COMPACT disc DIGITAL AUDIO

CLASS 1
LASER PRODUCT

CAUTION
Invisible laser radiation when open the unit.
Do not stare into beam.

TOP HI-FI

CDM2

COMPACT DISK MECHANISM

SAE

SERVICE MANUAL

SCIENTIFIC AUDIO ELECTRONICS INC

Contents

Servicing Hints

To prevent loose metal objects from getting in the CD mechanism, it will be necessary to see to a clean repair station.

The objective can be cleaned with a blow brush.

When effecting repairs to, or making measurements on the CD mechanism, be careful not to damage the flat springs of the focusing unit.

THE PHOTODIODES AND THE LASER ARE MORE SENSITIVE TO ELECTROSTATIC DISCHARGES THAN MOS ICS. CARELESS HANDLING DURING SERVICING MAY REDUCE LIFE EXPECTANCY DRASTICALLY. FOR THIS REASON CARE SHOULD BE TAKEN THAT DURING SERVICING THE POTENTIALS OF THE AIDS AND YOURSELF ARE EQUAL TO THAT OF THE SCREENING OF THE SET.

THAT IS TO SAY.

ESD

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD).
Careless handling during repair can drastically reduce life expectancy.
When repairing, make sure that you are connected via a wrist wrap with resistance to the same potential as the chassis of the set. Keep components and aids also at the same potential.

The disc should always bed down well on the turntable. If the tray mechanism has to be demounted for repair, one or several separate disc hold-downs should be used.
The CD mechanism then can function normally in the set.

For measurements and adjustments it is possible to position the working mechanism outside the set.
To do this, the following extension cables are supplied as service aids.

SERVICE AIDS

Audio test disc	4822 397 30085
Disc without errors+ disc with DO errors, black spots and fingerprints	4822 397 30096
Torx screwdrivers	
Set (straight)	4822 395 50145
Set (square)	4822 395 50132
Disc hold-down	4822 532 60906
13th order filter	4822 395 30204
Service cable (5-pole)	4822 321 21273
Service cable (14-pole)	4822 321 21598
IR LED CQY 89A-11	4822 130 31332

Servicing the RAFOC unit (=Radial and Focusing unit, item no. 56. See exploded view CDM-2).

— Take the CD-mechanism and servo PCB assembly out of the set.
(For the demounting instructions see the service manual of the set).
— Remove the flexible PCB from connector 31 on the servo PCB by lifting the upper part of the connector and taking the flexible PCB out.

