that the capstan does not stand vertically with respect to the tape course.

Loosen the three fixing screws of the mounting plate of the head to such an extent that it is just about possible to shift this plate.
Place a super long-playing tape in the apparatus and switch the apparatus to the position "playback".
Adjust the capstan in such a way by moving the mounting plate of the head that the tape is pulled through the tape guide at the recording/playback head without wrinkling.

Checking of the adjustment of the recording/playback head

About 100 cc carbon tetrachloride, with dissolved therein ½ gr. iron powder with a grain-size of 3-5 µ (code number A9 881 36/F10) is needed for this check. It is best to keep this liquid in a bottle with a wide neck.
Record on a piece of tape 4 tracks of 1000 c/s with 100 % modulation, the erasing head must be put out of action (in position "stereo").
Immerse a piece of about 10 cm in the bottle containing the abovementioned liquid. Shake the bottle firmly, wait for about 10 seconds and take the piece of tape cautiously out of the liquid. The iron powder has deposited on the four tracks.
The track picture should be properly symmetric as has been drawn in fig. 35.
If the track picture is not good then the following should be checked:

1. Tape fouls against the tape guide of the recording/playback head. (See adjustment recording/playback head.)
2. The tape guide on the recording/playback head has moved with respect to the cores (head should be replaced).

- Erasing head 115

The height of the erasing head must be so adjusted that the tracks can be completely erased and those that should not be erased are attenuated to a maximum of 1.5 dB.
Place a tape in the apparatus.
Adjust the height with the aid of three screws in such a way that the upper core protrudes 0-0.1 mm above the upper side of the tape, fig. 36.
Here the core and the front side of the head should be parallel to the tape.

Checking of the adjustment of the erasing head

Make a recording on a piece of tape of about 3 metres on track 3 (position 2-3) with a frequency of 1000 c/s and 100 % modulation. (See the horizontally shaded part of fig. 37.)
Turn the tape over.
Erase on track 4 (position 1-4) a piece of about 1 metre (see the vertically shaded part of fig. 37).
Depress the stop key, and switch to track 2 (pos. 2-3).
Erase on track 2 a piece of about 1 metre (see vertically shaded part of fig. 37).
Depress the stop key and wind the tape about 1 m.
Turn the tape over and connect a valve voltmeter to the diode output.

- Checking the slowing down period of the flywheel 98

- Mark the upper side of the pressure roller.
- Switch the apparatus to position "playback", tape speed 2.4 cm/sec. (15/16"/sec.).
- When the apparatus is switched off by putting the tape speed switch into position "OFF" (between 15/16 and 1 7/8"/sec.) the flywheel should run out until the pressure roller has made at least one more revolution. (Check this by means of the mark on the pressure roller).
- If the slowing down period is too short then the flywheel bearings must be greased as described in chapter "Maintenance").
- Also check wether the pressure runs smoothly. (If necessary grease it as described in chapter "Maintenance").

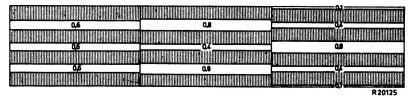


Fig 35

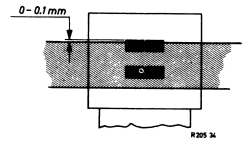


Fig 36

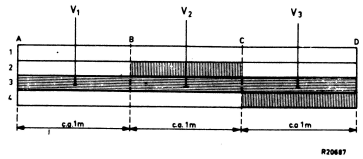


Fig 37

Play back the whole recording of track 3 and make a note of the indications of the valve voltmeter. The valve voltmeter can indicate three different voltages, namely, of A-B, V1; of B-C, V2; and of C-D, V3 (see also fig. 37).
The difference between the voltages V1-V2 and V1-V3 may not be more than 1.5 dB.
If the output voltages V2 and V3 are good, then the adjustment is in order.
If the output voltage V2 is too low, then the erasing head has to be adjusted somewhat lower.
If the output voltage V3 is too low, then the erasing head has to be adjusted somewhat higher.
After this repeat the same measurement.
Erase the recording of track 3 and play back the erased track.
Absolutely nothing should be heard.

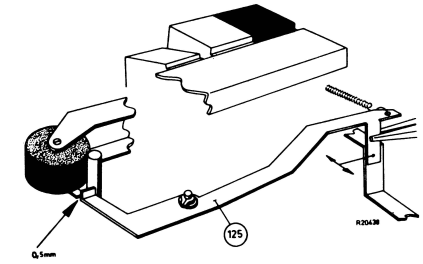


Fig 38

- Tumbler pin 116

When the tape transport is entirely adjusted properly, the tumbler pin 116 should be mounted. This should be done in such a way that the course of the tape does not change by this. The pin should stand vertical with respect to the mounting plate of the heads.

Adjustment of the rapid stop

- When the apparatus is in position "playback", the distance between the pressure roller lever and the lever 125 for the rapid stop should be 0.3 - 0.5 mm (see fig. 38).
This can be adjusted by bending the vertical lip of the lever.
- When the rapid stop key is depressed, lever 125 should come against the pressure roller lever and at the same time brake 28 against the left hand reel disc of brake 28, see fig. 39).
This can be adjusted by moving brake 28 with respect to the rapid stop bracket 29.
If the rapid stop key is fully depressed, then the locking bracket 23 should stop the key, see fig. 40)

If the key is depressed again, then lock bracket 23 should release the key.
Torsion spring 24 then pushes the lock bracket 23 in the rest position again.

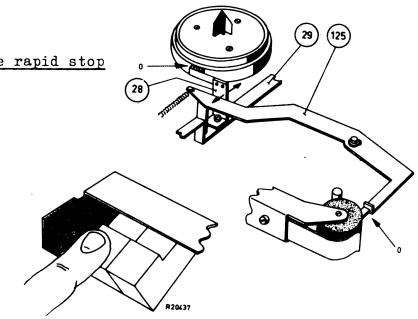


Fig39

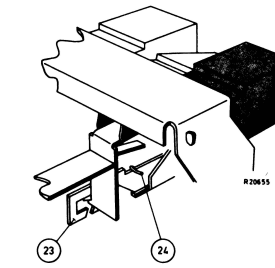


Fig 40

Adjustments for proper rewinding

- In the rest position of the apparatus the rewinding idler wheel 148 should lie more than 1 mm free of the motor pulley (see fig. 41).
This can be adjusted by moving plate 94.
The idler wheel should also run free of the right hand reel disc.

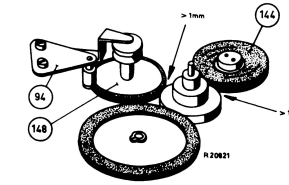


Fig 41

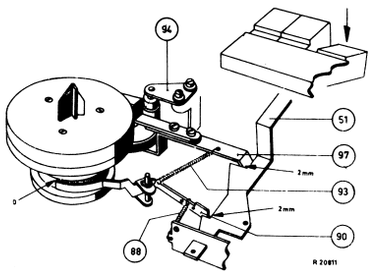


Fig 42

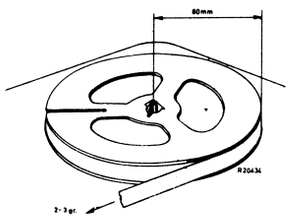


Fig 43

- If the key for rewinding is depressed, reel strip 51 should release idler wheel bracket 97 and brake bracket 89 about 2 mm, see fig. 42.
  Tension spring 93 should pull idler wheel 148 against the 19-cm/sec step of the motor pulley.
- The braking action of brake bracket 89 has to be 2-3 gr., measured with a full 5" reel (reel-diameter 120 mm). See fig. 43.
  This force can be adjusted by re-hooking tension spring 88 on brake bracket 89. See fig. 42.
- When the key for rewinding is depressed a play of approx. 1 mm should be present between lever 38a and operation bracket 38d of the rewind roller, see fig. 44.
  Tension spring 10 should pull roller 38b against the reel disc with a force of 300-350 gr (see fig. 44.
- In position "STOP" the lever 38a should move the operation bracket 38d so far to the right that the rewind roller 38b comes completely free from the left hand reel disc.
- A play of approx. 0.2 mm should be between the idler wheel 148 and bracket 95 (see fig. 45).
- The mounting of the bearing bracket 96 differs with the 50 c/s and 60 c/s apparatus (see fig. 45).
  When modifying from 50 c/s to 60 c/s or vice versa the bearing bracket 96 must be mounted as shown in fig. 45.

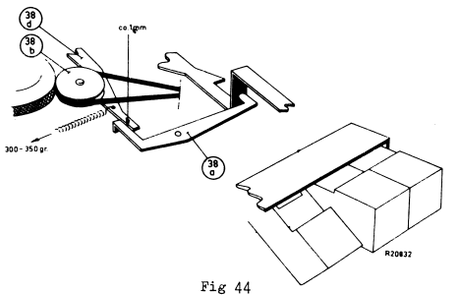


Fig 44

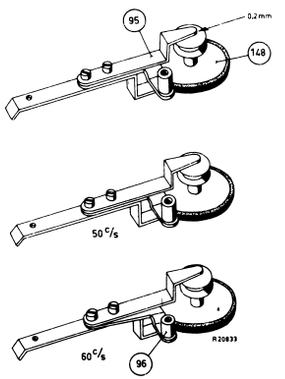


Fig 45

Adjustments for proper winding

- In the rest position the winding idler wheel 144 should be at least 1 mm free of the motor pulley and of the driving disc of the right-hand reel disc, fig. 41. This can be adjusted by bending the lip of bracket 91 which falls into the hollow of reel strip 52.

  N.B.: The lip of the bracket 91 should not touch the chassis.
- In the position "winding" the control bracket 91 of the winding idler wheel 144 should be about 2 mm free of the reel strip 52, see fig. 46.
  This can be adjusted by bending the lip of bracket 91. See fig. 46.
- The winding idler wheel 144 should be pulled by spring 92 between the driving disc of the right hand reel disc and the motor pulley, fig. 46.
- Between the stop lip of idler wheel bracket 147 and the eccentric 74 there must be a clearance of 0-5 - 0.7 mm, see fig. 46.
  This can be adjusted by turning eccentric 74.
- It must be possible that idler wheel bracket 147 moves without jamming in the longitudinal direction of bracket 91.

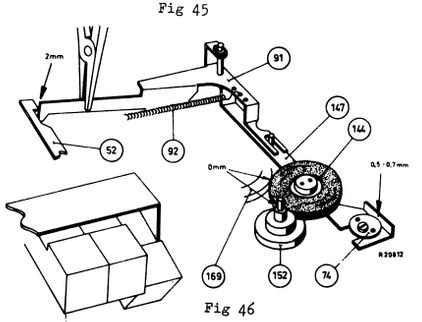


Fig 46

- The force with which the tape is kept taut during winding should amount to approx. 20 grammes, measured with a full 5" reel (reel-diameter 120 mm) see fig. 47. This braking action is obtained by the driving cord for the counter and the braking action of brake bracket 78b, which presses the tape against the left-hand tape guide.
  In order to measure this force the apparatus must be put into position "Winding".
  The braking action of brake bracket 78b can be adjusted by means of pressure spring 63.
  This spring can be tensioned with the nuts A, see fig. 48.

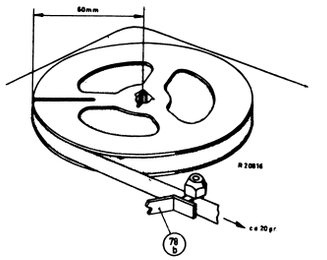


Fig 47

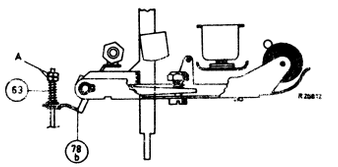


Fig 48

Adjustments of the automatic switching off relay 103

- In the rest position of the relay 103 the switch cam 106 should stand about 1 mm above the rim of the flywheel, see fig. 49.
  This can be adjusted by moving the fixing bracket 109 of the relay with respect to the chassis (see fig. 49).
  At the same time the switch cam 106 should stand above the lead-in groove of the flywheel.
  This can be adjusted by bending lip A of bracket 111 a little, see fig. 49.
  The distance between the relay coil and the lip on bracket 107 should be 3-3.5 mm (in the rest position) see fig. 50.
  This can be adjusted by bending the lip B, see fig. 50.
  If the relay attracts, the switch cam 106 should be pulled in the groove of the flywheel.
  For the adjustment of the switch SK11, consult chapter "Adjustments of the switches".

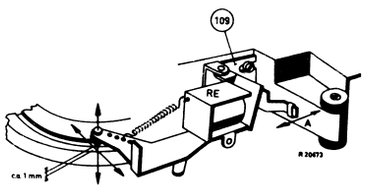


Fig 49

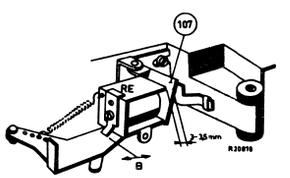


Fig. 50

PHILIPS MODEL EL3549A

Adjustment of the lock brackets 40 and 61

- When the winding or rewinding key is depressed, the recording, rapid stop and playback keys should be locked.
  This is ensured by the lock bracket 61, see fig.51.
  This can be adjusted if necessary by bending somewhat the lips of lock bracket 61.

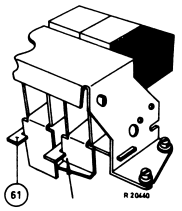


Fig. 51

Adjustments of the driving mechanism

- The motor.
  The rotor of the motor must be so adjusted that it correctly rotates in the stator field.
  There should be a distance of 1.5 ± 0.2 mm between the rotor and the laminations of the motor, see fig. 52.
  This distance can be adjusted by means of adjustment screw, see fig. 52.
  Tighten the counter nut 158 firmly after the adjustment.
  The height of the pulley 152 on the motor spindle measured between the upper side of the step for 19 cm/sec (7½"/sec) tape speed and the laminations of the motor should be 25.0 ± 0.1 mm, see fig. 52.

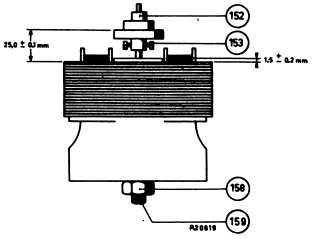


Fig 52

- Tape speed switch mechanism

  Put the apparatus in the position 19 cm/sec (without mains voltage).
  Tighten the three screws which affix plate 138 to the chassis to such an extent that this plate cannot easily be moved, see fig. 53.
  Place the metal covering plate on the apparatus and screw them so tightly that the 5 screws are all exactly in the middle of the hole in this covering plate.
  Now put the shaft of the switch cam 146 exactly in the middle of the hollow in the covering plate and make sure that this shaft does not move.

  Check: Place the ornamental cap 258 on the apparatus. The shaft of switch cam 146 should protrude freely through the hole in the ornamental cap.
  It must be possible that the control knobs move freely in the hollows in the ornamental cap.

  Remove the ornamental cap and the covering plate and firmly secure the three screws, which affix the plate 138, without moving the shaft of switch cam 146.
  Undo the two screws which affix stop plate 142 on switch cam 146 one turn. see fig. 53.

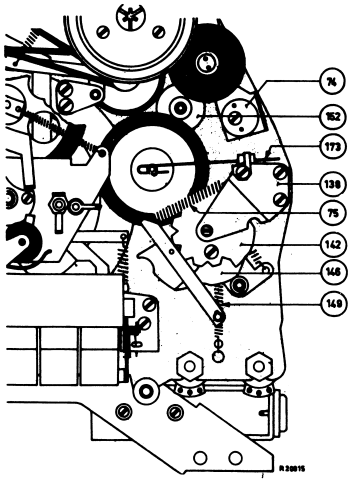


Fig 53

Adjust roller 177 on slide 179 in such a way with the aid of the stop plate 142 that there is a clearance of about 0.5 mm between this roller and the hollow in the switch cam, see fig. 54.
The idler wheel 175 should properly lie against the flywheel and against the 19 cm/sec (7½"/sec) step of the motor pulley.
Switch the apparatus to the "OFF" position between 19 and 9.5 cm/sec (7½-3¾"/sec). The idler wheel should now lie free of the motor pulley, see fig. 55.
Switch the apparatus to the position 9.5 cm/sec (3¾/sec), see fig. 56 to the position 4.75 cm/sec (1 7/8"/sec), see fig. 57 and to the position 2.4 cm/sec (15/16"/sec), see fig. 58.
The idler wheel 175 should properly come between pulley 152 and the flywheel in all these positions and always stand in the middle of the relevant step of pulley 152.
The distance between roller 177 and the switch cam should always amount to about 0.5 mm.
If the idler wheel is not put in the middle of the relevant steps of the pulley, bracket 181 should be bent a little. The idler wheel should be, however, in a purely horizontal position!
In the position 2.4 cm/sec (15/16"/sec) the idler wheel should remain more than 1 mm under the rim of the flywheel.
In the three "OFF" positions the idler wheel should be pulled entirely free of the pulley.

N.B.: The idler wheel bracket 179 should be able to move freely in its longitudinal direction in guide bracket 181.

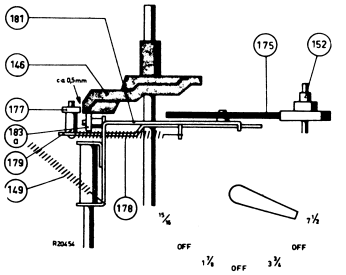


Fig 54

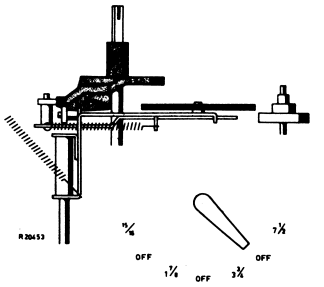


Fig 55

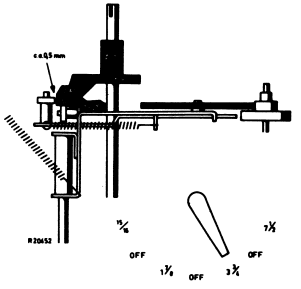


Fig 56

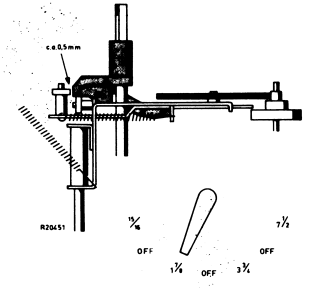


Fig 57

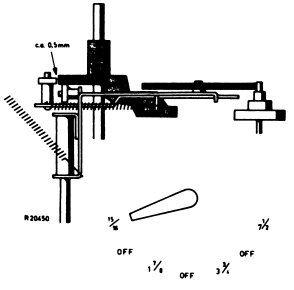


Fig 58

Adjustment of the switches

- SK0, mains switch.
  The switch plate 183 must be so adjusted that the control pin of the mains switch in each "OFF" position has a clearance of 0.2-0.8 mm in the hollow in the switch plate 183, see fig. 59.
  This can be adjusted by varying the switch plate 183 in height.

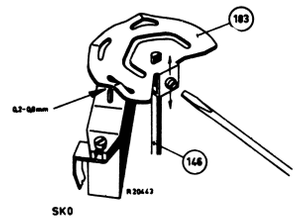


Fig 59

- SK1, recording/playback switch.
  The lip of the control bracket 36 should fall into the bracket which has been affixed to the slider of the switch SK1, see fig. 60.

  Depress the recording key.
  The slider of the switch SK1 is now put into the position "recording" by bracket 11.

  Checking : The slider must now be moved so far that a lock pin of ± 1.5 mm thickness can be pushed into the hole in the switch, see fig. 60.
  If this is not possible, then the slider should be readjusted by bending the raised lip of bracket 11, see fig. 60.

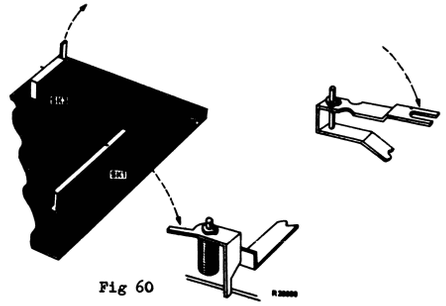


Fig 60

- SK2, frequency correction switch.
  The adjusting screw on the slider of SK2 should fall into the hollow of control bracket 184, see fig. 61.
  Put tape speed switch in the position 19 cm/sec. (7½"/sec.).
  Control bracket 184 puts the slider of SK2 in the position for frequency correction on 19 cm/sec. (7½"/sec.).
  Insert a lock pin of about 1.5 mm thickness through the hole in the switch, see fig. 61.
  If this is not possible, then the adjusting screw must be so turned that the lock pin can be easily pushed through the switch.

  N.B. : Some apparatus are not provided with an adjustment screw. With these apparatus the switch is adjusted by bending it, see fig. 61.

  Checking : Switch the speed switch consecutively to 9.5 cm/sec. (3¾"/sec.), 4.75 cm/sec. (1 7/8"/sec.) and 2.4 cm/sec. (15/16"/sec.) and insert the lock pin through the switch in each of these positions.

  For each of the positions this should proceed with ease.
  After adjustment, firmly tighten the nut of the adjusting screw.

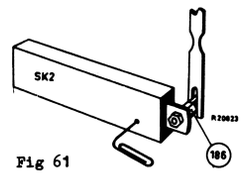


Fig 61

- SK3, playback switch.
  The adjusting bracket on the slider of SK3 should snap into the hollow of control bracket 5.
  Put the apparatus in position "playback".
  Control bracket 5 puts the switch into position "playback".
  Insert a lock pin of about 1.5 mm thickness through the hole in the switch.
  If this is not possible, then the adjusting bracket must be so bend that the lock pin can be easily pushed through the switch.

  Checking : Put the apparatus into position "STOP". Here too it must be possible to push the lock pin easily through the switch.