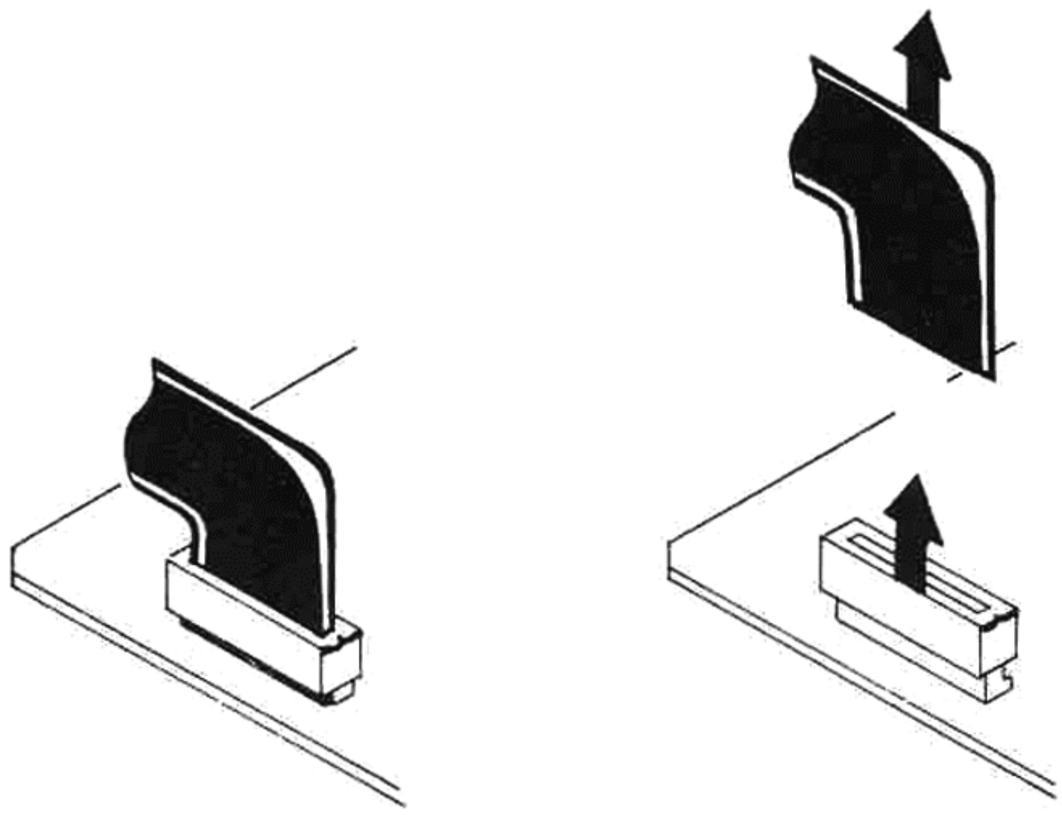


Fig. 1

— Undo the 4 screws on the conductor-side of the servo + pre-amplifier PCB (Fig. 1).
The servo + pre-amplifier PCB can now be removed.
— The RAFOC unit can be removed after the two fixing screws M3×25 have been loosened.
Caution: When doing so, the two nuts M3 on the upper side of the CD mechanism come loose.
— Now the pivot plate, item no. 59, can be removed.
— After removing the clamping piece, item no. 51, the RAFOC unit/flexible PCB assembly can be taken out.
Attention: When mounting the RAFOC unit, see to it that the flexible PCB reset well against the mounting plate at the height of the clamping piece (item no. 51).
In some cases, after exchanging the RAFOC unit/flexible PCB assembly, it may be necessary to glue the flexible PCB with a fast-drying glue to prevent the RAFOC unit from rubbing against the flexible PCB.
The gluing should be done very carefully.
— When the laser and/or the monitor diodes are defective, it will be necessary to replace the RAFOC unit, item no. 56.
— After mounting the RAFOC unit you should make sure that the arm runs clear over the entire disc diameter.
This can be checked by means of a spring-pressure gauge which is held against the magnet of the focusing unit.
The friction of the arm, measured over the entire meter reading, may not be greater than 25mN.
— A fast check of the clearance of the arm is possible in service position 0.
The RAFOC unit can be moved across the diameter of the disc by operating the SEARCH FORW, and REV. keys. (see DETAILED MEASURING METHOD Servo-circuit).

Replacing the flexible PCB(item 57)

— Demount the RAFOC unit.
— Remove the 2 fixing rings (item 60) from the flexible PCB.
— Desolder the connections A (see Fig. 2) of the flexible PCB.
— Before desoldering the connections C of the photodiode PCB, the positions of the connecting points of the photodiode PCB should be marked, so that afterwards the PCB can correctly be replaced.
— Now the 6 connections C of the photodiode PCB can