- SK4, track selector.
  The adjusting screw on the control bracket of SK4 should fall into the hollow of control bracket 1, see fig. 62.
  Put the track selector into the position "parallel".
  Control bracket 1 puts the track selector switch SK4 into the position "parallel", see fig. 62.
  If this is not possible, then the adjusting screw must be so turned that the lock pin can be easily pushed through the switch.

  N.B. : Some apparatus are not provided with an adjustment screw.
  With these apparatus the switch is adjusted by bending the operation bracket of the switch, see fig. 62.

  Checking : Switch the track selector switch consecutively to 1-4 and 2-3 and insert the lock pin through the switch in each of these positions.
  For each of the positions this should proceed with ease.

  After adjustment, firmly tighten the nut of the adjusting screw.

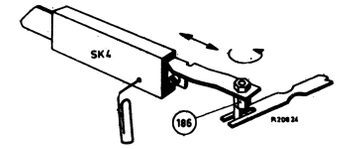


Fig 62

- SK11, switch for automatic switch relay.
  When the relay stands in the rest position, SK11 should be opened approx. 0.5 mm, see fig. 63.
  This can be adjusted by bending the lip on to which the switch SK11 has been mounted, see fig. 63.
  If the switch cam 106 of the relay is pressed on the flywheel rim (not in a groove) then the switch should be closed.

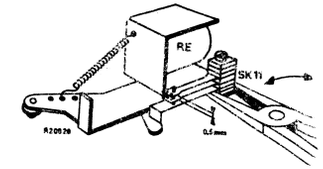


Fig 63

- SK12, switch for automatic switching off relay.
  When the apparatus stands in the position "STOP", SK12 should be open, see fig. 64.
  If the apparatus is put in the position "playback" or "winding", then the brake brackets 56 and 68 should move the control leaf spring of SK12 backwards, as a result of which the switch closes.
  This can be adjusted if necessary by bending the control leaf spring, see fig. 64.

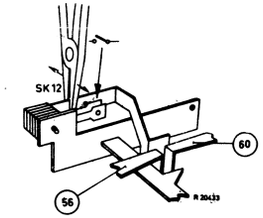


Fig 64

- SK13, break contact switch for automatic switching-off relay.
  The switch SK13 has been mounted under the operation keys.
  If one of the keys is normally depressed, then SK13 should remain closed.
  If one of the keys is however more firmly depressed then the lip on the operation bracket 62a should come against the long lip of the switch and so open the switch, see fig. 65.
  This can be adjusted, if necessary, by varying the switch in height.

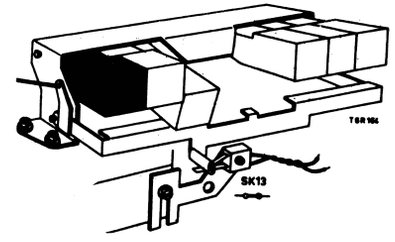


Fig 65

Replacement of parts

Important:- All screws which have been undone should be sealed after tightening.

- All parts which have been loosened should be adjusted after repair as described under "Mechanical adjustments".
- If new parts have been mounted these should be greased, if necessary, according to the greasing instructions (see "Maintenance").

Replacement of pressure roller 122

- Undo the shaft 119 of the pressure roller and remove same, see fig. 66.
- The pressure roller 122 can be replaced. However, specially take care of the rings 123 under and above the pressure roller.
- Mounting is done in the reverse order.

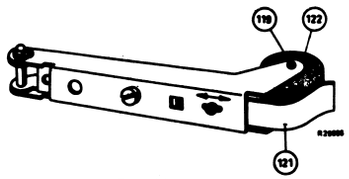


Fig 66

Replacement of pressure bracket 81 and the pressure felt which presses against the recording/playback head, see fig. 75a.

- Remove the clamping ring which fixes the pressure roller lever on the shaft. Pull pressure roller lever upwards.
- Unhook tension spring 82 from pressure bracket 81.
- Remove the clamping ring which fixes the pressure bracket 81 on the shaft. Take the pressure bracket out of the apparatus.
- The pressure felt can now be easily replaced.
- Mounting is done in the reverse order. (Check the adjustment of the pressure bracket.)

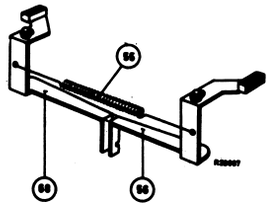


Fig67

Replacement of the left-hand reel disc, see fig. 75a.

- Undo the three screws 26 which fix the upper part of the reel disc 27. The upper part can be replaced.
- Removing the clamping ring which fixes the lower part of the reel disc 31. The lower part can be replaced.
- Mounting is done in the reverse order.

Replacement of the right-hand reel disc and the winding friction, see fig. 75a.

- Remove the intermediate wheel 57 by loosening shaft 32.
- Undo the three screws 160 which fix the upper part of the reel disc 161. The upper part can be replaced.
- Undo the two screws which fix plate 94. Take plate 94 with idler wheel bracket 97 out of the apparatus, after tension spring 93 has been unhooked from the idler wheel bracket.
- Remove the clamping ring which fixes the winding friction 166. The winding friction can be replaced when brake bracket 89 is lifted from the reel disc.
- If clamping ring 172 is removed, the winding friction can be dismantled.
- Mounting is done in the reverse order.

Replacement of the brake brackets 56 and 68, see fig. 67.

- Undo the tension spring 55 between both brake brackets.
- Remove the clamping rings which affix the brake brackets.
- The brake brackets can now be replaced.
- Mounting is done in the reverse order.

Replacement of the brake shoes of the brakes

- Dismount the brake brackets as described above.
- Remove the old brake shoe with a knife.
- Properly clean the metal of the brake bracket with aceton.
- Thinly smear the new brake shoe and the metal with Pliobond, code number A9 881 15/t30.
- Allow both parts to dry for about 15 minutes. Then firmly press the brake shoe onto the metal.
- The brake bracket should be allowed to dry for 1½ hours before it can be remounted in the apparatus.

Replacement of rewinding wheel 148, see fig. 75a.

- Unhook tension spring 93 from idler wheel bracket 97.
- Undo the two screws which affix plate 94 to the chassis. Take plate 94 out of the apparatus with bracket 97 and rewind wheel 148.
- Undo bracket 95.
- The idler wheel 148 can now be replaced.
- Mounting is done in the reverse order.

Replacement of parts of the speed switch mechanism, see exploded view, fig. 75a

- Put the speed switch in position 19 cm/sec (7½"/sec). Unhook tension spring 75 from bracket 138.
- Undo the screw with which the switch disc 183 has been affixed to switch cam 146.
- Unhook tension spring 149 from the chassis.
- Undo the three screws which affix plate 138 to the chassis and remove bracket 138. Switch cam 146 with locking plate 142 can now be replaced.
- When the clamping ring on the shaft of idler wheel 175 is removed the profile spring 173 can be replaced.
- The idler wheel 175 can be replaced when the second clamping ring is removed from the shaft of the idler wheel.
- Guide bracket 181 with slide 179 can also be taken out of the apparatus.
- Mounting is done in the reverse order.

Replacement of parts of the key block, see fig. 68 and 75a

- When replacing the control keys or locking brackets 61 and 62 it is sometimes easier to dismount the whole key block.
- Remove the nut and pressure spring 63 which is mounted to the shaft 67a from the brake bracket 78b.
- By removing the four screws A and unhooking spring 69, the whole block can be taken out of the apparatus. (The control bracket 21 of the multiplay switch SK8 must be unhooked).
- By pulling the shafts 204 and 208 out of the block the control keys can be replaced.
- By pulling the shaft 209 out of the block, the locking bracket 62 can be replaced.
- Mounting is done in the reverse order.

Replacement of rapid stop bracket 29 and the strips 50, 51 and 52

- Undo the three screws with which the mounting plate of the heads is affixed to the chassis and remove the mounting plate of the heads. (Unhook tension spring 53 from idler wheel bracket 33.)
- Remove the clamping ring with which bracket 34 is affixed; bracket 34 can be taken out of the apparatus with idler wheel bracket 33 and idler wheel 57.
- Unhook tension spring 55.
- Remove the brake brackets 56 and 68 after both clamping rings with which these brackets have been affixed have been removed.
- Unhook tension springs 66 and 67.
- The start strip 50 and the winding strip 51 can now be replaced.
- Remove the hook 210 which is affixed to rapid stop bracket 29.
- Unscrew guide bracket 211 and remove same.
- The rapid stop bracket 29 can now be replaced.
- Unhook tension spring 93.
- Undo plate 94 and take it complete with idler wheels out of the apparatus.
- Unhook tension spring 69.
- Winding strip 52 can now be replaced.
- Mounting is done in the reverse order. Check however that the vertical lip of the control bracket of the pressure roller lever properly comes into the hollow of the control bracket of SK3.
- Readjust the tape transport! See part II chapter 3.

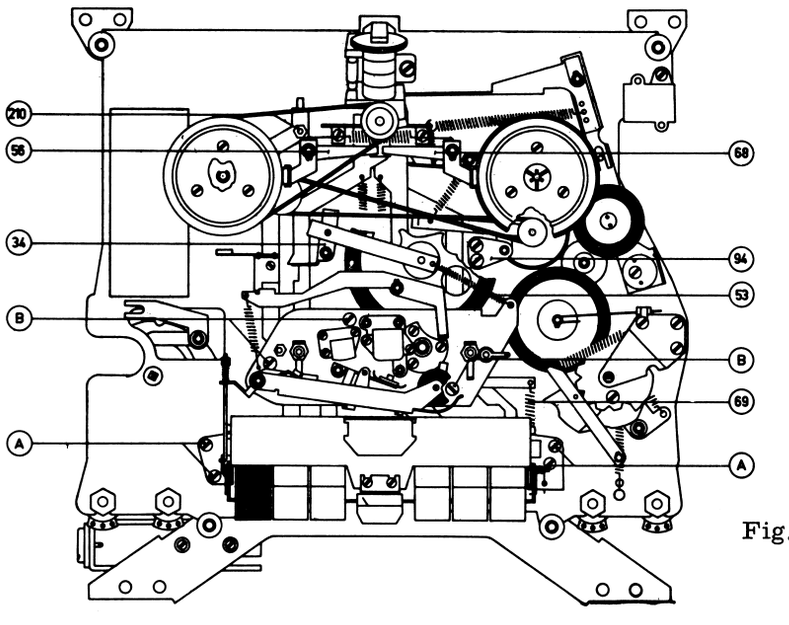


Fig. 68

Replacement of idler wheel 57 for winding friction, see fig. 69

- Unhook tension spring 53 from idler wheel bracket 33.
- Unscrew the shaft 32 which affixes idler wheel bracket 33 to bracket 34.
- Take the idler wheel bracket 33 (with idler wheel 57) out of the apparatus.
- Remove the clamping ring which affixes the idler wheel to bracket 33.
  The idler wheel can now be replaced.
- Mounting is done in the reverse order.

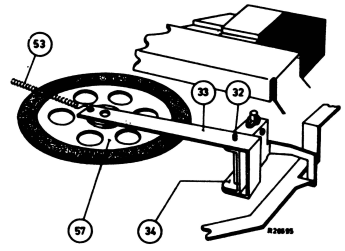


Fig 69

Replacement of the mains switch SK0, see fig. 70

- Remove the clamping ring which fixes switch bracket 184 and take out switch bracket 184.
- Undo the screw which affixes switch plate 183 on shaft 146 and remove switch plate 183.
- The mains switch can be unscrewed and replaced.
- Mounting is done in the reverse order.

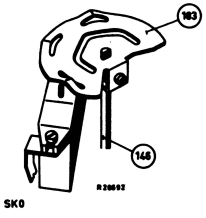


Fig 70

Replacement of the motor and motor pulley 152, see exploded view, fig. 75a.

- By undoing the three screws which affix the motor mounting plate onto the chassis the complete motor can be taken out of the apparatus.
- When only the motor pulley 152 is to be replaced the two fixing screws 153 should be undone and the idler wheel 144 must be removed.

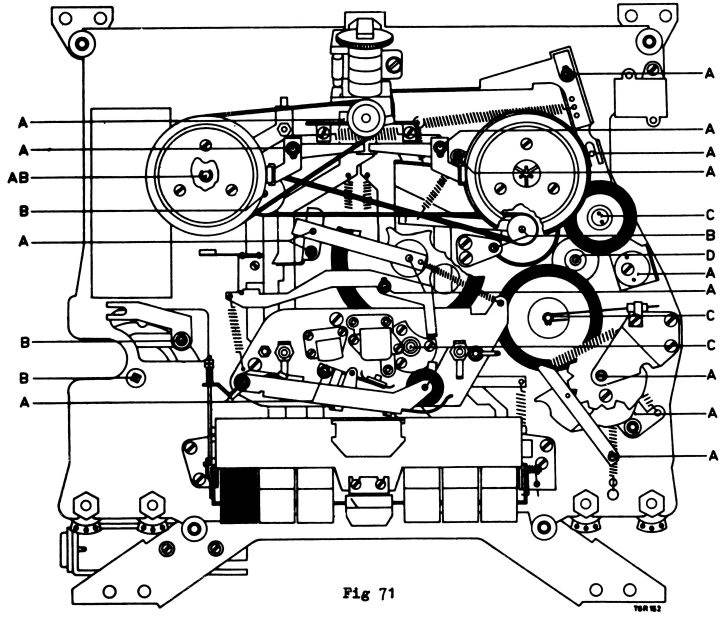


Fig 71

Maintenance

After a working period of about 500 hours it is necessary to clean the apparatus and to grease it again at various points.
The following points must be cleaned with methylated spirits :

- Tape guides 80.
- Erasing head and recording/playback head.
- Capstan.
- Pressure roller.
- Cords 25 and 31a.
- Pulley
- Contact surface of the flywheel.
- The contact surfaces of the idler wheels 57, 144, 148 and 175.
- The grooves of the rewind roller 38b and the rewind wheel 148.

For greasing after cleaning, see instructions below:

Grease with Shell Alvania EP2 (see A in figures 71 and 72

Code number: A9 881 31/P50.
Hinge point of the pressure roller lever 113.
Hinge point of the pressure bracket 81.
Hinge point of bracket 34.
The upper side of the reel disc shafts.
Hinge points of the brake brackets 56 and 68.
All contact faces of the strips 50, 51 and 52 in the guide bracket 87.
Hinge point of control bracket 91.
All contact faces of winding bracket 147.
Hinge point of brake bracket 89.
Hinge point of the rapid stop bracket 125.
Hinge point of switch cam 146 with bracket 138.
All contact faces of idler wheel bracket 179.
Hinge point of bracket 78.
Hinge point of bracket 184 in switch disc 183.
Shaft of roller 12.
Hinge points of the brackets 1 and 5 with switch disc 9.
Hinge point of bracket 11.
Hinge point and contact faces of the brackets 5 and 6.
Contact faces of locking bracket 23 of rapid stop.

- The driving ring 156 of the winding friction.
- The brake blocks of the brakes 56 and 68 and the brake block of the rapid stop.
- The outer sides of the reel discs against which the brakes press.

Clean the following felts carefully with a brush :

- The pressure felt which lies against the recording/playback head.
- The brake felt 90 of brake bracket 89.

Grease with bearing oil (see B in the figures 71 and 72

Code number: A9 881 29/F50.
Shaft 7 of switch disc 9.
Bearing of bracket 1.
Bearings of the reel discs.
Bearings of the rewind wheel 148.
Bearing of idler wheel bracket 96.
Lower bearing of switch cam 146.
Bearing of bush 180.
Bearings of control brackets 36 and 38.
Bearing of locking bracket 40.

Grease with Calypsol D5 (see C in the figures 71 and 72

Code number: A9 881 27/T50.
Bearing of winding idler wheel 144.
Lower and upper bearing of the flywheel.
Bearing of idler wheel 175.
Bearing of pressure roller 122.
Pivot of the rotor of the motor.

Grease with bearing oil (see D in the figures 71 and 72

Code number: A9 881 29/F50.
Upper and lower bearing of the motor.