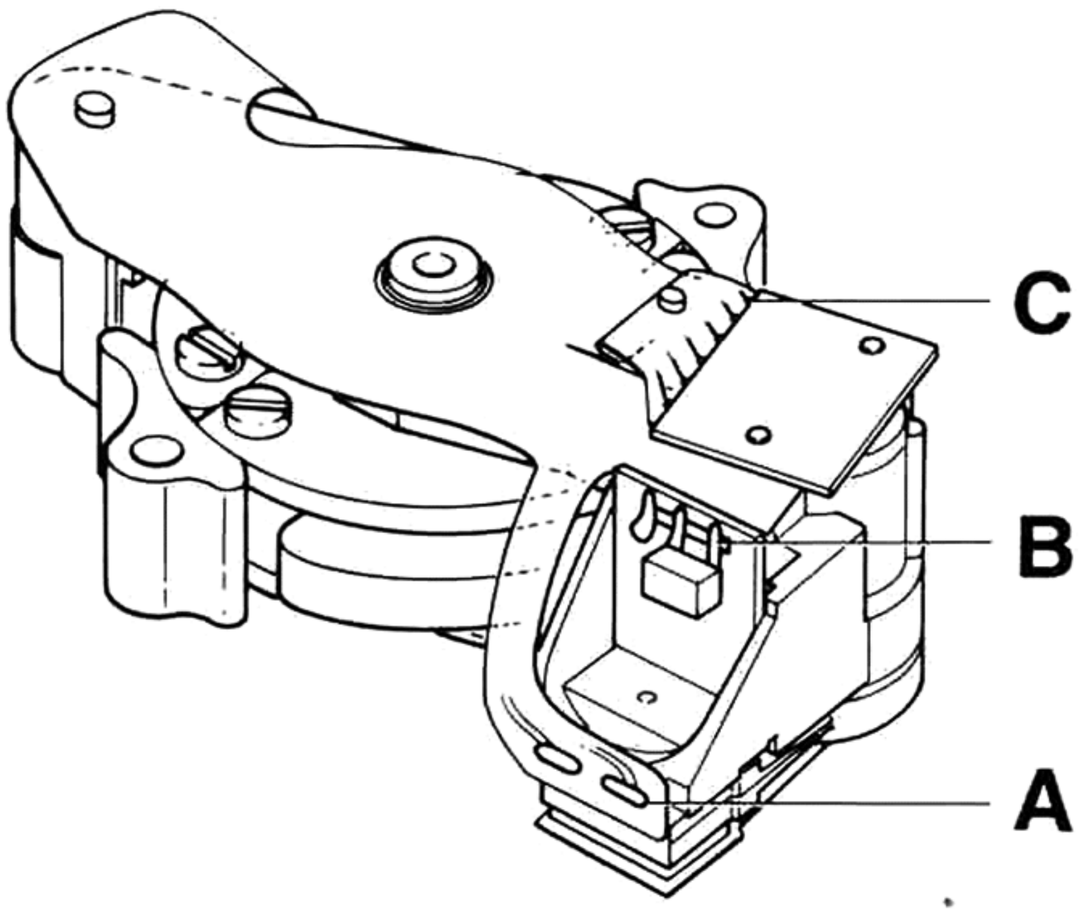


Fig. 2

be desoldered by heating the pins C one by one until the flexible PCB comes loose.
This should be done very carefully.
— Desolder the 4 connections of the radial coils.
— Unsolder the 3 connections of the laser PCB.

Mounting the flexible PCB (item 57).

— Solder the 4 connections of the radial coils.
— Apply the connections A and B (see Fig. 2).
— Before the 6 connections of the photodiode PCB can be soldered, they should be provided with an extra coating of tin.
— Place the flexible PCB under the photodiode PCB.
— In order to hold this position, the flexible PCB may be supported (for example by an expanded paper-clip between the arm and the underside of the flexible PCB).
— Tnen the 6 connections C can be heated so that they become soldered to the photodiode PCB.
— Replace the two fixing rings (item 60) of the flexible PCB.

Replacing the focusing unit (item 52).

— Desolder the 2 connections of the flexible PCB on the focusing unit.
— Remove screw 2N×10.
— As a result the fixing piece (item 54) will come loose.
— The focusing unit can now be removed.
— When mounting the focusing unit, care should be taken that the focusing unit runs clear.
The position of the focusing unit is fixed, adjustments are not possible.

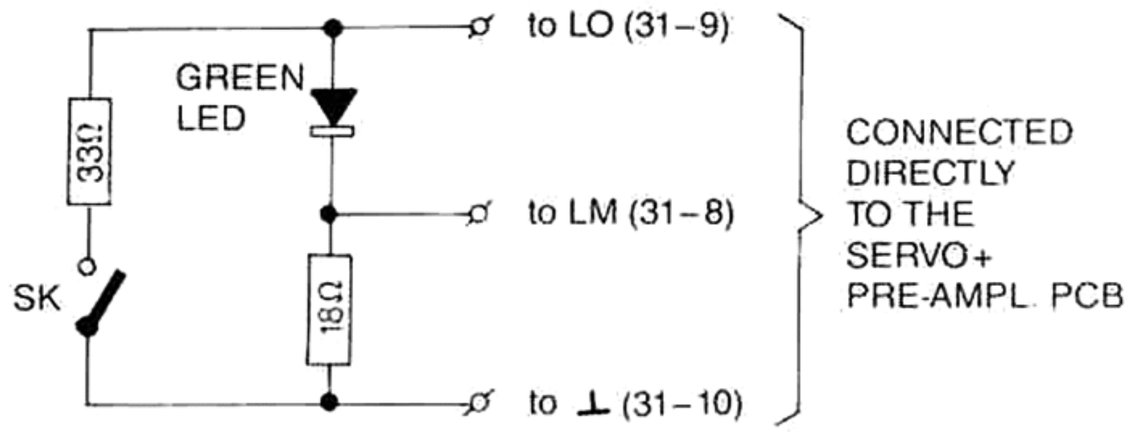
Servicing the turntable motor (see exploded view).

The components indicated in the exploded view by item numbers 62, 63 and 64 are supplied as an assembly for servicing purposes because of the mechanical and electrial factory adjustments.
For inspection of the turntable motor assy see "check of the turntable motor", page 6.

Measurements and Adjustments

Check of the laser supply

The laser and the laser supply in IC6101 plus the monitor diode form a feedback system. A defect in the laser supply may result in the destruction of the laser.
If, in that case, the laser (=complete RAFOC unit item no. 56) is replaced, the new laser will also become defective.
However, it is impossible to check and repair a feedback system if a link is missing. For this reason the laser supply can be checked with the circuit below. The green LED replaces the laser, the voltage across the 18-Ohm resistor is fed back as monitor voltage, the 33-Ohm resistor and the switch serve to draw more current from the laser supply.



LED GREEN e.g. CQY 94 IV **5322 130 32182**

The above circuit is connected to connector 31 via an extension cable instead of a flex print. The normal flex print is not suited for this purpose because of its high internal resistance.

Code no. extension cable 4822 322 40066

— The above flex print out of connector 31 on the servo + preamplifier PCB.
— Connect the circuit via the extension cable to connector 31.
— Select the play mode by grounding Si (pin 20 of IC6101).
Note: Si=0, start initialization low, is the play mode.
— Measure the voltage LO (Laser Out) at test point 9.
SK open: 1,8 V LO 2,3 V
170 mV LM 220 mV
The green LED emits little light.

SK closed1,8 V LO 2,3 V
170 mV LM 220 mV
The green LED emits little light.

— During the change- over from SK closed to SK open, the LED will emit more light for a short moment.
— The control sees to it that the same amount of current flows through the LED when SK is open and when SK is closed.

At $\overline{Si}$=1, in the STANDBY state, LO=0 V ± 0,2 V.

Repair procedure

Since laser, monitor diode and photodiodes are very sensitive to static charges, care should be taken that

during measurements and adjustments the aids and yourself have a potential that is equal to that of the CD mechanism.

Attention

When exchanging the RAFOC unit (item 56 on the CDM-2 exploded view drawing), the laser output potentiometer (3106) should be placed in mechanical mid-position to avoid damage to the laser.

Adjusting the laser current

Test point on the servo + pre-amplifier PCB.

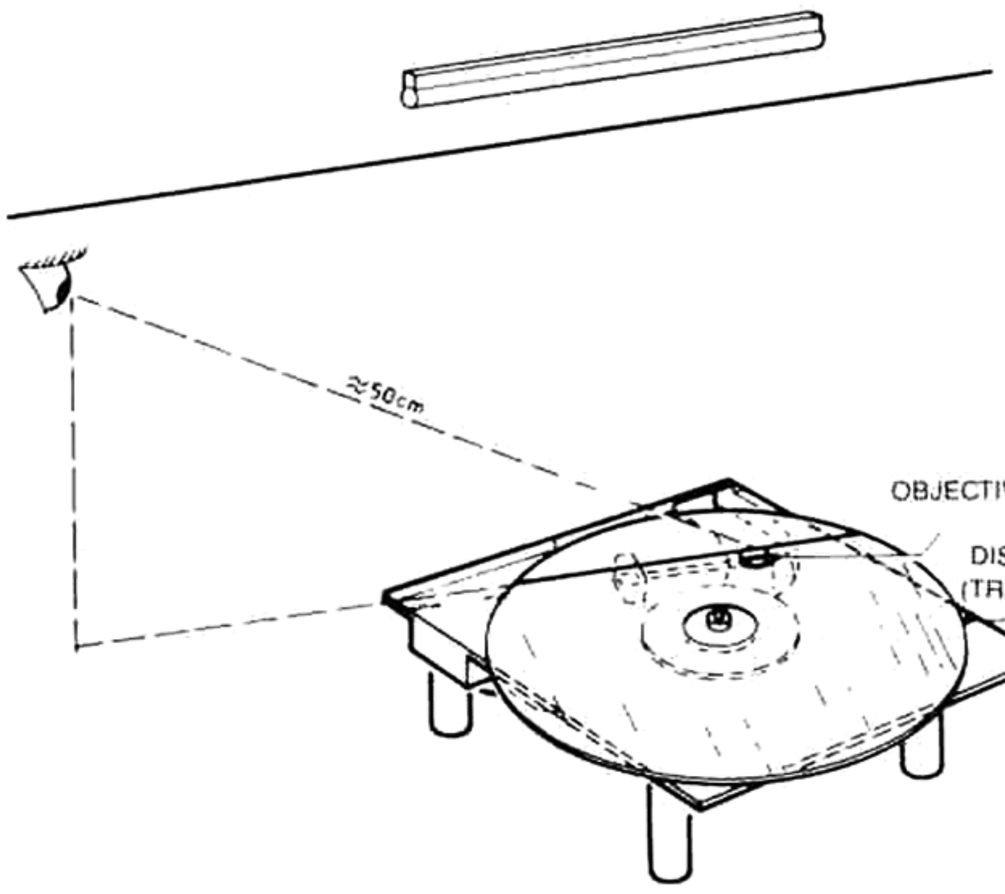
— Put test disc 4822 397 30096 (disc without defects=test disc number 5) on the turntable.
— Put the player in service position 1.
— Connect a DC voltmeter to test points 1 and 2 (=across resistor 3102).
— Using potentiometer 3106, adjust the laser supply until the voltage across resistor 3102 is about 40 mV.
(This voltage varies when the disc is rotated).
This is a preliminary adjustment.