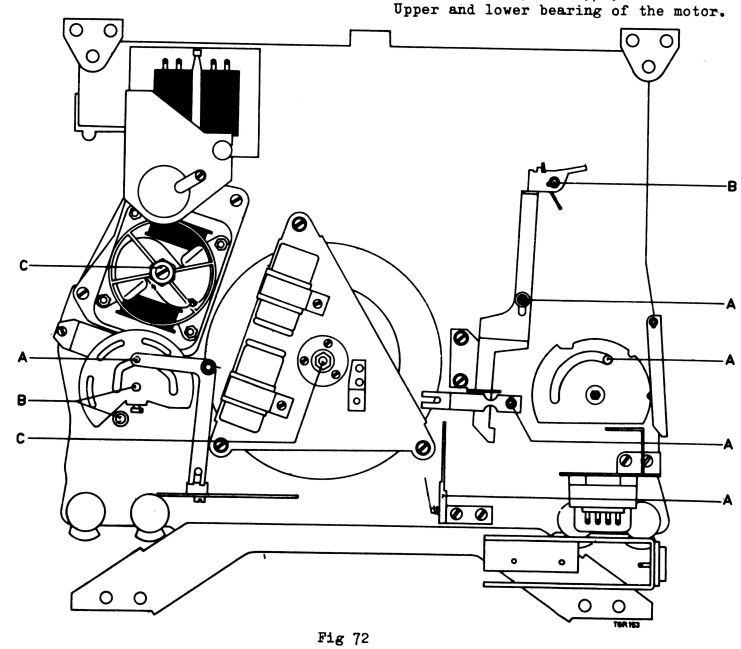


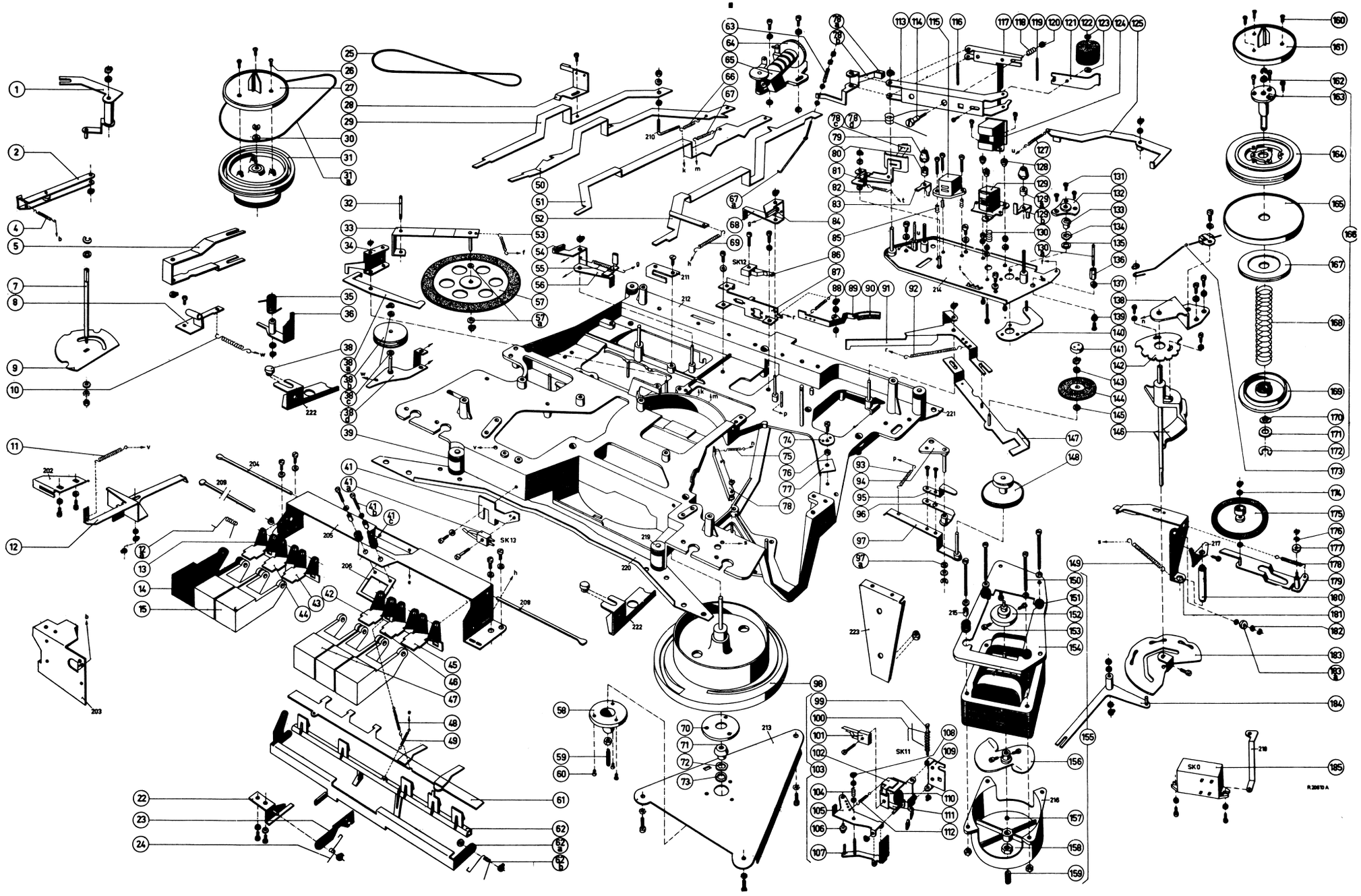
Fig 72

PHILIPS MODEL EL3549A

Item	Code number	Description
1	WT 837 32	Control bracket SK4
2	WT 883 05	Stop bracket
4	WT 741 63	Tension spring
5	WT 032 27	Control bracket SK2
7	WT 646 87	Shaft
8	WT 897 48	Bracket
9	WT 479 56	Switch disc
10	WT 742 09	Tension spring
11	WT 741 55	Tension spring
12	WT 046 65	Control bracket
12a	WT 760 38	Torsion spring
13	WT 036 37	Bracket
14	VT 540 08	Key (red)
15	VT 540 06	Key (white)
22	WT 823 71	Bracket
23	WT 680 75	Locking bracket
24	WT 760 30	Torsion spring
25	VU 950 06	Cord
26	998/3x10	Screw
27	VT 575 01	Reel disc
28	WT 897 04	Brake bracket
29	WT 046 44	Rapid stop bracket
30	WHB 950 WK 5.2x9x0.5	Ring
31	WY 820 44	Reel disc (lower part)
31a	WT 496 08	Cord
32	WT 646 84	Shaft
33	WT 823 70	Idler wheel bracket
34	WT 036 33	Bracket
35	WT 760 29	Torsion spring
36	WT 857 73	Control bracket
38	WRB 905 YY/805	Nylon plug
38a	WT 065 69	Bracket
38b	WT 478 36	Rewind roller
38c	A9 868 66.1	Ring
38d	WT 824 22	Bracket with shaft
39	WT 135 16	Grommet
40	WT 837 49	Locking bracket
41	WT 065 61	Bracket
41a	WY 849 09	Switch SK13
41b	999/2x12	Screw
41c	WRB 905 TU/3x2	Grommet
42	WT 035 38	Bracket
43	WT 035 38	Bracket
44	WT 036 39	Bracket
45	WT 036 36	Bracket
46	WT 036 42	Bracket
47	VT 540 06	Key (white)
48	WT 741 06	Tension spring
49	WT 741 61	Tension spring
50	WT 046 46	Start strip
51	WT 078 35	Rewinding strip
52	WT 889 80	Winding strip
53	WT 741 74	Tension spring
54	WT 279 62	Brake shoe
55	WT 742 07	Tension spring
56	WT 824 30	Brake bracket, complete
57	WT 888 90	Idler wheel
57a	WT 479 71	Ring
58	WT 265 65	Lower bearing cup
59	WT 835 88	Adjusting screw
60	998/3x10	Screw (3x6)
61	WT 681 24	Locking bracket
62	WT 934 51	Locking bracket
62a	WT 824 18	Bracket
62b	WT 760 35	Torsion spring
63	WT 731 05	Pressure spring
64	A9 888 73	Knob for counter
65	WT 898 38	Counter
66	WT 741 68	Tension spring
67	WT 741 68	Tension spring
67a	WT 647 07	Rod
68	WT 837 34	Brake bracket complete
69	WT 741 71	Tension spring
70	WT 479 14	Bearing plate
71	WT 265 64	Bearing
72	WT 766 12	Spring ring
73	WT 458 82	Ring
74	WT 479 30	Excentric disc
75	WT 741 63	Tension spring
76	WT 458 84	Ring
77	WT 065 67	Bracket
78	WT 883 04	Stop bracket
78a	WT 279 32	Brake shoe
78b	WT 824 23	Brake bracket
78c	WY 820 38	Pressure felt
78d	WT 760 36	Torsion spring
79	WT 924 52	Nut
80	WT 458 58	Tape guide
81	WT 837 33	Pressure bracket
82	WT 741 70	Tension spring
83	WT 065 72	Bracket
84	WT 279 62	Brake shoe
85	WT 730 47	Pressure spring
86	WY 837 49	Switch SK12
87	WT 064 91.1	Guide bracket
88	WT 741 43	Tension spring
89	WT 837 29	Brake bracket
90	WT 279 55	Brake shoe
91	WT 078 44	Control bracket
92	WT 741 54	Tension spring
93	WT 741 72	Tension spring
94	WT 867 21	Plate with shaft
95	WT 046 86	Control bracket
96	WT 897 45	Bracket
97	WT 837 73	Bracket with shaft
97a	A9 868 66.1	Ring
98	WT 479 36	Flywheel
99	WT 617 00	Shaft
100	WT 760 25	Torsion spring
101	WY 837 48	Switch
102	WT 046 35	Bracket
103	WY 820 48	Switching-off, relay, complete
104	WT 730 99	Pressure spring
105	WT 064 87	Bracket
106	WT 618 36	Switch cam
107	WY 820 75	Bracket
108	WHB 045 TU/2.5	Ring
109	WT 032 13	Bracket
110	WY 885 26	Relay coil
111	WT 823 77	Bracket
112	WT 741 95	Tension spring
113	WT 032 16	Pressure roller lever
114	WT 646 88	Adjusting screw
115	WT 857 19	Erasing head
116	WT 617 29	Shaft
117	WT 837 74	Control bracket
118	WT 730 94	Pressure spring
119	WT 646 12	Shaft
120	WT 479 34	Nut
121	WT 680 92	Screening bracket for pressure roller
122	WT 881 66	Pressure roller
123	P5 515 93/304	Ring
124	WT 857 72	Screening cap for recording playback head
125	WT 837 38	Bracket
127	WT 741 59	Tension spring
128	WT 924 58	Adjusting nut
129	WT 857 25	Recording/playback head
129a	WT 458 02	Guide roller
129b	WT 046 41	Guide bracket
130	WT 730 96	Pressure spring
130a	WT 647 08	Shaft
131	998/3x10	Screw
132	WT 265 66	Bearing plate
133	WT 265 64	Bearing
134	WT 766 12	Spring ring
135	WT 458 82	Ring
136	WT 647 09	Spacer
137	VT 575 06	Insulating ring
138	WT 046 38	Bracket
139	VT 610 19	Insulating ring
140	WY 851 55	Bearing plate
141	WT 252 98	Cap
142	WT 479 15	Stop plate
143	A9 868 66.1	Ring
144	WT 882 67	Idler wheel
145	A9 868 66.1	Ring
146	WT 937 75	Switch cam 60 c/s
146	WT 937 71	Switch cam 50 c/s
147	WY 851 45	Idler wheel bracket
148	WT 882 72	Cord wheel
149	WT 741 66	Tension spring
150	999/4x50	Screw
151	WRB 905 TU/8x1	Grommet
152	WT 479 47	Pulley 60 c/s
152	WT 479 22	Pulley 50 c/s
153	999/2.6x8	Screw
154	WT 213 14	Motor mounting plate
155	WY 853 38	Motor 60 c/s
155	WY 853 34	Motor 50 c/s
156	WT 897 14	Fan
157	89 205 02	Ball
158	B 020 AD/8	Nut
159	VT 590 00	Adjusting screw
160	998/3x10	Screw
161	VT 575 01	Reel disc (upper part)
162	WHB 950 WK/5.2x9x0.5	Ring
163	VT 510 00	Reel disc bearings
164	WT 890 78	Reel disc (lower part)
165	VT 575 03	Driving ring
166	WT 890 68	Winding friction, complete
167	WT 889 99	Ring
168	WT 730 93	Pressure spring
169	WT 479 85	Winding ring
171	WHB 950 WD/6.2x14x0.32	Ring
172	985/8	Circlip
173	WY 838 06	Profile spring + felt
174	A9 868 66.1	Ring
175	WY 876 01	Idler wheel
176	WHB 050 ZZ/813	Ring
177	VT 575 04	Roller
178	WT 741 64	Tension spring
179	WT 889 37	Idler wheel bracket
180	WT 150 72	Bush
181	WY 837 99	Guide bracket
182	WHB 050 ZZ/813	Ring
183	WT 479 24	Switch disc
183a	VT 575 04	Roller
184	WT 837 25	Control bracket SK3
185	A3 187 10	Mains switch SK0

Modified parts' list of the WR-00 version

Pos.	Code number	Description
25	WT 496 58	Driving belt
31	A9 042 97	Reel disc (lower part)
63	WT 823 78	Bracket with shaft
65	VT 575 09	Wheel
88	WT 741 65	Tension spring
95	WT 837 48	Bracket
97	WT 883 07	Wheel
148	WT 883 06	Rewinding wheel



7. Modification of the recorder EL 3534A from 50 c/s to 60 c/s

Mechanical modifications

- Put the speed switch in position 19 cm/sec (7½"/sec). (Apparatus without supply voltage.)
- Take the apparatus out of the casing (see section II point 1).
- Unhook tension spring 75 from bracket 138 (see fig. 73).
- Undo the screw with which the switch disc 183 is affixed to the switch cam 146.
- Unhook tension spring 149 from the chassis.
- Undo the three screws which affix bracket 138 onto the chassis and remove bracket 138.
- Remove switch cam 146 with stop plate 142 out of the apparatus and replace same by a switch cam for 60 c/s, code number WT 937 75.
- The stop plate 142 should now be transferred to the switch cam for 60 c/s.
- Mount the switch cam in the reverse order. Secure all screws, not too firmly, however.
- Undo the screw with which eccentric 74 is affixed to the chassis and remove the eccentric.
- Undo the two screws 153 which fix the motor pulley 152 to the motor shaft and remove the pulley.
- Replace the pulley by a pulley for 60 c/s, code no. WT 479 47.
- Mount the pulley for 60 c/s in the reverse order. Secure all screws; not too firmly, however.

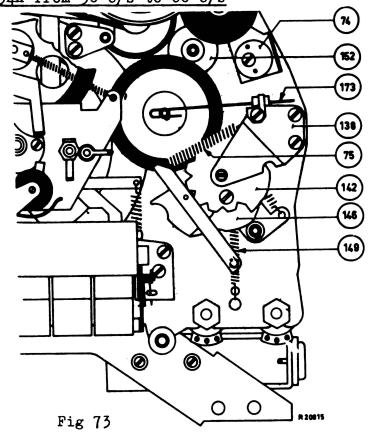


Fig 73

Consecutively, one should now adjust as described under "Mechanical adjustments":

- The height of the pulley 152 on the motor shaft.
- Eccentric 74.
- Rewind wheel 148.
- Bearing bracket 96 (see "Adjustments for rewinding" page 18.
- The tape speed switch mechanism.
- The mains switch SK0 should be adjusted as described under "Adjustments of switches".

Electrical modification

When modifying from 50 c/s to 60 c/s, the following motor connections should be soldered from one point to the other: see fig. 74.
Change connection "a" on the motor, from point 5 to point 4 of the adapter.
Change connection "d" on the motor from point 2 to point 3 of the adapter.

Modification of the recorder from 60 c/s to 50 c/s

Mechanical modification

The modification from 60 c/s to 50 c/s is identical to the modification from 50 c/s to 60 c/s. However, the following should now be used:

switch cam 50 c/s code number WT 937 71
pulley 50 c/s code number WT 479 22

Electrical modification

When modifying from 60 c/s to 50 c/s, the following motor connections should be changed: see fig. 74.

Change connection "a" on the motor from point 4 to point 5 of the adaptor.
Change connection "d" on the motor from point 3 to point 2 of the adaptor.

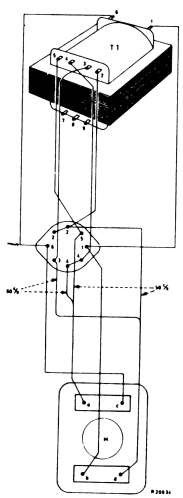


Fig 74

THE AMPLIFIER

1. Description of the working of the amplifier with the aid of block diagrams

The amplifier is mounted on three print plates (except the supply part).
The pre-amplifier with the transistors TS1...TS6 is mounted on the largest print plate with hinged suspension.
The switch SK2 is mounted on the print in vertical position on which is also mounted the frequency network.
The oscillator circuit is mounted with switch SK4 on the smallest print plate.
In order to facilitate the description and to make clear th working of the various amplifier stages a few block diagrams are given.

- The supply part

The supply transformer T1 can be primarily adjusted by means of the voltage adapter for the following mains voltages :
110 - 127 - 220 - 245 V ... 50 c/s and after modification of the recorder to 60 c/s;
110 - 127 - 220 and 245 V ... 60 c/s.

The transformed mains voltage is converted by the rectifiers GR2 and GR3 into a voltage of about 37 V across C15 for the supply of the pre-amplifier and by GR3 a voltage of about 16 V across C16 for the supply of the output transistor TS7 and the switching-off relay RE.

- Switching-off relay RE

When the apparatus is switched into position "recording", "playback" or "winding" the switch SK12 closes.
Switch 13 is closed and is only opened when one of the keys is depressed.
If the tape contact is closed by the switching foil of the tape, the the switch-off relay will be energised via SK12 and SK13 and will attract. The switch SK11 is closed at the same time by the relay itself.
The switch SK11 is connected in parallel with the tape contact so that the relay remains energised when the switch foil has passed the tape contact.
If the keys are unlocked, then switch SK12 opens as a result of which the switch-off relay comes into the rest position again and switch SK11 is opened.

- Position "playback"

In the position "playback" the amplifier is connected as indicated in the block diagram of fig. 76.

For the circuit diagram see fig. 82.
The signal of the playback head K1 (K101) is applied to the base of TS2 via C6. The signal is amplified and applied to the base of TS3 via C7 and C11. Between C7 and C11 the low frequencies are boosted by the filter (C8-R15) for 1 7/8"/sec. (C9-R16) for 3 ¾"/sec. or (C9-R17) for 7 ½"/sec.

Via C22 the amplified signal comes at the base of TS4 and is amplified by this transistor.
Via C26 the signal is applied to the volume control R42.
At the same time a frequency-dependent feedback from C26 to the emitter of TS3 is in effect.
The network consists of R28 in series with C17-R72 and C12.
The higher frequencies are amplified to a lesser extent.
At the same time a voltage of about 1 V is taken from C26 and applied to the diode output via R44.
From the slider of the volume control R42 the signal is applied to the tone control R47 via R45.
Via R46 and C30 the signal is applied to the base of TS5. This transistor amplifies the signal after which it is applied to the base of TS6 via C32.

This transistor is connected in grounded collector circuit and serves as driver-transistor for the output transistor TS7.
By varying the base adjustment of TS6 with the aid of R53 the emitter current also varies.
As a result, the adjustment of the output transistor TS7 is also varied.
The signal current is amplified by TS6 and applied to the output stage TS7- (Voltage amplification approx. 1x).
The output stage which is adjusted in class A amplifies the signal and applies it to the output transformer T2.
The incorporated loudspeaker is connected to the primary of the output transformer. (Two loudspeakers have been connected to the left-hand channel).
From the secondary of the output transformer T2, the signal passes a negative feedback circuit consisting of C29-R50 and is then fed to the base of TS5.
The third winding on the output transformer serves as anti-hum winding.
An external loudspeaker can be connected to the secondary of the transformer. The switch SK7 then switches off the incorporated loudspeaker.

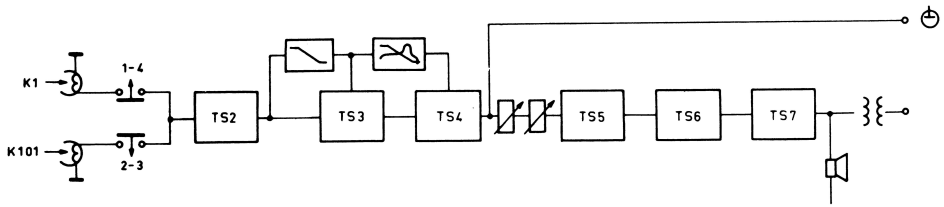


Fig. 76

Item	Code number	Description
250	A9 888 85	Hinge
251	WY 845 22	Case, complete
254	WT 857 41	Knob
256	WY 820 68	Covering cap for pressure roller
257	WRB 801 UV/4x8	Ornamental screw
258	WT 857 48	Ornamental plate
259	WT 857 49	Lock, complete
260	WT 890 86	Handle
261	WT 857 99	Fixing bracket for handle
262	WT 857 41	Knob, small
263	WT 850 06	Modulation indicator
264	B 013 AF/1/16"	Clamp for affixing trade mark
265	WT 857 47	Covering cap for the heads
266	WT 923 12	Glase for counter
267	WT 857 70	Cover for flex storing space
268	WRB 964/TT/3/16"	Clamping bush for pos. 265
269	WT 823 95	Bottom plate, large
270	WY 841 13	Bottom plate, small
271	WRB 802 YY/802	Fixing screw for bottom plates
272	WT 886 61	Voltage adapter
273	VT 550 08	Cap for pos. 272
274	WT 910 44	Rubber foot
278	WT 910 65	Plastic foot
279	VT 555 09	Indication plate
280	WT 867 12	Plug plate complete
281	VT 550 06	Indication plate
282	WY 885 00	Plug plate, complete
283	V3 480 03	Clamp for mains flex
284	979/5x180	5-pole plug socket (round)
285	979/F5x1	5-pole plug socket (flat)
286	979/20	Fixing spring for 979/F5x1
287	VT 520 03	Ornamental window
288	VT 520 04	Loudspeaker grill (front)
	914/M10	Nut for potentiometer
	56 680 54/3B	Ferroxcube core for coils
	WY 820 80	Connection block mains flex.
	WT 078 86	Bracket for SK3
	WT 646 91	Control screw for SK2 + SK4

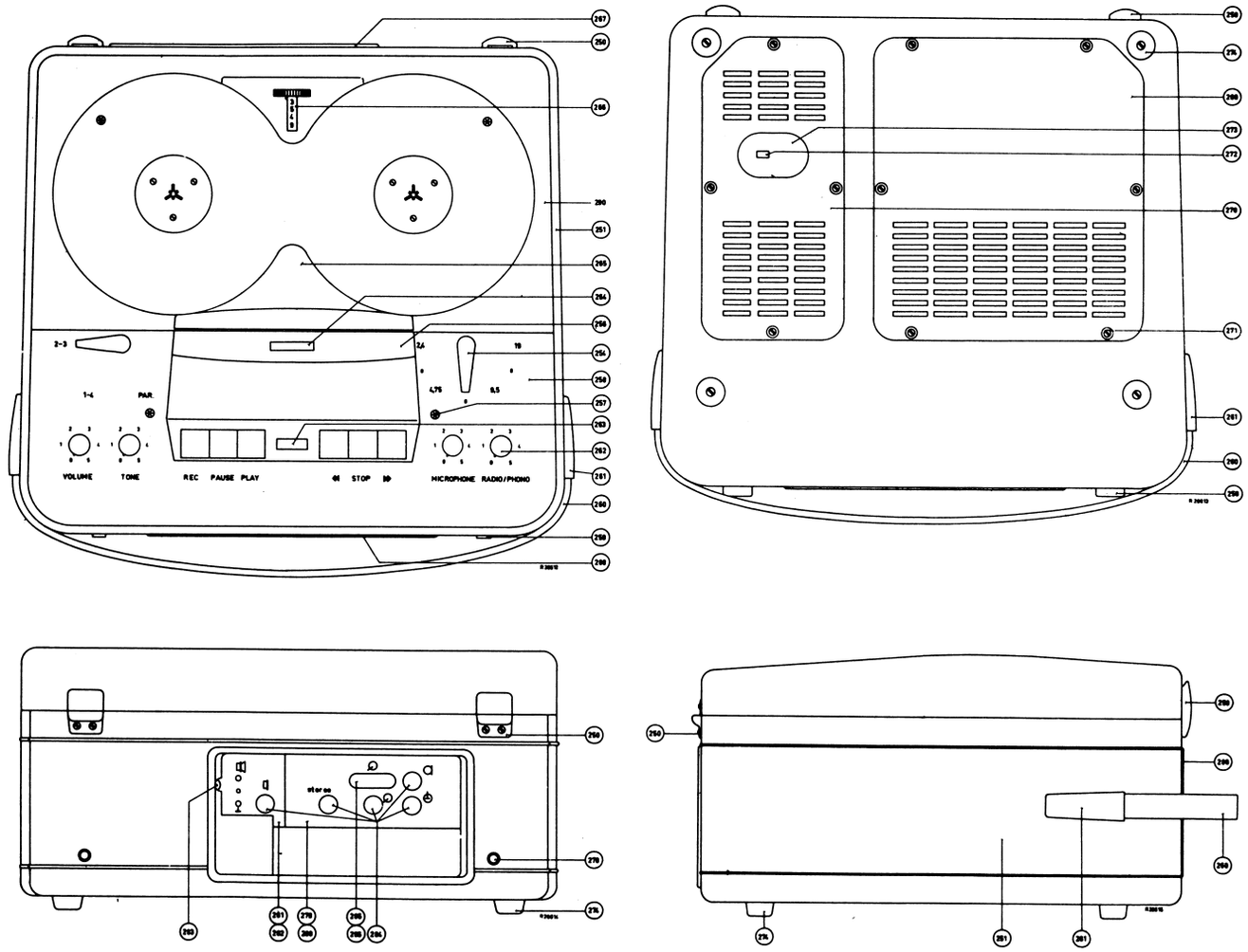


Fig 75

Playback - Stereo I (fig. 77)

It is possible to play back stereo-recorded tapes with a tape recorder as an amplifier for the left-hand channel, and a pre-amplifier EL 3787 plus a radio as amplifier for the right-hand channel.
The signal of the right-hand channel (track 2-3) is amplified to about 1 V by a pre-amplifier EL 3787. This signal is then applied to the P.U. or recorder input of the radio. The volume and balance are now controlled by the volume controls of the recorder and radio.

Playback - Stereo II(fig. 78)

Another method of playing back stereo-recorded tapes is via a stereo amplifier. Then the pre-amplifier EL 3787 must be connected to the stereo output of the recorder. The signal, already amplified by the recorder of the left-hand channel, is also applied to the EL 3787 via the amplifier, but it is not amplified again.

The signal of the right-hand channel is amplified to the same level by the EL 3787. Then both signals are fed from the EL 3787 to the stereo output amplifier.