Fine adjustment of the laser current

— Connect a DC voltmeter to test points 1 and 2 (=across resistor 3102).
— Play track 1 of test disc 4822 397 30096.
— Using potentiometer 3106, adjust the laser supply until the voltage across resistor 3102 is 50 mV ± 5 mV.

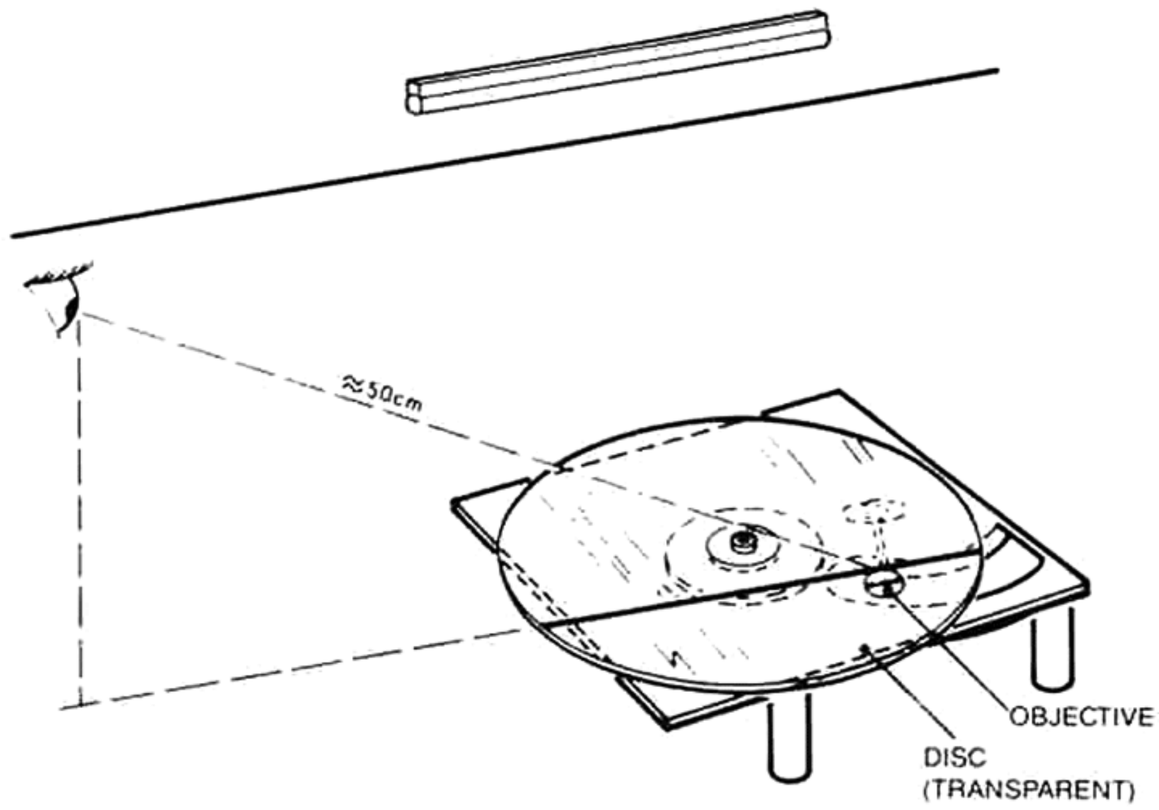
Checking the angle setting

The angle setting can be checked with the glass-disc method which is explained below.



Put glass disc 4822 395 90204 on the turntable.
Make sure that the glass disc beds down well on the turntable.
Place the CD mechanism under a light source, under which there is a straight line (e.g. under a fluorescent tube with grid).
Set the arm to mid-position of its radial track.
Turn the mechanism until the arm is parallel to the line under the light source (see figure below).
Look into the direction and in the extension of the line to the reflection there of on the glass disc and in the objective.
These lines should not be apart more than 4 mm.

Place the CD mechanism, so that the reflected line runs across the centre of the objective.
When the line that is reflected by the glass disc stays within the surface of the objective, the angle setting is correct.

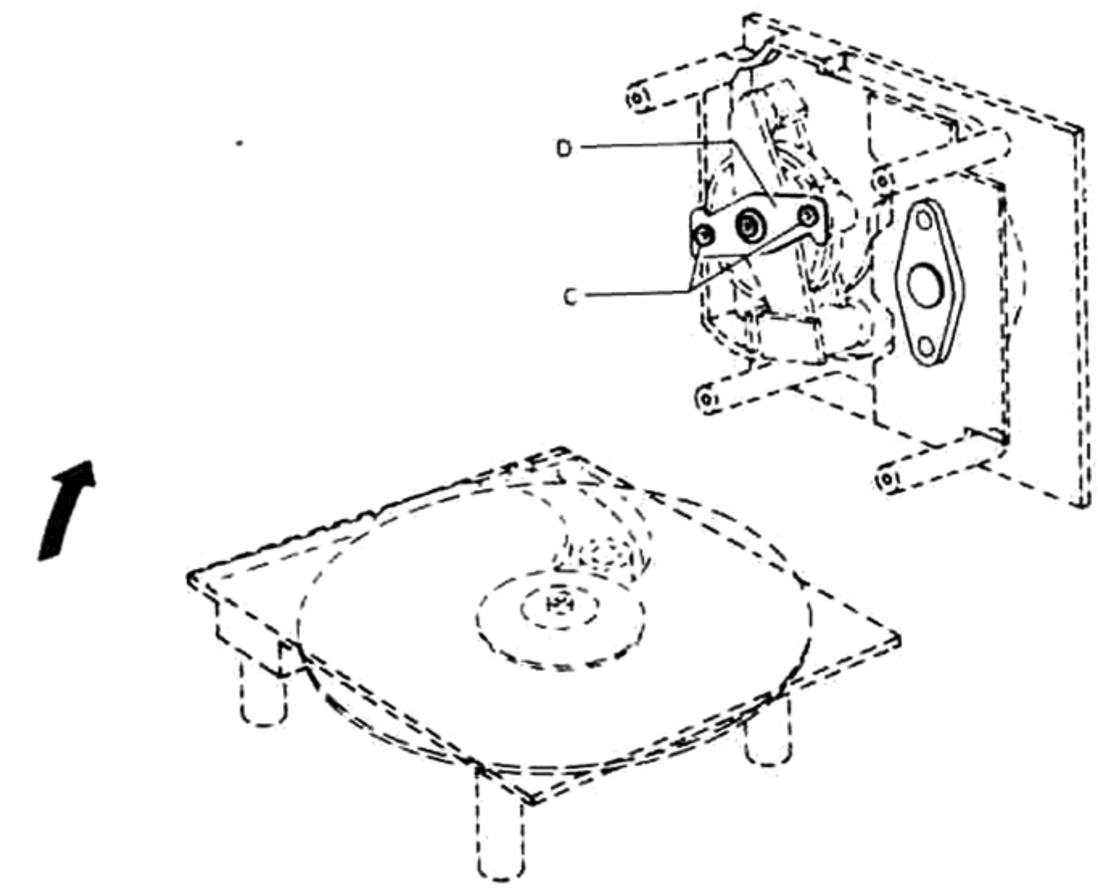


Turn the CD mechanism through 90° relative to the previous position. The arm must be kept in mid-position (see figure above). Repeat the previous check.