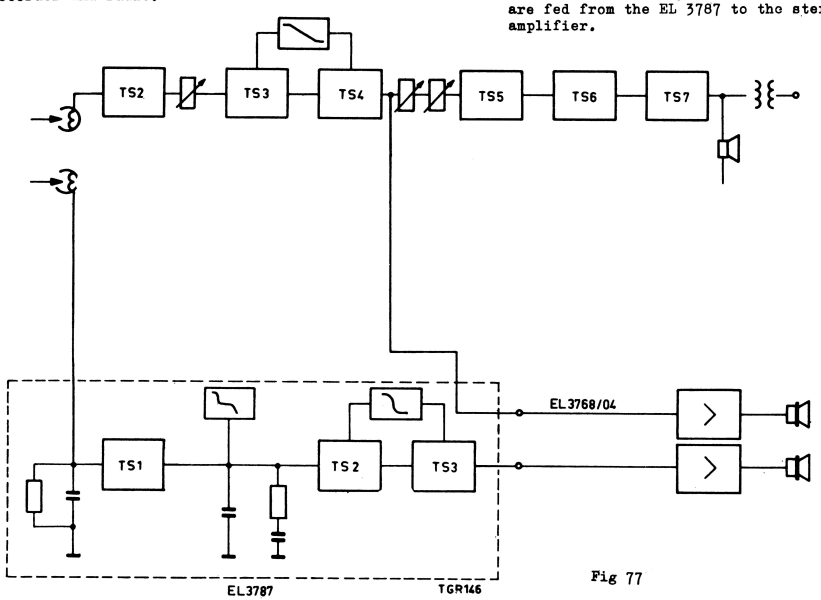


Fig 77

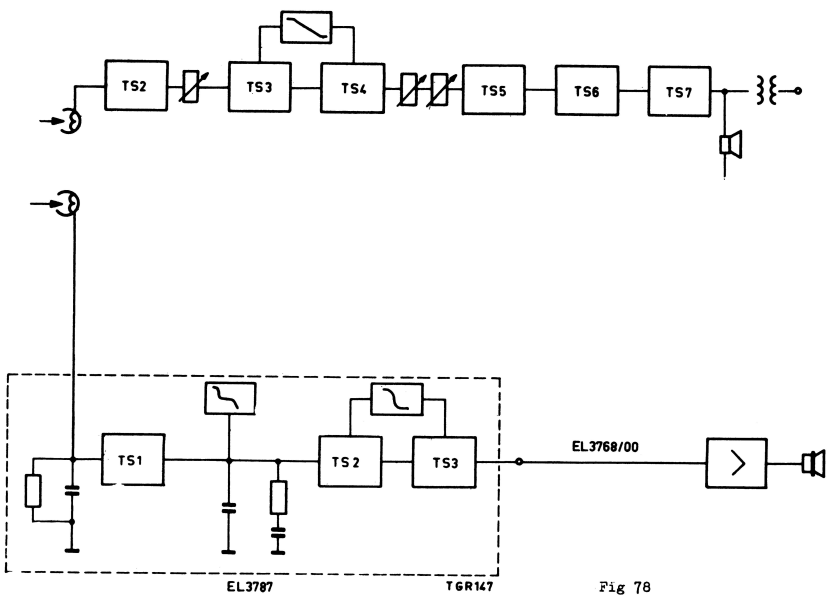


Fig 78

- Position "recording"

In the position "recording" the amplifier is switched as indicated in the block diagram of fig. 79.
For the circuit diagram, see fig. 82.
For recording, the pre-amplifier is switched by switch SK1
Use can be made of four inputs for recording, namely : 2 pick-up inputs, one diode input, which are connected to the base of TS1 and a microphone input, which is connected to the base of TS2.
The signals are amplified by the transistors TS1 and TS2, and then applied to the recording intensity controls R9 and R12.
From here the signals are applied via C11 to the base of TS3.
So, two signals can be mixed, namely, microphone with pick-up or microphone with radio.
Transistor TS3 amplifies the signals and applies them via C22 to the base of TS4.
Transistor TS4 amplifies the signal.
From the collector of TS4 a frequency-dependent negative feedback is provided to the emitter of TS3.
The higher frequencies are additionally amplified.
The negative feedback depends on the tape speed.
The network consists of :

R29, L1, C18+C19 and R31
for 2.4 cm/sec. (15/16"/sec.)

R29, L1. C18+C19 and R32
for 4.75 cm/sec. (1 7/8"/sec.)

R29, L1, C18 and R32
for 9.5 cm/sec. (3 $\frac{3}{4}$"/sec.)

R29, L1, C18 and R32
for 19 cm/sec. (7 $\frac{1}{2}$"/sec.)

The following signals are taken from the collector of TS4.
The signal to be recorded for recording head K1 (K101).
The signal for the head output.
The signal which is rectified by GR4 and then applied o the modulation indicator.
The signal for the output amplifier.
During "recording" one can therefore listen via the headphone and also via the incorporated loudspeaker.
At the same time as the signal to be recorded, the bias current is supplied to the recording head K1 (K101).
The transistor TS8 connected as an oscillator supplies this current which can be varied by resistor R67 or R68.
The erasing head K2 (K102) is also connected to the oscillator, This head will erase a recording which may be on the tape.

Remark : When the selector switch is in the position "parallel" no voltage is applied to the oscillator, so it is not possible to make a recording.

P.A.-amplifier

Only th recording key must be depressed when using the apparatus as an amplifier.

In order to obtain a good playback response, the speed selector must be put into position '7$\frac{1}{2}$"/sec.", the tone control R47 must be set at a minimum, and the volume control R42 at two-thirds of its control range. The volume can be controlled by R9 and R12.

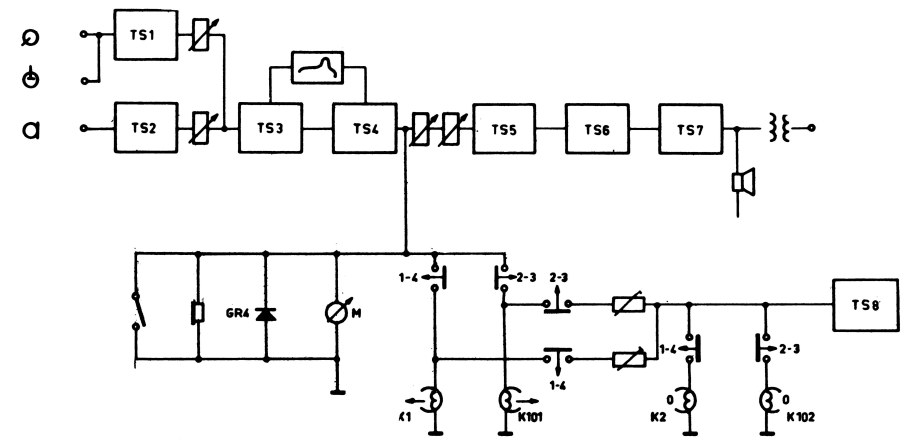


Fig 79

Multi-play (fig. 80)

It is possible to record the signal of track 1-4 on to track 2-3 and vice-versa by means of the pre-amplifier EL 3787; it is also possible to add a new signal. The apparatus must be put into position "recording-track 2-3". The signal of track 1-4 is amplified by the stereo pre-amplifier EL 3787 and applied to the diode input of the recorder. In the pre-amplifier the signal is amplified by TS1, TS2 and TS3. The r.f. voltage induced into K1, by K101, is suppressed by the filters C1-R1 and L1 and C3. This is necessary in order to prevent the circuit from going into oscillation. The high frequencies are attenuated between TS2 and TS3. After TS1, the low frequencies are corrected by the circuit C2-R2. From TS3 the signal is applied to the diode input of the recorder via a voltage divider. A second signal (microphone signal) is amplified by TS2 and mixed with the signal of track 1-4 in TS3. The mixed signal is amplified by TS3 and TS4 and fed to the recording head K101 (track 2-3).

Duo-play (fig. 81)

It is possible to listen to one track with a headphone by means of the pre-amplifier EL 3787 and to record a new signal to the other track via the recorder amplifier. When the recorder is put into position "recording - track 1-4", the signal of track 2-3 can be listened to via the pre-amplifier EL 3787. When the recorder is put into position "recording - track 2-3", the signal of track 1-4 can be listened to via the pre-amplifier EL 3787. A signal can be recorded on to the relevant track with a microphone or radio. When playing-back, the selector knob must be put into position "parallel". In this position both signals are simultaneously played back via the recorder-amplifier.

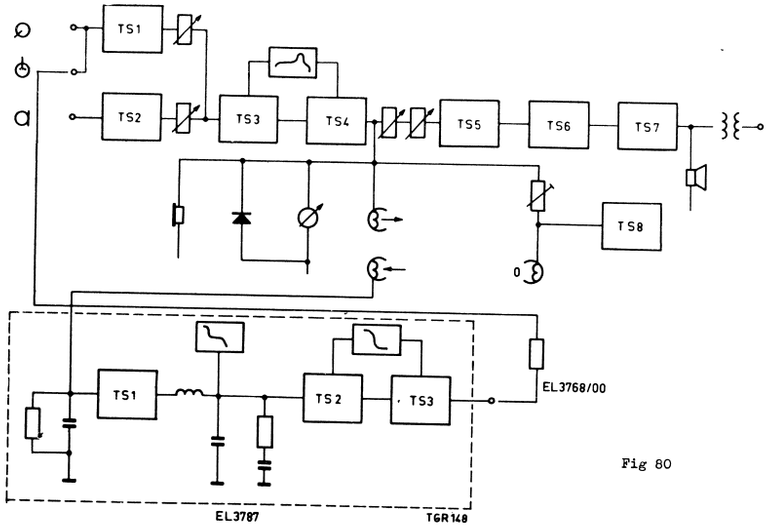


Fig 80

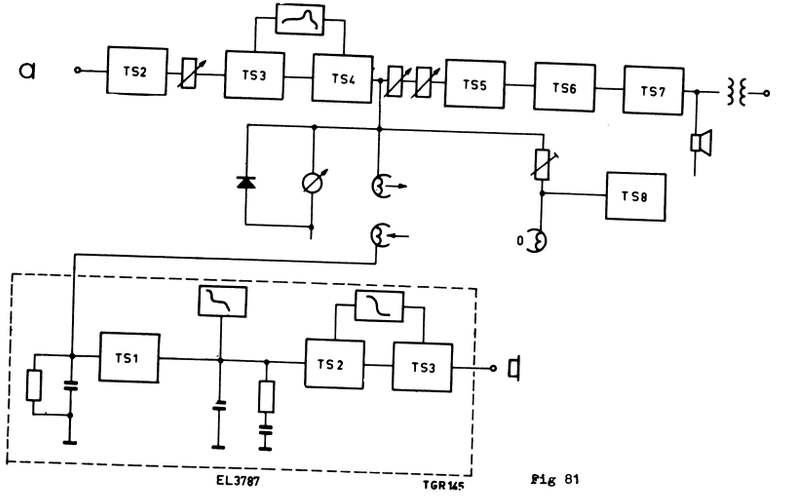


Fig 81

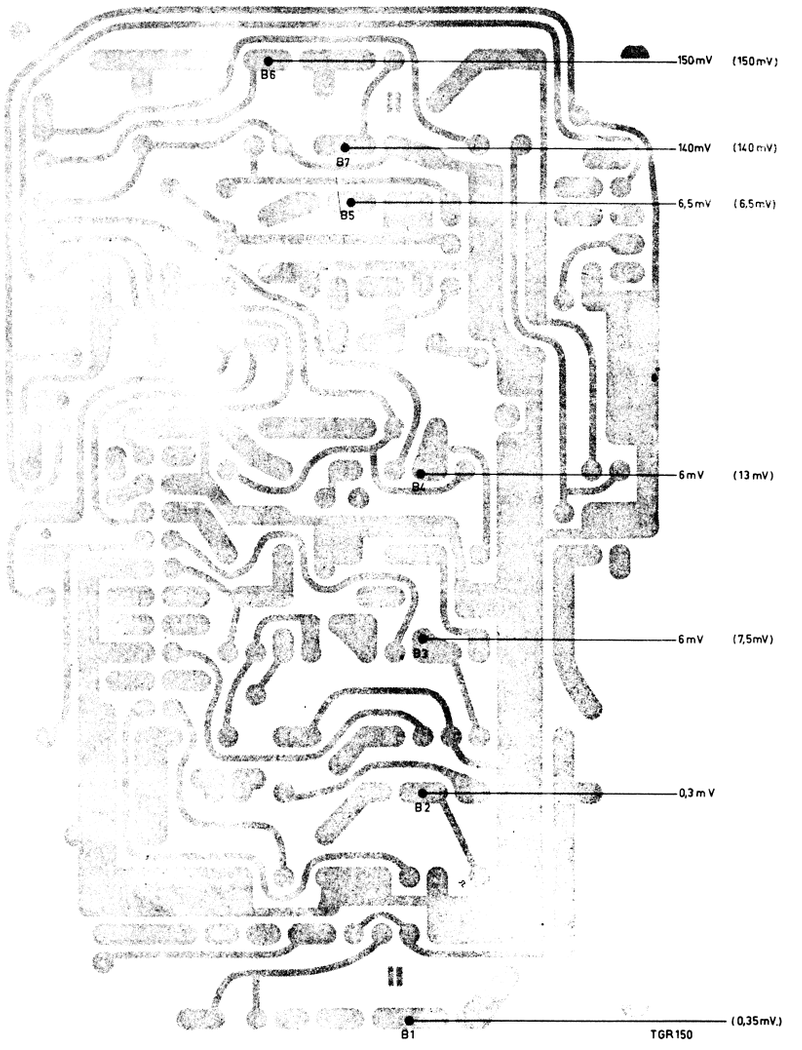


Fig 88

PHILIPS MODEL EL3549A

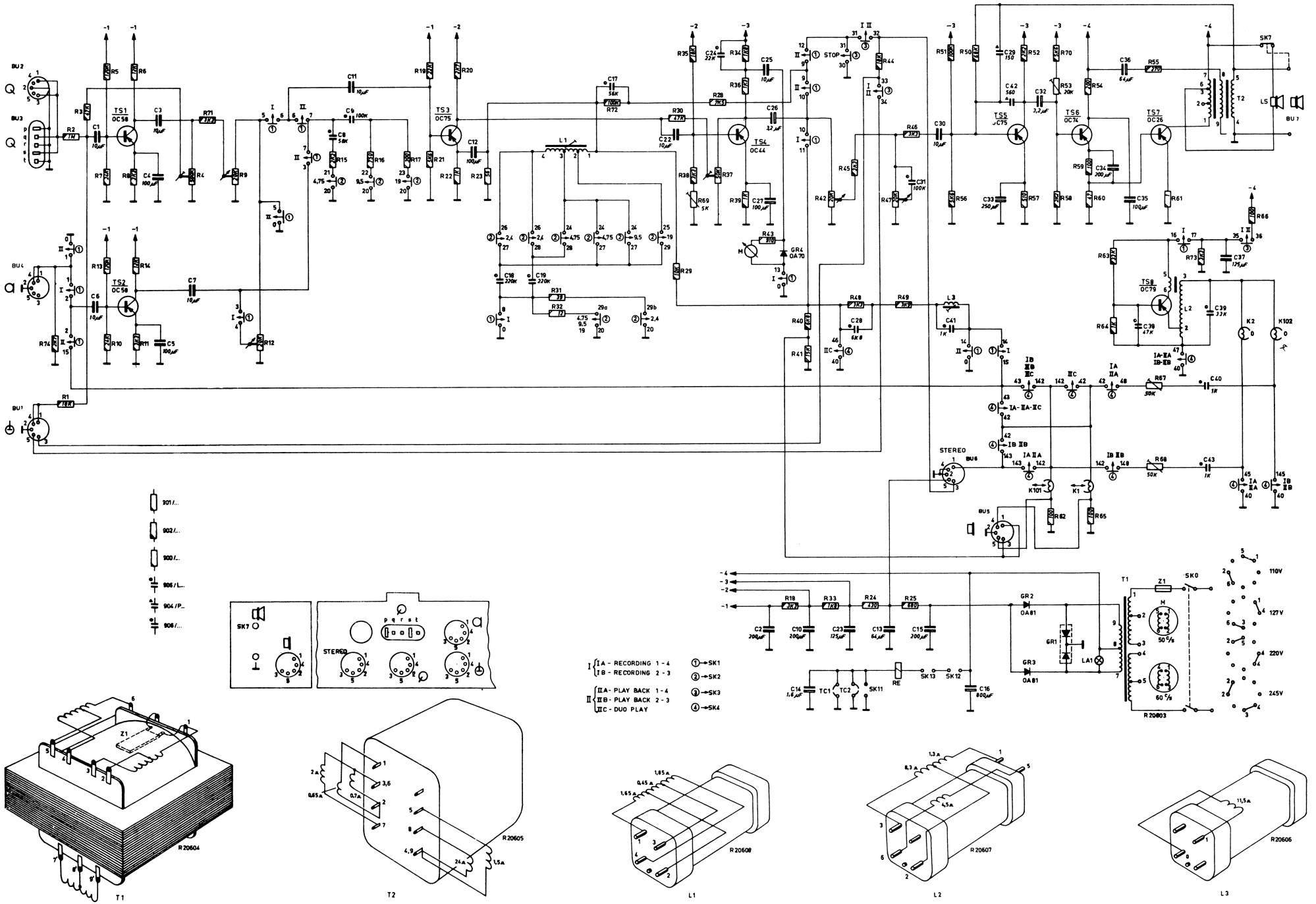


Fig. 82

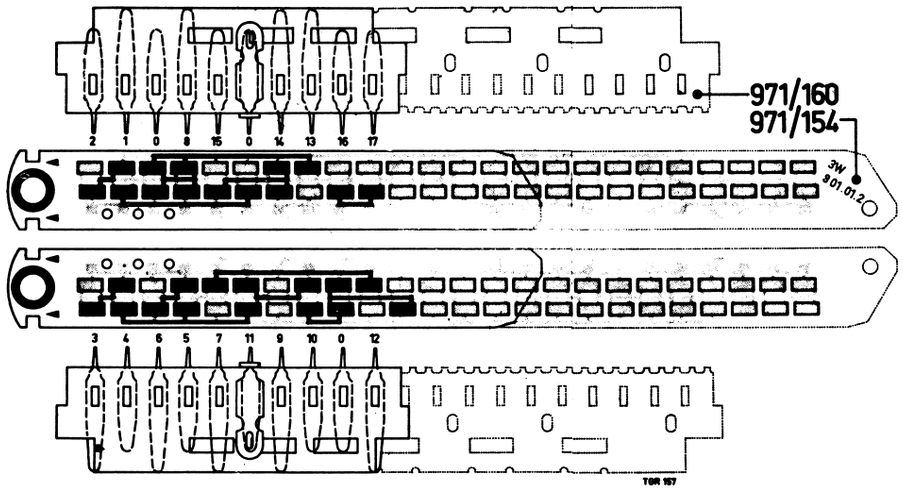


Fig 83

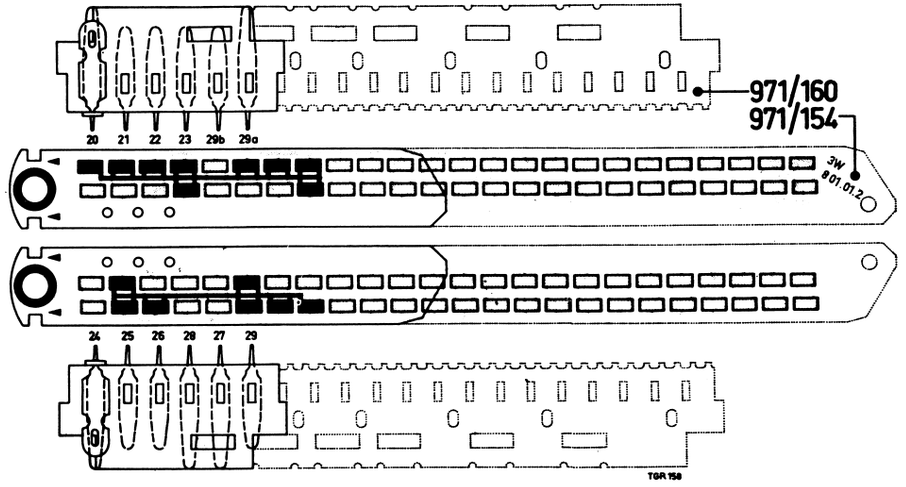


Fig 84

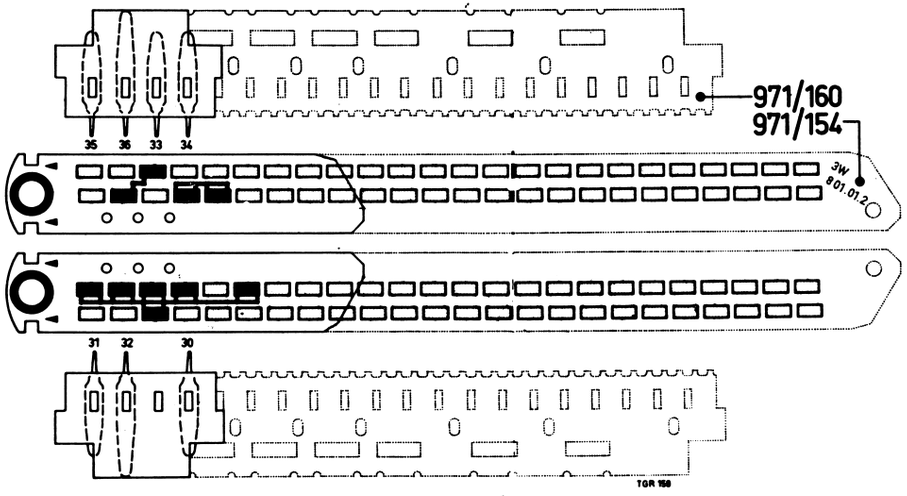


Fig 85

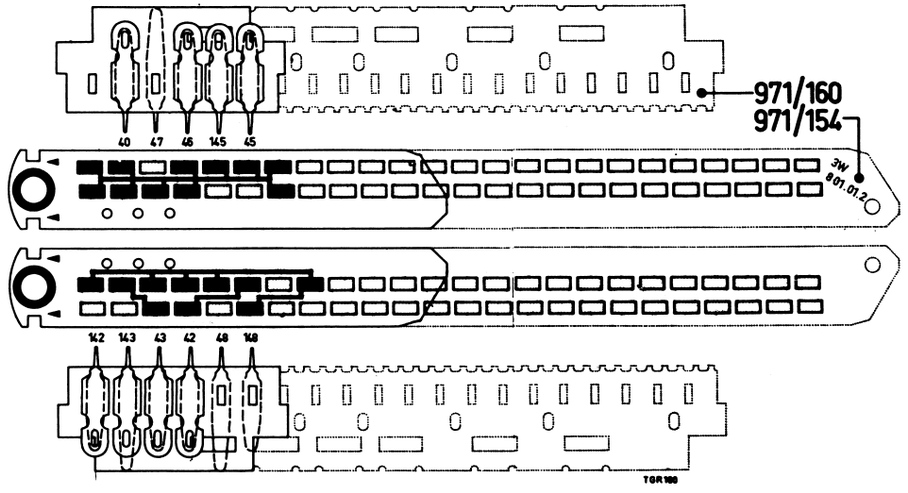


Fig 86

2. Checking measurements to the amplifier

- Biasing of the transistors TS1 ... TS8

The voltages mentioned in the circuit diagram have the following values :

-1
-2
-3
-4

The transistors have been adjusted as follows :

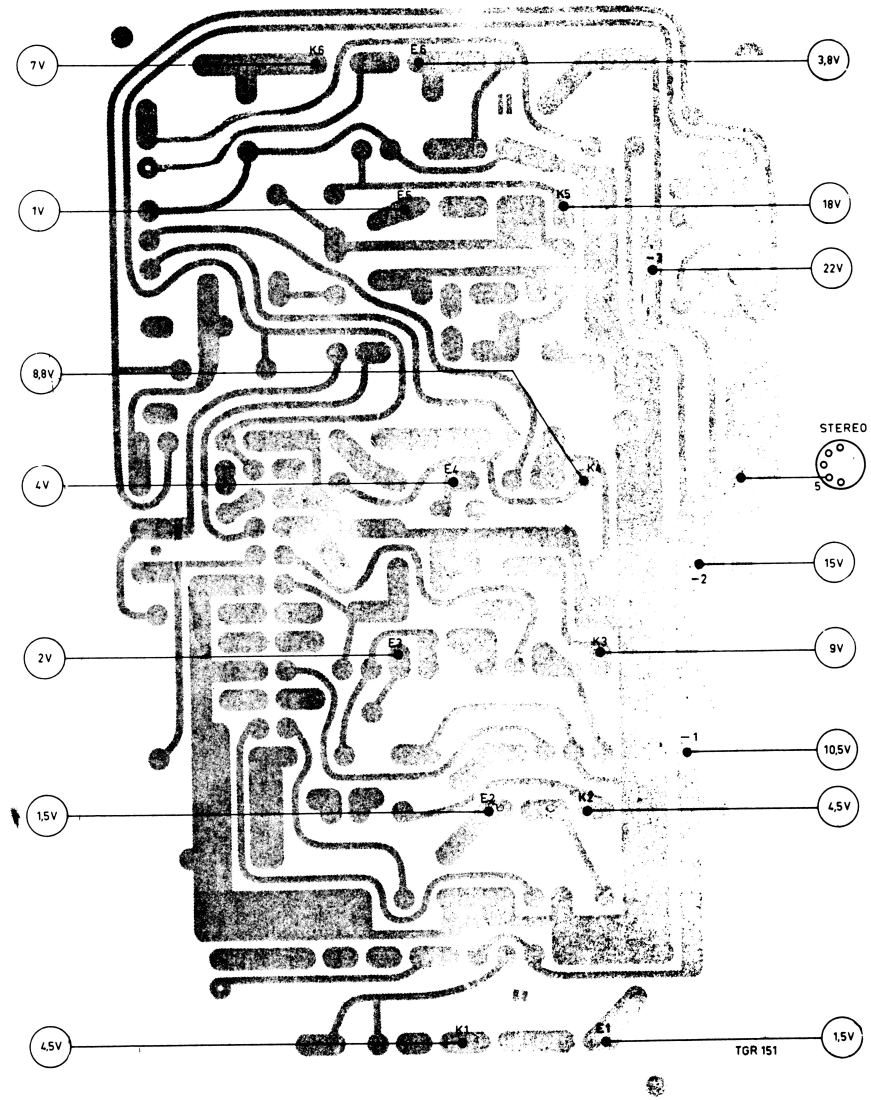
	Collector	Emitter
TS1	4.5 V (K1)	1.5 V (E1)
TS2	4.5 V (K2)	1.5 V (E2)
TS3	9 V (K3)	2 V (E3)
TS4	8.8 V (K4)	4 V (E4)
TS5	18 V (K5)	1 V (E5)
TS6	7 V (K6)	3.8 V (E6)
TS7	13.5 V (K7)	0,55 V (E7)
TS8	11 V	

The above-mentioned d.c. voltages are measured with a moving coil instrument of 40.000 Ω/V (P 817 00/01).
Unless otherwise stated, all voltage values are ± 10 %.
In fig. 87 has been indicated where the above-mentioned voltages can be measured.

- Adjustment of the output transistors TS7

The emitter current of the transistors should be adjusted to 550 mA.
This means a voltage of 550 mV across R61.

This can be adjusted if necessary with the aid of the adjusting potentiometer R53.



Amplification per stage in position "recording"

- Switch the apparatus to position "recording" at a tape speed of 9.5 cm/sec.
- Put the track selector into position 1-4.
- Turn R9 (P.U.) and R47 (volume) up to a maximum, and R12 (microphone) down to a minimum.
- Connect a resistor of 5.6 Ω across the additional loudspeaker output and connect a vacuum tube voltmeter across this resistor.
- Apply a signal of 1000 c/s to the P.U. input; BU2, point 1.
- The input voltage must be 130 mV.
- Adjust the output voltage to 1 V with the volume control R47.
- The following base voltages (a.c.) should then be measured :

Base TS1	B1	0.35 mV
Base TS3	B3	8.50 mV
Base TS4	B4	13.00 mV
Base TS5	B5	6.50 mV
Base TS6	B6	150.00 mV
Base TS7	B7	140.00 mV

These voltages can be measured at the points shown in fig. 88. The vacuum tube voltmeter to be used is a GM 6012.

Amplification per stage in position "playback"

- Turn R9 and R12 down to a minimum and R47 (volume) up to a maximum.
- Connect a resistor of 5.6 Ω across the loudspeaker output and a vacuum tube voltmeter across this resistor.
- Apply a signal of 1000 c/s to BU5, point 4, via a resistor of 100 kΩ.
- Adjust the amplitude of the input signal to 280 mV.
- Switch the track selector to position 1-4.
- With R47 adjust the output signal to 1 V across 5.6 Ω.
- The following a.c. voltages should then be measured :

Base TS2	B2	0.3 mV
Base TS3	B3	6.0 mV
Base TS4	B4	6.0 mV
Base TS5	B5	6.5 mV
Base TS6	B6	150.0 mV
Base TS7	B7	140.0 mV

Check for the recording frequency response and the adjustment of L1

- Put the track-selector into position 1-4.
- Depress the recording key.
- Turn R9 (P.U.) up to a minimum.
- Connect a vacuum-tube voltmeter to BU5, point 4.
- Connect a signal generator to BU2, point 1 or 3.
- Switch the apparatus to position 4.75 Ω/sec.
- Adjust the input voltage so that the vacuum-tube voltmeter shows a reading of 3 mV.
- The input voltage is approx. 24 mV and must be used for the other frequencies during this measurement.
- The following table shows the output voltages for various frequencies and tape speeds.

	2.4 cm/sec	4.75cm/sec	9.5cm/sec	19cm/sec
60 c/s	3mV -1dB	3mV -1dB	3mV -1dB	3mV 1dB
400 c/s	3mV	3mV	3mV	3mV
2000 c/s	3mV	3mV	3mV	3mV
4500 c/s	8mV ±2dB	4.3mV±1dB		
8000 c/s		9mV	5mV ±1dB	4.7mV±1dB
10000 c/s		16mV -2dB		
14000 c/s			8mV ±2dB	6mV ±2dB
16000 c/s			8.3mV	6.5mV

- L1 is adjusted at 4.75 Ω/sec. and 10 kc/s (see table).
- The core of L1 must be turned into the coil until the vacuum-tube voltmeter shows a reading of 16 mV.
- Then check the maximum which should be at 10 kc/s.

Check for the playback frequency response across the diode output BU1

- Switch the apparatus into position "playback" at 9.5 cm/sec.
- Put the track selector into position 1-4.
- Connect a vacuum tube voltmeter to BU1, point 3.
- Turn the volume control R42 down to a minimum.
- Apply a signal of 1000 c/s to BU5, point 4 via a resistor of 100 kΩ.
- Adjust the amplitude of this signal so that the vacuum tube voltmeter shows a reading of 650 mV. The input signal should be 166 mV ± 2dB.
- The following table shows the output voltage as a function of the frequency for various tape speeds. The above-measured value must be used as input voltage.

f-c/s	2.4cm/sec.	4.75cm/sec.	9.5cm/sec.	19cm/sec.
60+	700mV-2dB	700mV-2dB	700mV-2dB	700mV±2dB
400+	190mV±1dB	165mV±1dB	145mV±1dB	145mV±1dB
1000	1500mV±1dB	920mV±1dB	650mV 0dB	650mV±1dB
4500	2700mV±2dB	900mV±2dB	330mV±1dB	190mV) ±2dB
8000			360mV±2dB	170mV)
10000		1500mV±3dB		
14000			480mV) ±3dB	
16000			450mV)	185mV±3dB

NOTE

For 60 and 400 c/s the value of the input voltage should have the above measured value divided by 10 (-20dB), thus $(\frac{166}{10})$ ± 2dB.

Check for the playback frequency response of the additional loudspeaker output

- Switch the apparatus to 19 cm/sec.
- Put the track selector into position 1-4 and depress the recording key.
- Turn R9 (P.U.) up to a maximum and R12 (microphone) down to a minimum.
- Turn R42 (volume) and R47 (tone) up to a maximum.
- Connect the vacuum tube voltmeter to the loudspeaker output BU7 and terminate the latter in 5.6 Ω.
- Apply a signal of 1000 c/s to BU2, point 1, and adjust the signal amplitude so that the vacuum tube voltmeter indicates 1 V.
- Then the input signal is 16 mV ± 2dB.
- The following table shows the output voltage as a function of the frequency. As input voltage the value, measured at 1000 c/s, must be used.

c/s	R47 maximum
60	1200 mV)
400	1000 mV) ± 2 dB
1000	1000 mV
4500	1200 mV)
10000	1500 mV) ± 2 dB
16000	1700 mV ± 3 dB

Overall frequency response for 2.4-4.75-9.5 and 19 cm/sec.

- Turn R9 (P.U.) up to a maximum and R12 (microphone) down to a minimum.
- Apply a signal with an amplitude of 6 mV to BU2, point 1.
- Turn R42 (volume) down to a minimum.
- Measure the following frequencies for the various tape speeds.

For 2.4 cm/sec. : 60 c/s - 4500 c/s

For 4.75 cm/sec. : 60 c/s - 10 kc/s

For 9.5 cm/sec. : 60 c/s - 13 kc/s

For 19.0 cm/sec. : 60 c/s - 16 kc/s

- When playing back the output voltage is measured at the diode output BU1, point 3.
- The output voltage for each tape speed must be in a band of 6 dB.
- The output voltage voltage at 1000 c/s should be 60 mV.

Check of modulation indicator and headphone output

Switch the apparatus to 4.75 cm/sec.

- Put the track selector into position 1-4 and depress the recording key.
- Apply a signal of 1000 c/s to BU2, point 1.
- Connect a vacuum tube voltmeter to the headphone output BU5, point 4.
- Adjust the amplitude of the input signal so that the vacuum tube voltmeter indicates 15 mV.
- Then the pointer of the modulation indicator should deflect as far as between the red and green range.
- The permissible tolerance is ± 2 mm.
- The output voltage at headphone output must be measured across a resistor of 1.5 kΩ.
- The output voltage should amount to 170 mV ± 2dB.

Recording sensitivity and adjustment of R4

- Switch the apparatus to 4.7 cm/sec.
- Put the track selector into position 1-4 and depress the recording key.
- Connect a signal generator to BU2, point 3.
- Turn R9 (P.U.) up to a maximum and R12 (microphone down to a minimum.
- Adjust the input signal to 1000 c/s at 120 mV.
- Connect a vacuum tube voltmeter to the headphone output BU5, point 4.
- With R4 adjust the output voltage at BU5 to 15 mV.
- Connect a signal generator to BU1, point 1.
- Adjust the amplitude to 2.5 mV.
- The output voltage at BU5 must now amount to 15 mV.
- Connect a signal generator to BU4, point 1.
- Turn R12 (microphone) up to a maximum and R9 (P.U.) down to a minimum.
- Adjust the amplitude of the input signal so that the vacuum tube voltmeter indicates 15 mV. The output voltage must now amount to 0.2 mV.

Playback sensitivity and adjustment of R37 and R69

- Since the adjustment of R37 is dependent upon that of R69 and vice-versa, both resistors must be simultaneously adjusted.
- Switch the apparatus into position "playback", speed 9.5 cm/sec., track 1-4.
- Turn the volume control down to a minimum.
- Connect a moving coil meter between the emitter and collector of TS4, range 6-12 V.
- Adjust R69 so that the meter indicates 5 V.
- Apply a signal of 1000 c/s to the headphone output BU5, point 4, via the resistor of 100 kΩ.
- Connect the vacuum tube voltmeter to the diode output BU2, point 3.
- Adjust the input voltage so that the vacuumtube voltmeter has a reading of 650 mV.
- Attenuate the input signal by 20 dB (10x) and change the frequency from 1000 c/s to 60 c/s.
- Then adjust the output voltage at BU1 to 700 mV with R37.
- R37 and R69 mest be sealed after the adjustments have been carried out.

Setting of the output transistor TS7 (R53)
See fig. 92

- Switch on the apparatus.
- Connect a voltmeter across R61.
- Adjust R53 so that the voltmeter shows a reading of 550 mV.
- R53 must be sealed after being set.

Adjustment of the bias current and L3

- Before adjusting the bias current, L3 has to be set or checked.
- Put the track selector into position "recording - track 1-4" and connect a vacuum tube voltmeter to BU5, point 4.
- With core of L3 adjust the reading of the vacuum tube voltmeter to a maximum.
- The core of L3 must be sealed after the adjustment.
- The bias current must be adjusted in view of the frequency response.
- Use the over-all frequency response does not meet the requirements, then the bias current for K1 (pos. 1-4) flowing through R67, must be reduced.
- For K101 (pos.2-3), the current through R68 must be reduced.
- The approximate value for this current is 700 µA. This current can be measured (voltage) at BU5, point 4, for K1 and at point 5 for K101.
- The voltage to be measured may vary from 60 mV to 110 mV.

TROUBLE-SHOOTING

Phenomenon	Possible cause	Remedy
1. Apparatus does not function at all.	a. Mains switch not properly adjusted. b. Mains switch defective. c. Fuse blown.	a. Check the adjustment for mains switch as described under "adjustments of switches", b. Replace mains switch. c. Localise fault and replace fuse.
2. Tape forms loops after "rewinding".	a. Right-hand brake shoe 84 greasy or soiled. b. Right or left-hand brake bracket not properly adjusted.	a. Clean with alcohol or methylated spirits or replace. b. Check adjustments of the brake brackets as described under "mechanical adjustments"
3. Tape forms loops after "winding".	a. Left-hand brake shoe 84 greasy or soiled. b. Right or left-hand brake bracket not properly adjusted.	a. Clean with alcohol or methylated spirits or replace. b. Check the adjustments of the brake brackets as described under "mechanical adjustments",
4. Does not rewind or rewinds badly.	a. Driving cord 25 greasy, soiled or slack. b. Rewind wheel 148 does not come against the motor pulley. c. Brake brackets are not sufficiently lifted from the reel discs. d. Rewind roller 38b does not come against the left reel disc. e. Rubber rim of rewind wheel 148 greasy. f. Tension spring 93 loose. g. Depressed rapid stop key.	a. Clean cord and running grooves with alcohol or methylated spirits, if necessary replace cord 25. b. Check adjustment of rewind wheel 148 as described under "mechanical adjustments" c. Check the adjustments of the brake brackets as described under "mechanical adjustments" d. Check the adjustment of the rewind roller 38b as described under "mechanical adjustments" e. De-grease rewind wheel 97 and motor pulley with alcohol or methylated spirits. f. Remount tension spring 93. g. Rewind without depressed rapid stop key.
5. Does not wind or winds badly.	a. Rubber rim of winding wheel 144 greasy. b. Eccentric 74 not properly adjusted. c. Tension spring 92 loose. d. Idler wheel bracket 147 jams in control bracket 91. e. Brake brackets are not sufficiently lifted from the reel discs. f. Lip of bracket 91 touches the chassis. g. Rapid stop key is depressed.	a. Clean winding wheel 144, motor pulley and driving ring 169 with alcohol or meth. spirits. b. Check adjustment of eccentric 74 as described under "mechanical adjustments" c. Remount tension spring 92. d. Clean brackets with alcohol or meth. spirits and grease again as described under "Maintenance". e. Check the adjustments of the brake brackets as described under "mechanical adjustments". f. Bend the lip 91 so that it remains free from the chassis. g. wind without depressed rapid stop key
6. Wow during play-back.	a. Bad recording. b. Pressure roller 122 does not come, or comes too weakly, against the capstan. c. Pressure roller 122 and capstan greasy. d. Winding friction 166 too heavy. e. Rubber rim of idler wheel 175 greasy. f. Speed switch mechanism not properly adjusted. g. Flywheel runs too heavily. h. Driving wheel of the counter 64 does not run smoothly. i. Idler wheel 57 is not properly adjusted. j. Rewind roller 38b does not come free from the reel disc.	a. Try another tape which has a good recording. b. Check adjustments of the control bracket 117 of the pressure roller lever and the rapid stop lever 125 as described under "mechanical adjustments", c. Degrease with alcohol or meth. spirits or replace pressure roller. d. Check adjustment of the winding friction 166 as described under "mechanical adjustments" e. Clean idler wheel 175, motor pulley and contact surface of flywheel with alcohol or meth. spirits. f. Check the adjustments of the speed switch mechanism as described under "mechanical adjustments" g. Grease again as described under "maintenance". (Vertical clearance of the flywheel should be about 0.5 mm! Adjust with the adjusting screw in the lower bearing of the flywheel.) Also check the slowing down period of the flywheel as described under "Mechanical adjustments" h. Grease the driving wheel or replace the counter 64 if necessary. i. Check the adjustment of the idler wheel 57 as described under "mechanical adjustments" j. Check the adjustment of the rewind roller 38b as described under "mechanical adjustments"

List of electrical parts

Code number	Description
WT 562 29	Coil L1
WT 562 31	Coil L2
WT 562 30	Coil L3
WT 511 30	Loudspeaker transformer
JR 142 23	Mains transformer
AD 357 4M	Loudspeaker
WRE 981 21/810	Rectifier GR1
OA81	Rectifier GR2
OA81	Rectifier GR3
OA70	Rectifier GR4
WT 923 10	Lamp
WT 850 06	Modulation indicator
A3 187 10	Mains switch SK0
WY 883 00	Switch SK1, assy.
WT 681 01	Contact strip SK1
WY 883 02	Switch SK2, assy.
WT 681 03	Contact strip SK2
WY 883 03	Switch SK3, assy.
WT 681 04	Contact strip SK3
WY 883 01	Switch SK4
WT 681 02	Contact strip SK4
WY 837 49	Switch SK11
WY 849 09	Switch SK12
WT 064 91	Switch SK12
WT 824 30	Switch SK12
WY 849 09	Switch SK13
WT 886 61	Voltage adapter, assy.