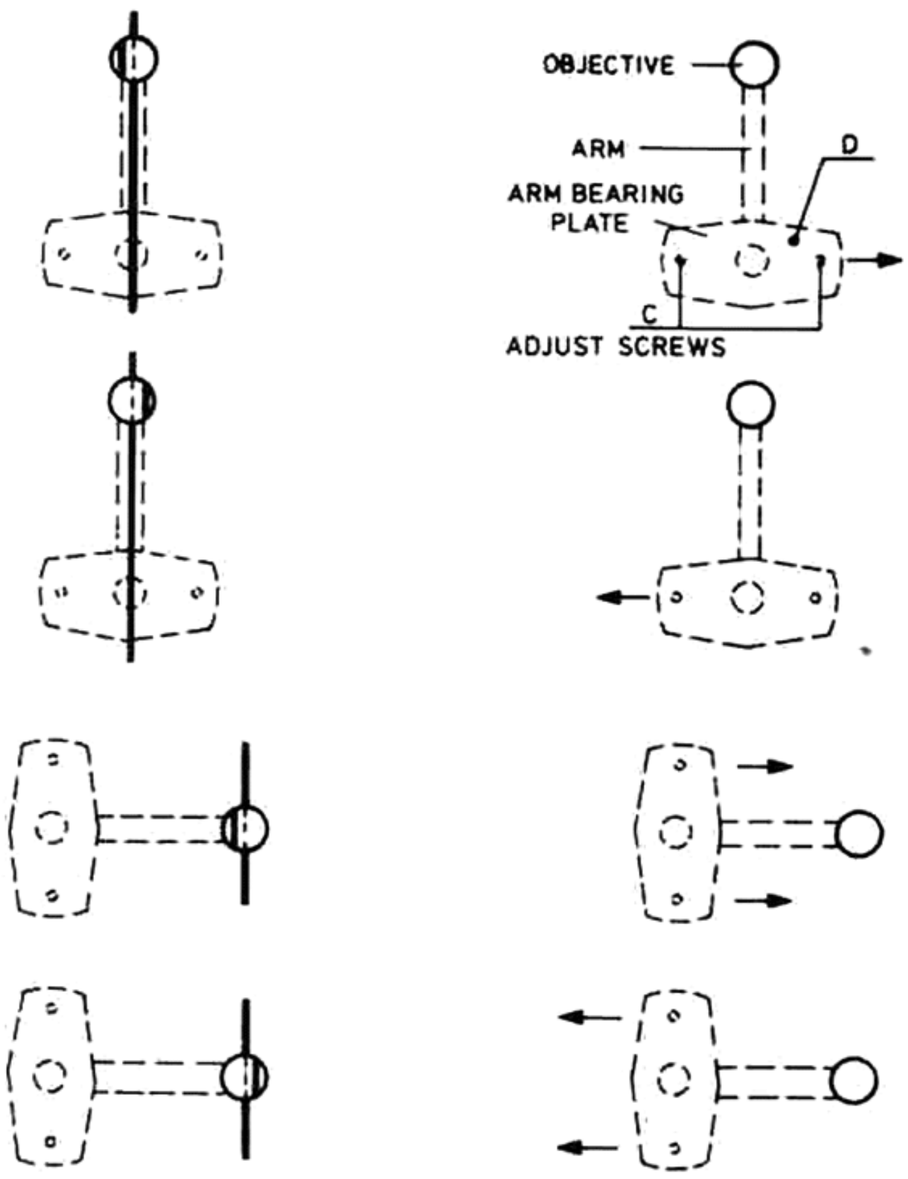
Adjusting the angle setting

For adjusting the angle setting one or both of the two locking knocks for the bearing plate on pos. 62 must be broken.
If a check on the angle setting shows that the angle falls outside the tolerance, the angle should NOT be adjusted for minimum deviation, but it should be adjusted within the tolerance.
The new setting should lie between the old setting and the optimum setting. After adjusting the setting, the friction of the arm must be checked. This is done by means of a spring pressure gauge which is held against the magnet of the focusing unit.
The friction of the arm, measured over the entire meter reading, should not be greater than 25 mN.
When the friction appears to be too high, the RAFOC unit must be replaced and the angle between disc and light path adjusted.