Capacitors and resistors

C1	909/W10	10 µF	16 V
C2	909/W200+909/W9,4	200 µF	16 V
C3	909/W10	10 µF	16 V
C4	C 426 AM/B100	100 µF	4 V
C5	C 426 AM/B100+909/W6,6	100 µF	4 V
C6	909/W10	10 µF	16 V
C7	909/W10	10 µF	16 V
C10	909/W200+909/W9,4	200 µF	16 V
C11	909/W10	10 µF	16 V
C12	C 426 AM/B100	100 µF	4 V
C13	C 435 CE/D64	64 µF	40 V
C14	C 426 AM/B1,6	1,6 µF	64 V
C15	C 430 BL/G200	200 µF	40 V
C16	C 430 BL/F800	800 µF	25 V
C22	909/W10	10 µF	16 V
C23	909/C125+909/W9,4	125 µF	25 V
C25	909/W10	10 µF	16 V
C26	909/E3,2	3,2 µF	40 V
C27	C 426 AM/B100	100 µF	4 V
C30	909/W10	10 µF	16 V
C32	909/E3,2	3,2 µF	40 V
C33	C 426 CE/B250	250 µF	4 V
C34	909/W200+909/W9,4	200 µF	6,4 V
C35	909/W100	100 µF	16 V
C36	909/D64+909/W9,4	64 µF	25 V
C37	909/C125+909/W9,4	125 µF	25 V
R4	E 097 AC/500K	500 kΩ	
R9	916/GL20K	20 kΩ	log.
R12	916/GL20K	20 kΩ	log.
R37	E 097 AC/50K	50 kΩ	
R42	916/GL20K	20 kΩ	log.
R47	916/GL20K	20 kΩ	log.
R53	E 097 AC/20K	20 kΩ	
R67	E 097 AC/50K	50 kΩ	
R68	E 097 AC/50K	50 kΩ	
R69	E 097 AD/5K	5 kΩ	

Phenomenon	Possible cause	Remedy
7. Tape is not wound from the right-hand reel disc during playback.	a. Idler wheel 57 not properly adjusted. b. Winding friction 166 too small. c. Rubber rim of idler wheel 57 greasy. d. Control bracket 34 of idler wheel 57 not properly adjusted.	a. Check adjustment of the idler wheel 57 as described under "mechanical adjustments" b. Check adjustment of the winding friction as described under "mechanical adjustments" c. Clean rubber rim with alcohol or meth. spirits. d. Check the adjustment of bracket 34 as described under "mechanical adjustments"
8. Tape forms loops when switching on "playback".	a. Idler wheel 57 not properly adjusted. b. Control bracket 34 of idler wheel 57 not properly adjusted. c. Winding friction too small.	a. Check adjustment of idler wheel 57 as described under "mechanical adjustments" b. Check adjustment of bracket 34 as described under "mechanical adjustments" c. Check adjustment of winding friction as described under "mechanical adjustments"
9. Tape is not tightly wound during playback.	a. Winding friction too small.	a. Check adjustment of winding friction as described under "mechanical adjustments"
10. Tape is not tightly wound during rewinding.	a. Brake bracket 89 does not come against right-hand reel disc. b. Brake bracket 78b does not touch the tape guide properly.	a. Check adjustment of brake bracket as described under "mechanical adjustments" b. Check the adjustment of the brake bracket 78b as described under "mechanical adjustments"
11. Tape speed switch does not function correctly.	a. Idler wheel 175 does not drive the flywheel in all positions.	a. Check adjustments of the speed switch mechanism as described under "mechanical adjustments"
12. Control keys do not stop.	a. Tension spring 49 loose.	a. Remount tension spring 49.
13. Automatic stop does not function.	a. Switch SK11, SK12 or SK13 not properly adjusted. b. Switch cam 106 not properly adjusted. c. Relay coil defective or wiring interrupted. d. Dirty switch contacts.	a. Check the adjustment of the switches as described under "adjustment of switches" b. Check adjustment of switch cam 106 as described under "mechanical adjustments". c. Trace fault and remedy d. Clean the contacts or replace the switches.
14. Apparatus does not play back.	a. Switch SK3 not properly adjusted. b. Switch SK9 defective. c. Fault in amplifier.	a. Check adjustment of the switch SK3 as described under "adjustment of switches" b. Repair switch SK9 or replace. c. Trace fault with the aid of the stage sensitivity as described under "Checking measurements to the amplifier". The fault can be localised and then remedied (see also point 27
15. Interrupted reproduction.	a. Recording/playback head soiled. b. Tape is not properly pressed against the recording/playback head by the pressure felt of the pressure bracket 81. c. Bias current not correct at recording. d. Bad tape is used during recording. e. Brake bracket 78b does not properly touch the tape guide.	a. Carefully clean recording/playback head with alcohol or meth. spirits. b. Clean pressure felt with a hard brush. Check adjustment of the pressure bracket 81 as described under "mechanical adjustment", c. Check bias current as described under "checking measurements to the amplifier" d. Try a good tape. e. Check the adjustment of brake bracket 78b as described under "mechanical adjustments"
16. Noise during playback.	a. Recording/playback head magnetised.	a. Switch apparatus on and off a few times in the position "recording".
17. Hum during playback.	a. Fault in the amplifier.	a. See point 27.
18. Noise in the position "playback" with no tape in the apparatus.	a. Noise in one of the pre-amplifier transistors. b. Fault in the amplifier.	a. Replace transistor. See point 27. b. See point 27.
19. Distorted sound when playing back.	a. Bad recording (over-modulated). b. Bias current not correct. c. Output transistors TS7 incorrectly adjusted. d. Fault in the amplifier.	a. Try another tape which has a good recording. b. Check bias current as described under "checking measurements to the amplifier" c. Check the adjustment of the output transistors TS7 as described under "checking measurements to the amplifier" d. See point 27.

PHILIPS MODEL EL3549A

Phenomenon	Possible cause	Remedy
20. No treble notes when played back on the tape recorder on which recording has been made.	a. Recording/playback head dirty or worn out.	a. Clean or replace head.
	b. One of the frequency correction networks between TS3 and TS4 does not function.	b. See point 27.
	c. Bias current too great.	c. Check bias current as described under "Checking measurements to the amplifier"
	d. Tape does not lie properly against the recording/playback head.	d. Check tape drive as described under "mechanical adjustments"
	e. Bad tape is used.	e. Try with good tape.
21. Tape is not or badly erased.	a. Erasing head 115 defective.	a. Replace head.
	b. Erasing head soiled.	b. Clean head with alcohol or meth. spirits.
	c. Height of the erasing head incorrectly adjusted.	c. Check adjustment of the erasing head as described under "mechanical adjustments"
	d. Oscillator defective.	d. See point 27.
22. Does not record or records badly.	a. Recording/playback head defective.	a. Replace head.
	b. Recording/playback head soiled.	b. Carefully clean head with alcohol or meth. spirits.
	c. Bias current incorrect.	c. Check bias current as described under "Checking measurements to the amplifier".
	d. No bias current.	d. Oscillator defective, or interruption in switch SK4 or in the wiring.
	e. Fault in amplifier.	e. Trace fault with the aid of the stage sensitivity as described under "Checking measurements to the amplifier". The fault can then be localised and remedied.
	f. Tape transport is not properly adjusted.	f. Check the adjustments of the tape transport as described under "mechanical adjustments"
23. Apparatus too insensitive when recording from radio or pick-up.	a. R4 has changed in value.	a. Check the adjustment of R4 as described under "checking measurements to the amplifier"
	b. Fault in the amplifier.	b. Trace fault with the aid of the stage sensitivity as described under "Checking measurements to the amplifier". The fault can then be localised and remedied (see point 27
24. Apparatus does not switch off.	a. Mains switch not properly adjusted.	a. Check the adjustment of mains switch as described under "Adjustment of switches"
	b. Mains switch defective.	b. Replace mains switch.
25. Mechanical noise.	a. Idler wheel 175 is dented.	a. Let the apparatus operate in position "STOP" for approx. 2 hours (tape speed 19 cm/sec ($7\frac{1}{2}$"/sec)).
26. Tape is not taut during winding.	a. Brake bracket 78b does not properly touch the tape guide.	a. Check the adjustment of the brake bracket 78b as described under "mechanical adjustments"

27. By checking the stage sensitivity and the d.c. voltage adjustments of the transistors as described under "Checking measurements to the amplifier", most of the electrical faults can be quickly and easily localised.

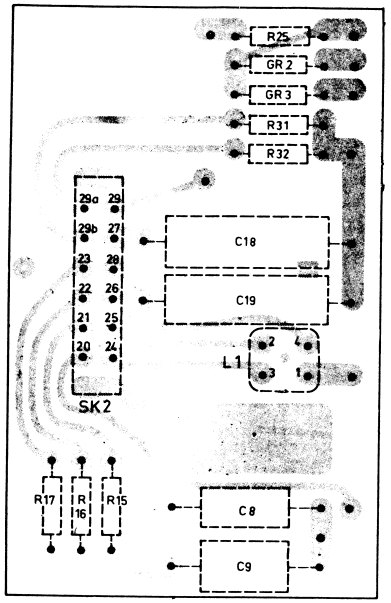


Fig 89

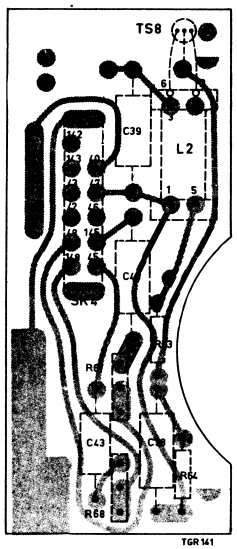


Fig 90

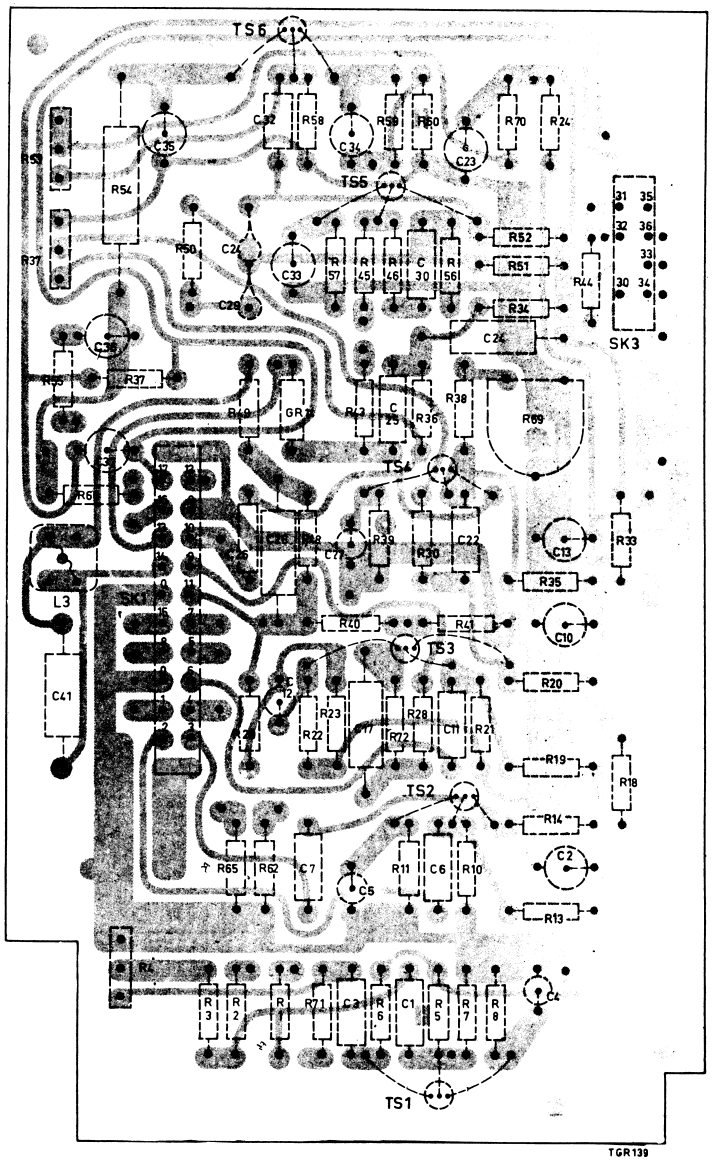
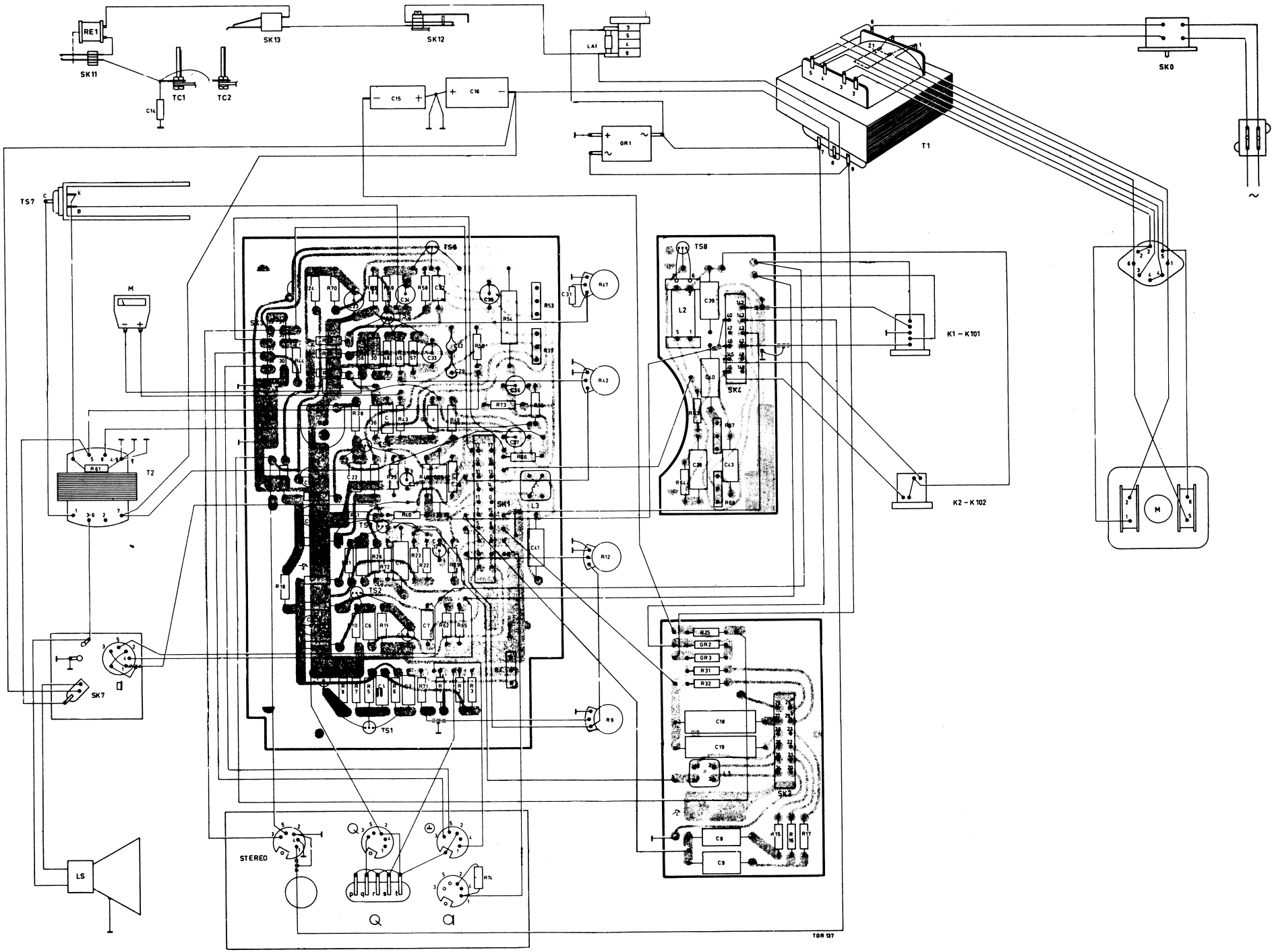


Fig 91

PHILIPS MODEL EL3549A



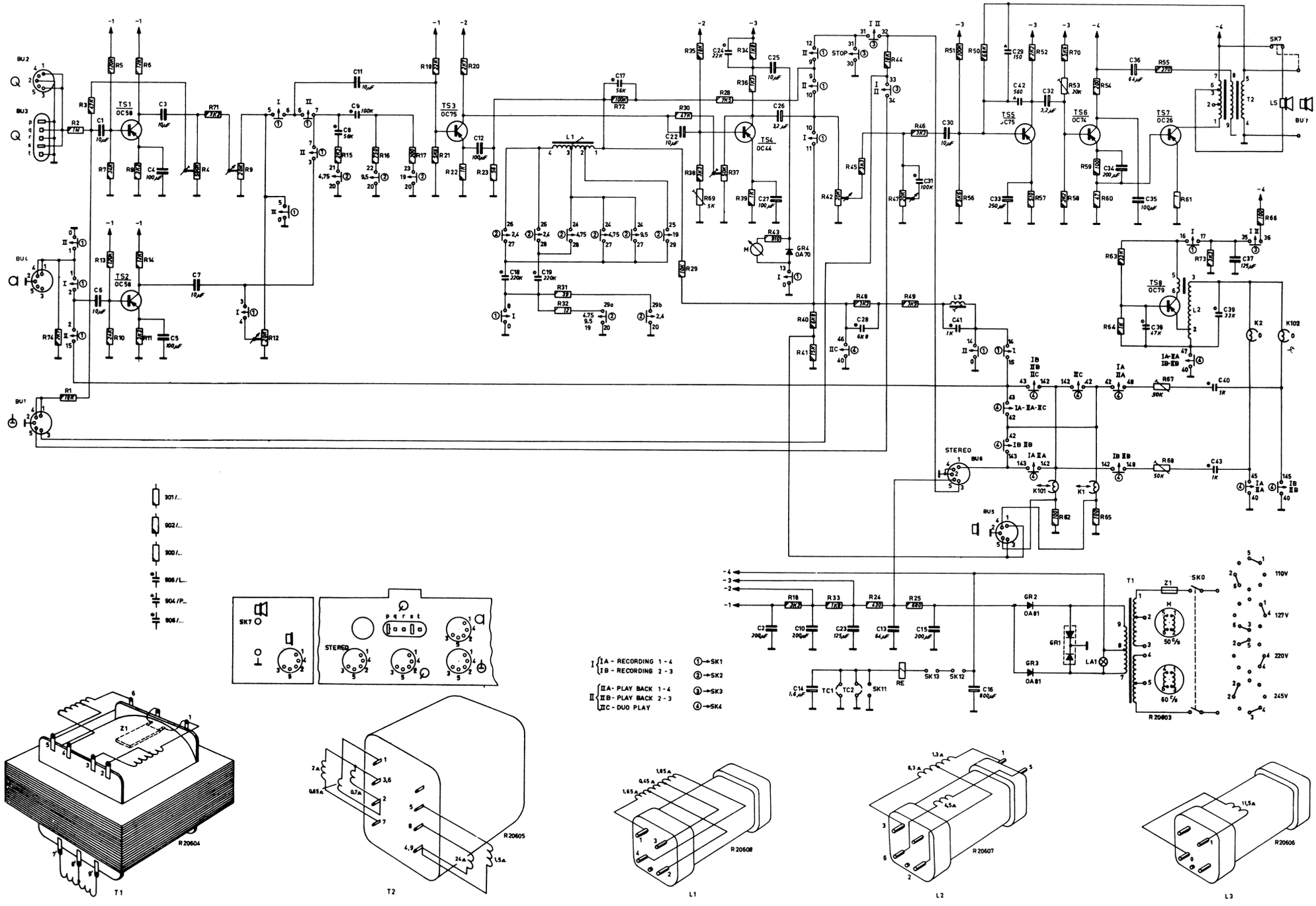

TS1 OC50
TS2 OC50
TS3 OC75
TS4 OC44
TS5 OC75
TS6 OC74
TS7 OC26
TS8 OC79
GR1
GR2 OA81
GR3 OA81
GR4 OA70
STOP
STEREO
IA - RECORDING 1 - 4
IB - RECORDING 2 - 3
IIA - PLAY BACK 1 - 4
IIB - PLAY BACK 2 - 3
IIC - DUO PLAY
110V
127V
220V
245V
R 20603
R 20604
R 20605
R 20606
R 20607
R 20608

Fig 93

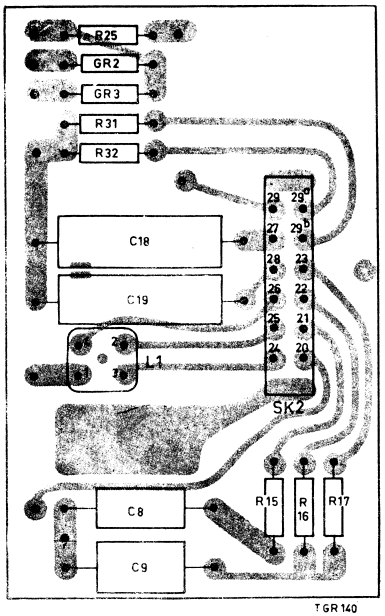


Fig 95

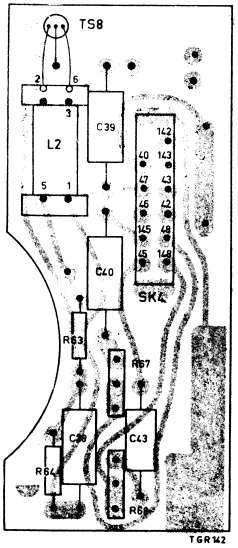


Fig 96

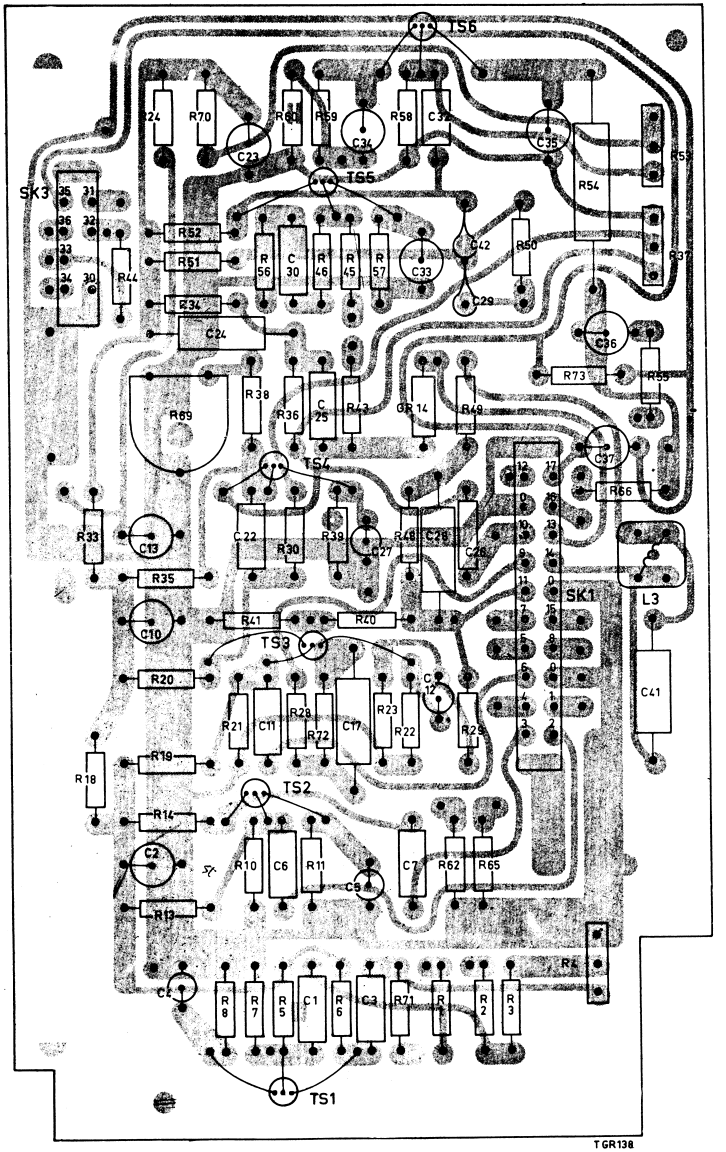


Fig 94

PHILIPS Service

INFORMATION

RECORDERS

8-5-1963	EL 3549A	Bc 353

Re: Alterations in tape recorders EL 3549A.
At present there are 5 versions of EL 3549A indicated by the data on the plate.

WR00 - original version

WR01 - WR00, exception: completely modified rewind mechanism

WR02 - WR01, exception: both chassis and metal cover plate suspended in rubber grommets at front

WR03 - WR02, exception: standard switches SK11, SK12 and SK13.

WR04 - WR03, exception: modified fitting of SK12.

N.B.: The Service Notes EL 3549A are based on version WR01

WR00 The rewind mechanism of the original version differs from that of the versions WR01 and higher (see fig. 1).
For this construction the following parts can be supplied.

pos. 25 - WT 496 58 driving belt
pos. 31 - A9 042 97 reel disc (lower part)
pos. 63 - WT 823 78 bracket with spindle
pos. 65 - VT 575 09 guide pulley
pos. 88 - WT 741 65 tension spring
pos. 95 - WT 837 48 bracket
pos. 97 - WT 883 07 rewind wheel
pos.138 - WT 883 06 guide pulley

The alignment of the rewind wheel pos. 97 is the same as that of rewind wheel pos. 148. See Service Notes

- The ornamental cap 258 and the control knobs 254 have been modified together with the suspension of the chassis and the cover plate.

In order to further reduce the mechanical vibration, the recesses in the ornamental cap 258 for the shaft of the control knobs 254 have been enlarged, and the metal bushings in the control knobs 254 have been extended. (The bushing now projects 4 mm. from the knob.)
Service supplies only the latest versions of the ornamental cap and the control knobs under the code numbers mentioned in the Service Notes.

N.B. Service to the apparatuses before stamp WR-02.
When replacing the ornamental cap 258 it is not necessary to replace the control knobs 254.
When replacing a control knob 254, the projecting part of the new knob must be sawn-off.

WR02/ WR03 Switches SK11, 12 and 13 replaced by standard switches starting from stamps WR02 37/62

a. SK11 Switch for stop relay RE.
With the introduction of standard switch SK11 the mounting and also the alignment of this switch have been modified (see fig. 2).
The contacts of this switch should be opened about $\frac{1}{2}$ mm in rest position of the stop relay.
To be aligned by bending the mounting bracket (pos.102) of SK11 with the aid of a screwdriver (see fig. 2).

N.B. This standard switch SK11 has been introduced from the stamps WR02 37/62.

The old version of the switch SK11 (WY 837 48) is no longer available and has to be replaced by complete relay WY 820 48.
Please add to the mechanical parts list.

pos. 101 - WY 849 09 switch SK11 (standard)
pos. 102 - WT 079 07 mounting bracket SK11 (for new version)
pos. 108 - WHB 045 TU/2.5 circlip over pressure spring pos. 140 (see fig. 2)

b. SK12 For mou nting switch SK12 see fig. 3.
By standardizing of SK12 the mounting and the alignment of this switch have been modified.
The switch has to be aligned in such a way that commanding lip B of SK12 is released by lip A on the left-hand brake bracket when the set is in rest position.
The contacts of SK12 are open in this position.
In position recording, playback, or wind/rewind lip A on the left-hand brake bracket has to push commanding lip B of SK12 so that the contacts of SK12 just touch.
Alignment by varying the position of SK12 with respect to lip A on the brake bracket.

N.B. This construction has been applied in apparatuses with stamps from WR02 39 up to and including WR03 47/62.

Sometimes another kind of mounting of SK12 can be met (see fig. 4). This switch has ten to be aligned as follows.

The set being in rest position lip A on the left-hand brake bracket has to pull commanding lip B of SK12 forwards, thus opening the contacts.
When the apparatus is switched into position recording playback or wind/rewind lip B of SK12 must be released by lip A, as a result the contacts of SK12 are closed.
Alignment by varying the position of SK12 with respect to lip A.

N.B. Applied in apparatus with stamps from WR02 37/62 up to and including WR02 38/62.

In case switch SK12 of versions WR01, WR02 and WR03 has to be replaced, see WR04.

c. SK13 Switch SK13 replaced by standard switch WY 849 09.
Both mounting and alignment of this switch have not been altered.

N.B. This switch has been introduced from WR02 38/62.

d. Mounting of brake bracket pos. 78b has been simplified from WR03 45/62. See fig. 5.
Pressure spring pos. 63 has been replaced by a tension spring mounted onto a lip of head mounting plate.
The brake bracket pos. 78b can be aligned by shortening or pulling out of the tension spring.
Please add to the mechanical parts list.

Tension spring - pos. 63 - WT 742 33

New commanding rod - pos. 67a - WT 838 11

N.B. Parts for the original construction remain deliverable.

WR04 In order to prevent looping of the tape the mounting and the alignment of switch SK12 have been modified once more (see fig. 6).
Alignment of switch SK12.
The set being in rest position lip A on the right-hand brake bracket has to push commanding lip B of SK12 so far upwards that the contacts of SK12 are opened.
In position recording, playback or wind/rewind the commanding lip B of SK12, must be released by lip A of the right-hand brake bracket, thus closing the contacts of the switch.
To be aligned by bending lip A on the right-hand brake bracket (see fig. 6).

N.B. This construction of SK12 has been introduced from stamp WR04 48/62.

With respect to standardization we only supply parts for the modified construction WR04.

In order to convert the versions WR00-01-02-03 to WR04 we supply a conversion kit under code number A9 043 44.
Please modify in the mechanical parts list:

pos. 68 - WT 837 78 - right-hand brake bracket
pos. 86 WY 849 09 - switch SK12

Please add to the mechanical parts list A9 043 44, conversion kit for SK12 consisting of
1x right-hand brake bracket pos. 68
1x switch complete with mounting bracket pos. 86a.

During production the following modifications have been introduced

I. Due to modifications of the fitting of the motor mounting plate the height of the motor pulley (pos. 152) mentioned in the Service Notes is no longer correct.
This height should be between 25 and 28 mm to be measured as mentioned on page 20 of the Service Notes.

Alignment of motor pulley.

a. Speed selector in position $7\frac{1}{2}$ inch/sec (19 cm/sec.).

b. Intermediate wheel pos. 175 has to be adjusted to the middle of the $7\frac{1}{2}$ inch/sec. step of the pulley.
Height can be adjusted by placing washers between motor mounting plate and chassis.

c. When the apparatus is switched $3\frac{3}{4}$ inch/sec., 17/8 inch/sec., and 15/16 inch/sec. the intermediate wheel pos. 175 should be correctly between motor pulley and flywheel, always in the middle of the pulley step in question

d. If not correct repeat a, b and c.

II. The alignment of the commanding bracket pos. 117 of the pressure roller lever pos. 113 has been modified to make alignment less critical.
Space between commanding bracket pos. 117 and lever pos. 113 must now be adjusted to 1-1.5 mm.
Page 13 of the Service Notes has to be corrected accordingly.

III. There is a possibility that with some sets commanding bracket pos. 62a of switch SK13 is caught behind the fixing screw of SK13, due to this it is impossible to insert the tape properly or to depress the push buttons.
For this reason commanding bracket 62a has been modified.
Code number remains the same.
For service purposes it will mostly suffice to shorten the mounting screw of SK13 of to bend bracket pos. 41 of switch SK13 slightly forward.

IV. In the course of the production the slides of the switches SK1, SK2, SK3 and SK4 have been provided with gold contacts in order to obtain better contact. This modification, however has not been introduced to all switches at the same time.

Only sets with stamps WR04 and higher are provided with a complete set of improved slides.
Code numbers of slides have not been modified.

V. In some sets it may occur that the pause button does not lock due to a misalignment of hook pos. 23. For this reason the mounting bracket pos. 22 of the locking hook has been modified (code number remains WT 823 71).

VI. There are two versions of the indication lamp LA1:
100 mA without limiting resistor and 200 mA with limiting resistor.
For service only 100 mA lamps are supplied (WT 923 10).
When 200 mA lamp is defective it can be replaced by a 100 mA-lamp after the limiting resistor has been short-circuited.
Resistor defective: mount new resistor or deleted resistor and mount 100 mA lamp.

VII. Protection for the diodes OA81.
As from stamp WR03 46/62, a resistor (R81) of 56 Ω has been added to the supply part in order to protect the diodes OA81 against initial current pulses (see fig. 7).
This resistor is located on the vertically positioned printed panel.
Code number of resistor R81 : 902/56E.

VIII. Rectifying cell GR1.
In some apparatuses the double rectifying cell GR1 has been replaced by a Graetz rectifier, in which case the diodes GR2 and GR3 (OA81) have been left out.
The supply part is then circuited as shown in fig. 8. The stop relay RE is not connected to the 16 V but to the 37 V voltage supply (-C15).
A resistor of 39 Ω has been connected in series with the switch SK11.
This resistor is mounted to fixing bracket 41 of SK13.
Code number of resistor: 938/B39E.
Code number of Graetz rectifier: WRE 981 21/850.
The modified part of the wiring diagram is shown in fig. 9.

IX. Various types of transistors.
It is possible that the transistors TS1 and TS2 (OC58) have been replaced by the transistors OC59.
For Service, OC58 as well as OC59 can be used.
It is also possible to replace transistor TS3 (OC75) by transistor OC58 or OC59. In that case, the transistor R20 has been modified from 2.7 kΩ to 5.1 kΩ (code number 901/5K1), and the resistor R22 from 1 kΩ (10 %) to 1 kΩ (5 %) (code number 901/1K). For Service an OC58 or OC59 must be used.
Note: If necessary, use can be made of an OC75 but then the resistor R20 must be replaced by a resistor of 2.7 kΩ. (Code number 902/2K7).

X. In order to avoid distortion due to over-modulation, the resistor R49 has been modified from 3.9 kΩ (code number 902/5K6).
In this connection, the following checking measurements have been slightly modified.
(Please amend the following on pages 40 and 41 of the Service Notes.)

1. Checking the recording frequency response curve and the adjustment of coil L1 (page 40).
2. Overall frequency response curve for 2.4-4.75-9.5 and 19 cm/sec (page 41).
   The input voltage at BU2, point 1, must now be 7.5 mV.
3. Checking the modulation indicator and the headphone output (page 41).
   The output voltage at the headphone output BU5, points 1 and 3, must now be 200 mV ± 2 dB.
4. Recording sensitivity and adjustment of R4 (page 41).
   The input voltage at BU2, point 3, (pick-up) must now be about 150 mV.
   The input voltage at BU1, point 1, (radio) must now be about 3 mV.
   The input voltage at BU4, point 1, (microphone) must now be about 0.25 mV.

Survey of the modifications

WR00 For this version add to the mechanical parts list of the Service Notes

pos. 25 - WT 496 58 - driving bel
pos. 31 - A9 042 97 - reel disc (lower part)
pos. 63 - WT 823 78 - bracket with spindle
pos. 65 - VT 575 09 - guide pulley
pos. 88 - WT 741 65 - tension spring
pos. 95 - WT 837 48 - bracket
pos. 97 - WT 883 07 - rewind wheel
pos.148 - WT 883 06 - guide wheel

WR01 For this version the parts mentioned in the Service Notes are correct.

WR02 For sets with stamps WR02 and higher add to the mechanical parts list of the Service Notes

pos. 292 - WRB 905 TU/8x1 - rubber grommet

WR02/WR03 a. SK11 For the original construction of the stop relay RE as mentioned in the Service Notes the following parts remain available.

pos. 100 - WT 760 25 - torsion spring
pos. 103 - WY 820 48 - stop relay complete
pos. 104 - WT 730 99 - pressure spring
pos. 112 - WT 741 95 - tension spring

The following parts can no longer be supplied.
If one of these parts is defective the complete stop relais has to be replaced.

pos. 99 - WT 617 00 spindle
pos. 101 - WY 837 48 switch SK11 (old version)
pos. 105 - WT 064 87 bracket
pos. 106 - WT 618 36 switch-off cam
pos. 106 - VT 585 00 switch-off cam
pos. 107 - WY 820 75 relay armature
pos. 109 - WT 032 13 bracket
pos. 110 - WT 885 26 relay coil
pos. 111 - WT 823 77 mounting bracket

The following parts have to be used for the new construction of SK11.

pos. 101 - WY 849 09 switch SK11
pos. 102 - WT 079 07 mounting bracket SK11
pos. 108 - WHB 045 TU/2.5 circlip over pressure spring pos. 104

N.B. The new mounting bracket pos. 102 (WT 079 07) can be used for the old construction WT 046 35 by cutting of mounting lip of SK11.

b. SK12 The following parts for sets with stamps up to and including WR03 are no longer available.

pos. 68 - WT 837 34 right-hand brake bracket (old version)
pos. 86 - WY 837 49 switch SK12 (old version)

For these parts can be ordere the conversion kit A9 043 44.
For sets with stamps WR04 and higher the following parts are supplied.

pos. 68 - WT 837 78 right-hand brake bracket (new version)
pos. 86 - WY 849 09 switch SK12 (new version)

c. SK13 The old version of SK13 - pos. 41a WY 885 05 is no longer available.
Order new one WY 849 09.

d. Please add to the mechanical parts list for sets with stamp WR03 and higher.

pos. 63 - WT 742 33 tension spring
pos. 67a- WT 838 11 rod

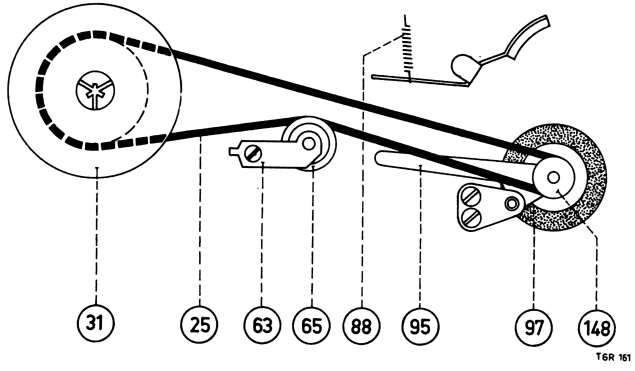


Fig.1

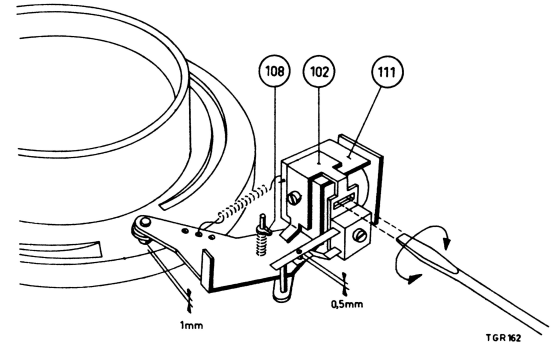


Fig.2

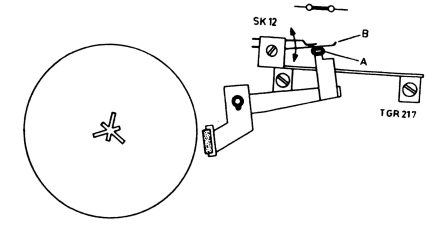


Fig. 3

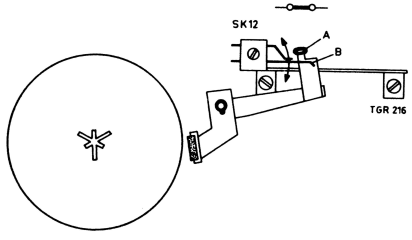


Fig. 4

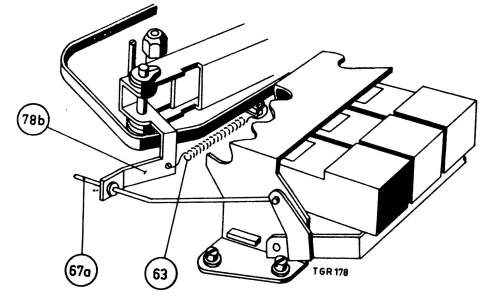


Fig. 5

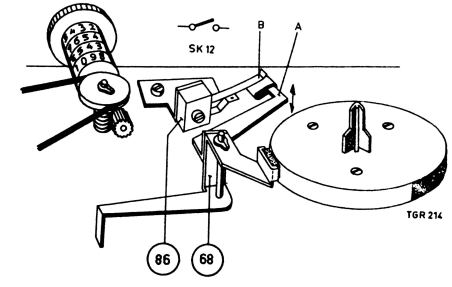


Fig. 6

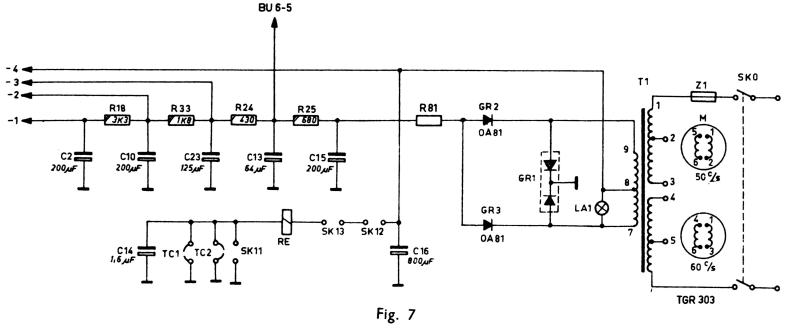


Fig. 7

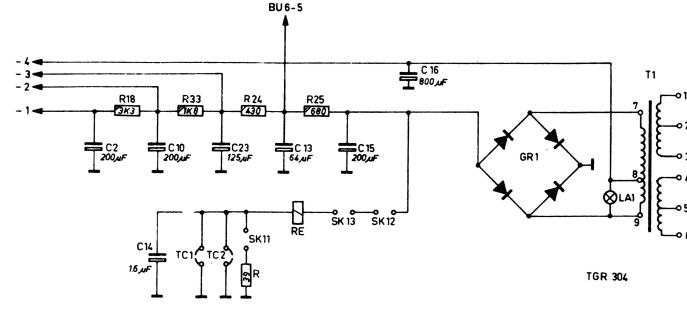


Fig. 8

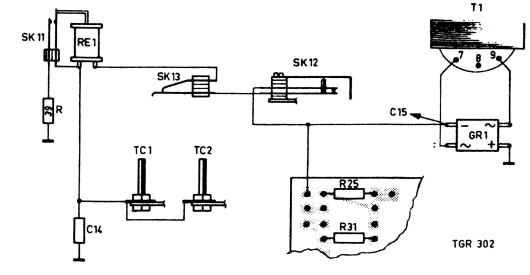


Fig. 9

PHILIPS Service
INFORMATION

RECORDERS

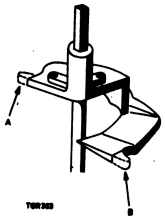
9-5-'63	EL 3534A - EL 3549A	Bc 360

Re: Modified switch cam 146

In order to facilitate the adjustment of the speed selector mechanism, the switch cam 146 has been modified.
The cams A and B on the switch cam have been deleted, see the figure in this Information.
The code numbers have not been modified;

WT 937 75 - Switch cam 60 c/s
WT 937 71 - Switch cam 50 c/s

Note: When servicing apparatuses in which the cams A and B are still present on the switch cam, these cams can be sawn off. (However, make the switch cam burr-free, for instance with a file.)



PHILIPS Service
INFORMATION

RECORDERS

14-8-1963	EL 3549A	Bc 393

Re : correction to the Service Notes

- In the list of mechanical parts the following has to be modified:

  pos. 42 must be modified to WT 036 38
  pos. 43 must be modified to WT 036 38
  pos.154 must be modified to WT 231 14

- On page 39 the voltages mentioned in the circuit diagram have been incorrectly stated. Please modify these voltages as follows:

-1	10.5 V
-2	15 V
-3	22 V
-4	15.5 V
voltage across C13	27 V
voltage across C15	35 V

- In the list of electrical parts the following must be modified:

  Switch SK11 - WY 849 09)
  Switch SK12 - WY 849 09) also see Bc 351 and Bc 353
  Switch SK13 - WY 849 09)

PHILIPS Service
INFORMATION

RECORDERS

28-8-1963	EL 3534A - EL 3549A	Bc 366

Re: Apparatus stamped WR-05.

As from stamp WR-05 28/63 the tape speed selector mechanism has been modified so that its adjustment is considerably simplified.
The roller pos. 177 serving for the horisontal movement of the idler wheel 175 is now fitted to the adjustment plate pos. 179b. The adjustment of the tape speed selector mechanism is now effected as follows (see pages 20 and 21 of the Service Notes):

a. Adjust plate 138 so that both sides of this plate run parallel to the chassis, see fig. 1 of this information.
b. Set the tape speed selector to position 2,4 cm/sec. (15/16"/sec.)
c. Loosen adjustment plate 179b until this plate can be shifted.
d. Adjust stop plate 142 so that the idler wheel 175 is correctly positioned between the 2,4 cm/sec. (15/16"/sec.) step of the motor pulley and the flywheel.
e. By means of adjustment plate 179b adjust roller 177 so that there is a clearance of 0,3 - 0,5 mm between this roller and the switching cam.
f. Now check all other positions of the speed selector mechanism. Between switching cam 146 and the roller 177 there must be a clearance of 0,3 - 0,5 mm in all positions (except the "OFF" positions).
   If necessary readjust roller 177.
   The new parts are avaible under the following code numbers:

pos. 177	208 00225	Roller
pos. 179a	214 00935	Idler wheel brakcet
pos. 179b	214 00936	Adjustment plate
pos. 179c	213 00486	Fixing plate

The parts of the old construction remain available.

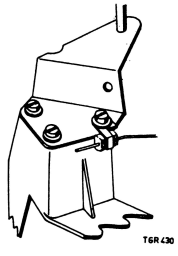


Fig. 1

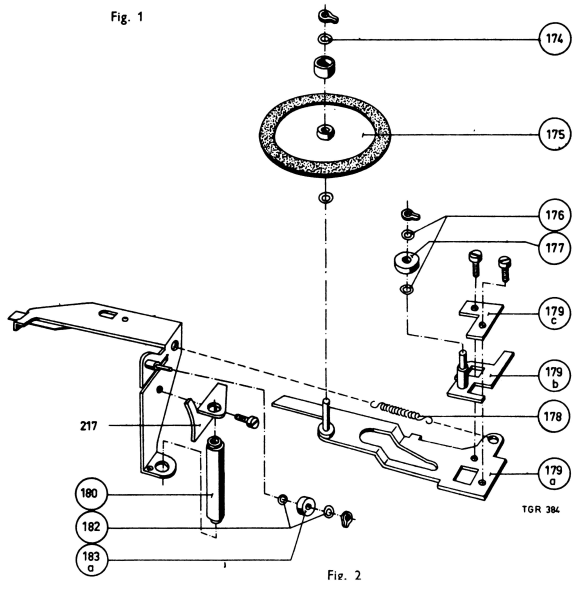


Fig. 2

PHILIPS Service

INFORMATION

28-8-'63	EL 3534A - EL 3549A	Bc 402

For material used for the tape guides 80 and 129a is changed to copper (nickel-plated) in view of possibly occurring oxidation.
The new tape guides are supplied under the following code numbers:

Pos. 80	213 00439	Tape guide, left
Pos. 129a	213 00438	Tape guide, right

5-11-1963	EL 3534 - EL 3549	Bc 430

Reduction of mechanical noise

In order to reduce mechanical noise the following modifications can be made.
The five measures mentioned below should be taken in the order as stated. Should the mechanical noise be removed before all five measures have been taken, then it is not necessary to continue.
The conversion kit, code number 4822 215 00783, contains all parts for the modifications mentioned below.
Contents of the kit:

1 idler wheel	WY 876 01
1 ring	4822 220 00332
1 torsion spring	4822 214 00942
8 rubber grommet	
8 spacers	
4 screws	999/4X25

I. Damping of idler wheel bracket

For this a torsion spring, item 183a, must fitted as shown in fig. 1. After mounting, check whether the idler wheel bracket can easily be operated. The contact faces of the spring must be greased (code number of grease: A9 881 22/P50).
The code number of the spring is: 4822 214 00942.

II. Modification to the idler wheel

Should after some time the mechanical noise still be perceptible at $7\frac{1}{2}$"/sec., then the idler wheel, item 175, must be replaced.
The new idler wheel has closer tolerances and is indicated with a blue cross. The code number is: WY 876 01.
At the same time a ring, item 174, has been added (see fig. 1).

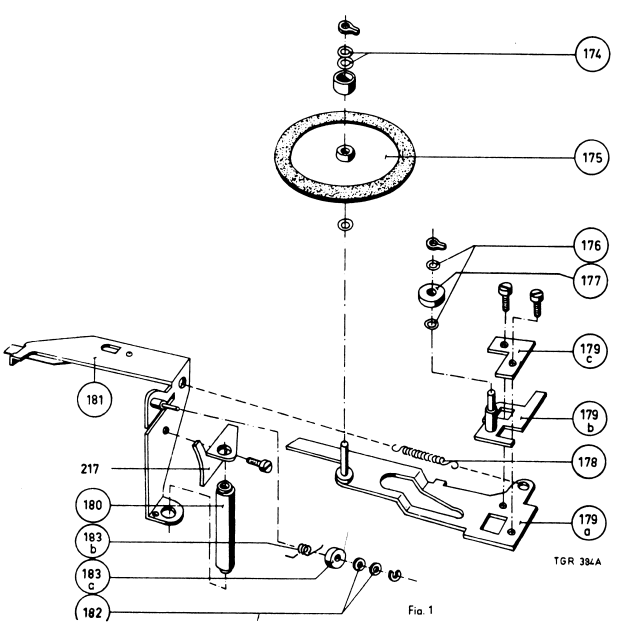


Fig. 1

III. Modification to the mounting of the chassis

The chassis on the back side should be mounted to the cabinet by means of grommets. Use should be made of the grommets WRB 905 TU/8x1 and spacers with a length of 5.6 mm inner diameter 4.1 mm, outer diameter 5.6 mm.
Mounting should be effected as shown in fig. 3b of the Service Notes to the EL 3549. This way of mounting requires longer screws. Code number 999/4x25.

IV. Modification to the mounting of the motor

The mounting of the motor should be effected with the aid of the same rubber grommets and spacers as mentioned under III.

V. Check of the mounting of the metal cover plate

Check that the metal cover plate of the chassis remains entirely free from the bearing plate 138. If necessary, bend the cover plate upwards.

PHILIPS Service

INFORMATION

RECORDERS

23-3-1964	EL 3534 - EL 3549	Bc 442

NOTE : The apparatuses in which measurements have been taken concerning mechanical noise, as stated in information sheet Bc 430, are distinguishable by the stamp WR06 46/63.

The following points pertain to additions and corrections :

- The bracket, item 206, for securing the modulation indicator, is available under code number 4822 212 00421 for the EL 3534 and code number 4822 212 00422 for the EL 3549
- The spring of the quick-stop brake 28 has been lengthened to provide additional stability.
  Bracket 28 is available under code number 4822 215 00856.
- Switching-cam 146 has been shortened at the top by 1.5 mm.
  The height of bracket 138 is reduced by 1.5 mm.
  Consequently the metal cover rests more freely, thus reducing chances of mechanical noise.
  If a new switching-cam 146 needs to be mounted, then either the space between switch-cam 146 and bracket 138 must be filled up with washers (A9 868 65), or a new bracket 138 should be used.
  Code number of switching-cam (50 c/s) 4822 215 00836
  Code number of switching-cam (60 c/s) 4822 215 00853
  Code number of bracket 4822 212 00423
- In the position where bracket 147 might touch disc. 74, a rubber stop strip has been glued.
  Bracket 147 including the stop strip is available under code number 4822 215 00854.
- To prevent vibration of the right-side brake bracket a spring pressure washer has been fitted under the clamping ring.
  Code number B 046 AA/4.

CENTRAL SERVICE

18.2.1964	EL 3534-EL 3549-EL 3548	Bc 451

**The lower part of the right-hand reel disc, item 166, is provided with bronze bearings. Owing to this the mechanical noise, which is sometimes audible during fast winding, is reduced to a minimum.
In this way irregular winding is also remedied.
This new unit is available under code number 4822 215 00871 for EL 3548 and 4822 215 00872 for EL 3534 - EL 3549.**

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PHILIPS MODEL EL3549A

P17-34

PHILIPS *Service*

INFORMATION

RECORDERS

4-3-1964	EL 3534A - EL 3549A	Bc 460

This information substitutes Bc 351 + Bc 437

Re.: Survey and modifications to the brake constructions

The construction of the brake brackets 56 and 68 and the winding strips 50 and 51 has been simplified. The lips of the winding strips no longer engage the recesses of the brake brackets. This construction has been introduced in apparatuses as from stamp WR-03 45/62, see figs. 4 and 6.
At the same time, the brake shoes of the brake brackets have been made adjustable in apparatuses as from stamp WR-04 12/63. The reason for this is that the reel discs were blocked by the brake shoes during braking, resulting in the tape being twisted.
The brake shoes must now be adjusted by means of a pair of pliers. (See fig. 15.)

Note : In apparatuses in which one of the brake shoes 54 or 84 is worn due to incorrect adjustments, both brake shoes must be replaced. (The brake shoes should be of the same thickness.) Then the adjustments of the brake shoes and brackets must be checked as given in the Service Notes and in this Information (figs. 15, 16, 17 and 18).

It is also necessary to adjust the height of the brake shoes with respect to the reel discs, because the brake shoes must be correctly positioned with respect to the rim of the reel disc, see fig. 16.

In apparatuses which have not yet been provided with adjustable brake shoes, a saw cut can be made in the brake brackets, as shown in fig. 15.
The brake shoes can then be readjusted if necessary.

Note : After having adjusted the brake shoes, the other brake adjustments have to be checked.

Checking the brake shoe adjustment

Put a full 5"-reel on the left or right-hand reel disc (apparatus in position "STOP"). The pressure of the brake shoes, measured in accordance with figs. 17 and 18, should not exceed 250 grams. Should the brake force exceed 250 g, the reel disc rim an the brake blocks must be properly cleaned with a dry cloth.
If necessary, replace the brake blocks, item 54 and 84. The forces measured in the opposite direction of rotation should amount to approx. half the value mentioned above.
Owing to these and previous modifications, the former code numbers for brake brackets and winding strips have been deleted. (See the Service Notes and the relevant Informations).
With each construction described in the following, the new code numbers have been stated.

The following code numbers have been deleted :

		4822 213 00437	Conversion kit
Pos. 51	WT 078 35	4822 126 00688	Rewinding strip
Pos. 52	WT 889 80	4822 126 00689	Winding strip
Pos. 56	WT 837 35	4822 126 00692	Brake bracket, left
Pos. 56	WT 824 30	4822 214 00857	Brake bracket, left
Pos. 68	WT 837 34	4822 126 00691	Brake bracket, right
Pos. 68	WT 837 78	4822 214 00858	Brake bracket, right

Please state the code numbers mentioned in the following when ordering

For service purposes two special brake brackets have been designed which can be applied in all models (see Fig. 9-10). As from now only the new model will be available.

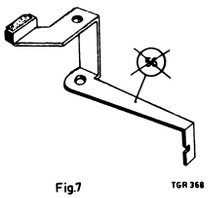

Fig.7

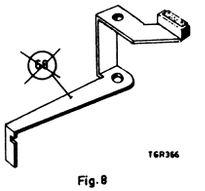

Fig.8

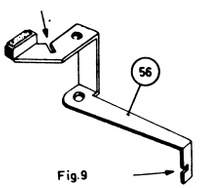

Fig.9

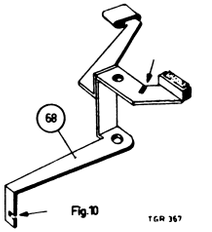

Fig.10

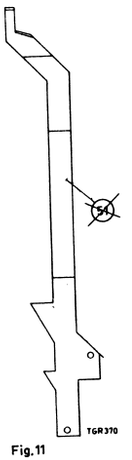

Fig.11

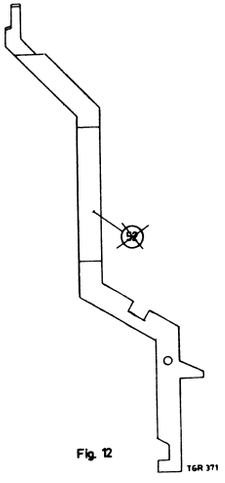

Fig. 12

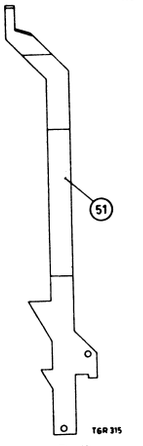

Fig.13

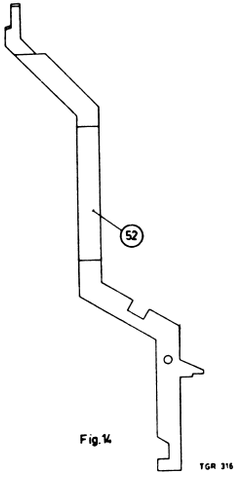

Fig.14

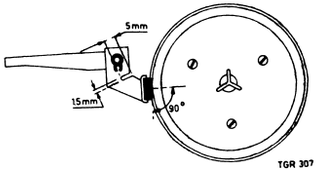

Fig. 15

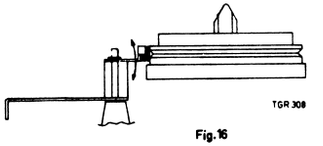

Fig.16

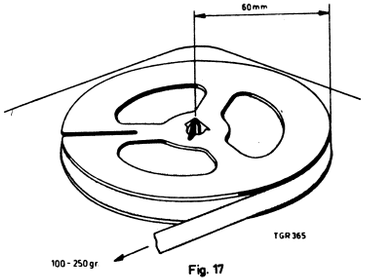

Fig. 17

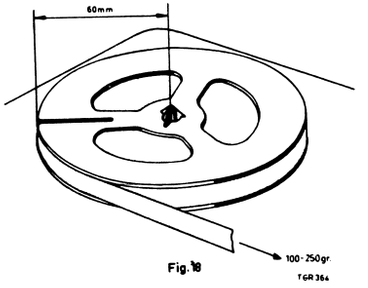

Fig.18

Construction 1 (fig. 1)

This construction applies to apparatuses as from stamp WR-02 37/62.
When ordering the following parts, use the code numbers mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	4822 211 00914	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	x)	Switch SK12
87	xx)	Guide bracket

x) When this part has to be replaced, the apparatus must be modified to construction 5. The reconstruction kit A9 043 44 is supplied for this.

xx) When this part has to be replaced, the apparatus must be modified to construction 5. The reconstruction kit A9 043 44 is supplied for this.

Note : A9 043 44 consists of :
1x switch SK12, complete with fitting
1x brake bracket 68 (right) code no. 4822 211 00915

Construction 2 (fig. 2)

This construction applies to apparatuses as from stamp WR-02 37/62 to stamp WR-02 39/62.
When ordering the following parts, use the code number mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	x)	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	WY 849 09	Switch SK12
87	xx)	Guide bracket

x) When this part has to be replaced, the apparatus must be modified to construction 5. The reconstruction kit A9 043 44 is supplied for this.
The code number of the appropriate brake bracket, pos. 56, is 4822 211 00914.

xx) As for construction 1 xx).

Construction 3 (fig. 3)

This construction applies to apparatuses as from stamp WR-02 39/62 to stamp WR-03 45/62.
When ordering the following parts, use the code numbers mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	x)	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	WY 849 09	Switch SK12
87	xx)	Guide bracket

x) As for construction 2 x).
xx) As for construction 1 xx).

Construction 4 (fig. 4)

This construction applies to apparatuses as from stamp WR-03 45/62 to stamp WR-04 48/62.
When ordering the following parts, use the code numbers mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	x)	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	WY 849 09	Switch SK12
87	xx)	Guide bracket

x) When this part has to be replaced, the apparatus be modified to construction 6. The reconstruction kit A9 043 44 is supplied for this. The code number for the appropriate brake bracket, pos. 56, is 4822 211 00914

xx) As for x), but appropriate guide bracket, pos. 56. Code number of guide bracket WT 064 91.

Construction 5 (fig. 5)

Service version for the construction 1 to 3 incl. When ordering the following parts, use the code numbers mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	4822 211 00914	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	WY 849 09	Switch SK12
87	WT 064 91	Guide bracket

Construction 6 (fig. 6)

This construction applies to apparatuses as from stamp WR 04 48/62.
It is advisible to modify apparatuses of construction 4 to this construction.
When ordering the following parts, use the code numbers mentioned below :

Pos.	Code number	Description
51	4822 212 00395	Rewinding strip
52	4822 215 00721	Winding strip
56	4822 211 00914	Brake bracket (left)
68	4822 211 00915	Brake bracket (right)
86	WY 849 09	Switch SK12
87	WT 064 91	Guide bracket

Note : When use is made of the old control bracket, pos. 51-52 (see Fig. 11-12) the adjustment should be effected as described in the Service Notes (page 12). When using new control brackets, pos. 51-52 (see Fig. 13-14) the bracket should press into the brake bracket either above or below the groove. This can be adjusted by bending the operating lug of the left-hand brake downward, that of the right-hand brake should be bent upward.

JFW/JD

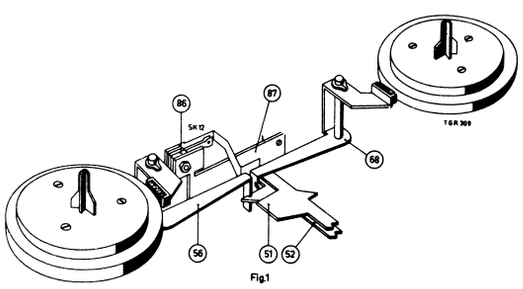

Fig.1

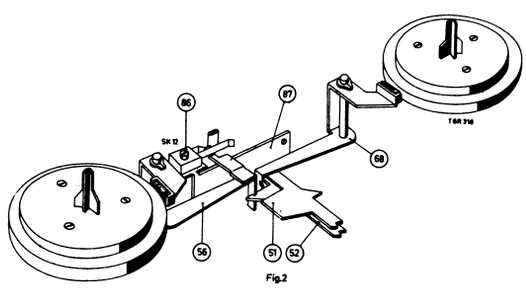

Fig.2

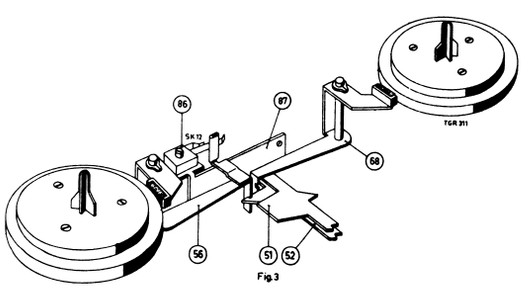

Fig.3

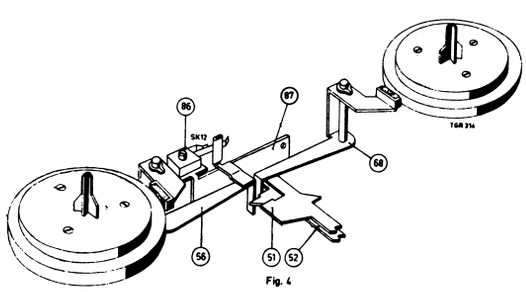

Fig. 4

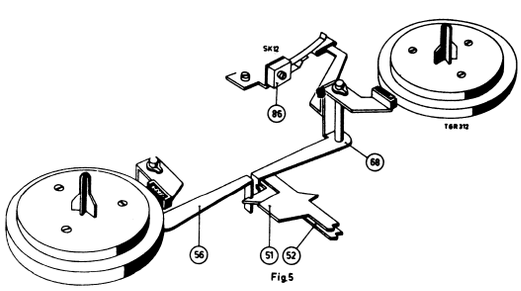

Fig.5

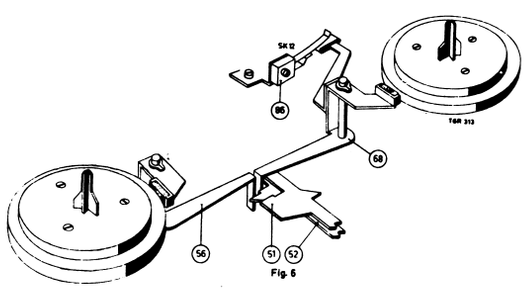

Fig. 6

PHILIPS MODEL EL3549A

P17-36

P17-37 PHILIPS MODEL EL3549A

17-3-1964	EL 3549	Bc 474

Please amend the following in the Service Notes.
under "Check for the recording response and the adjustment of L1".

Line 6 : 4.75 Ω/s should read 4.75 cm/s.
Line 7 : add : measuring frequency 1000 c/s.

Page 42 under "Adjustment of the bias current and L3".

Line 6 : should read : If the overall frequency response at 4.75 cm/s, as described on page 41, is not to be attained, the bias current for K1 (position 1-4) should be reduced with the aid of R67.

29-5-1964	EL 3534 - EL 3549	Bc 486

To prevent the modulation meter from being fitted incorrectly, its fixing has been modified. The fixing bracket, item 206, is no longer screwed to bracket, item 205, via grommets, but is now fitted directly.
This modification has been made in :

EL 3534 as from serial number 67201 14/64
EL 3549 as from serial number 145501 15/64

For service purposes the brackets may be fixed with the aid of washers.

PHILIPS Service

INFORMATION

3-2-1965	EL 3534 - EL 3549	Bc 525

Re : Reducing mechanical noise.

During production the mechanical noise caused by intermediate wheel item 175, has been reduced considerably.
This is effected by application of a different type of rubber, namely a white-coloured silicone rubber.
Code number 4822 212 00752.

3-2-1965	EL 3534 - EL 3549	Bc 533

Re : Wear of the pick-up/play-back head.

To reduce wear of the pick-up/play-back head, the length of the felt pad, item 78c, has been changed from 3 mm to 6 mm. This decreases the pressure per cm^2 and causes dust to collect on the tape farther away from the slot. The new pressure felt may be obtained under the same code number.