The lock is adjusted as follows:



Loosen screws C (see figure above) until bearing plate D can be displaced. Correct the angle setting by moving the bearing plate into the direction shown in figure below. Tighten screws C, ensuring that the setting does not drift. Then double check the setting in two directions.



Check of the motor control (Hall control) (see motor PCB)

Principle

With the oscilloscope the form of the voltage across resistor 3094 in the +2 lead and across resistor 3093 in the −2 lead is seen. This voltage is a consequence of the current and in this way current signals (pictures) are formed.
The current through the motor-coils A and B is sinusoidal. This current is switched on and controlled by the Hall ICs.
The Hall ICs are mounted at an angle of 90 degrees with respect to each other. Consequently the currents through A and B are shifted in phase 90 degrees.
In the following figures the origin of the current signal through the +2 and −2 leads is shown graphically.

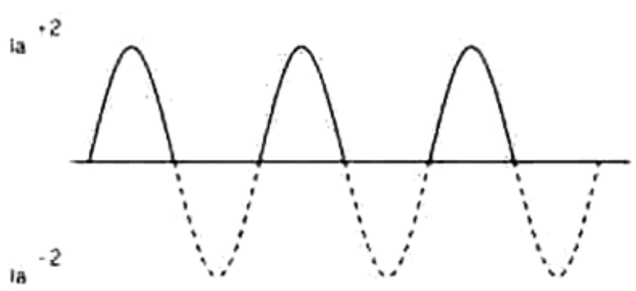
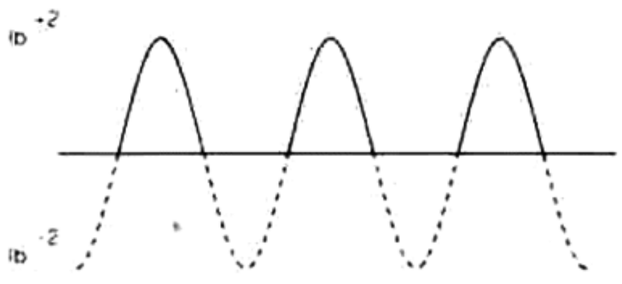


FIG 1.



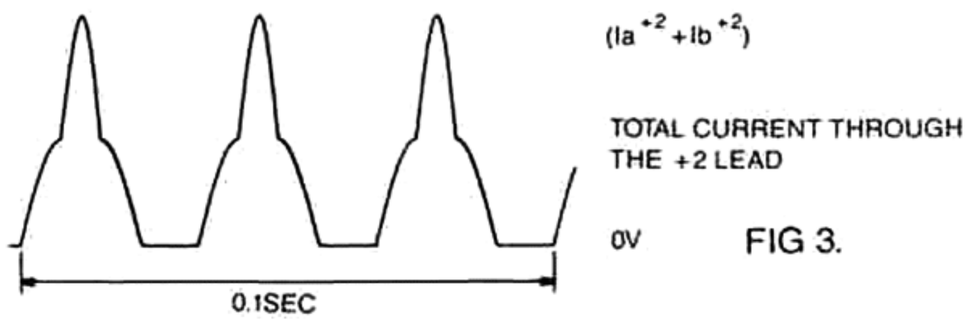


FIG 3.

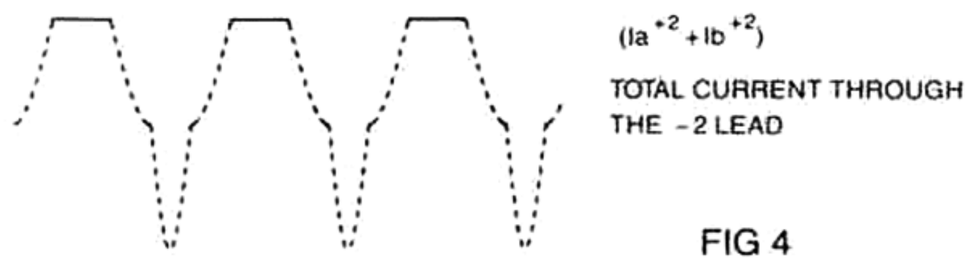
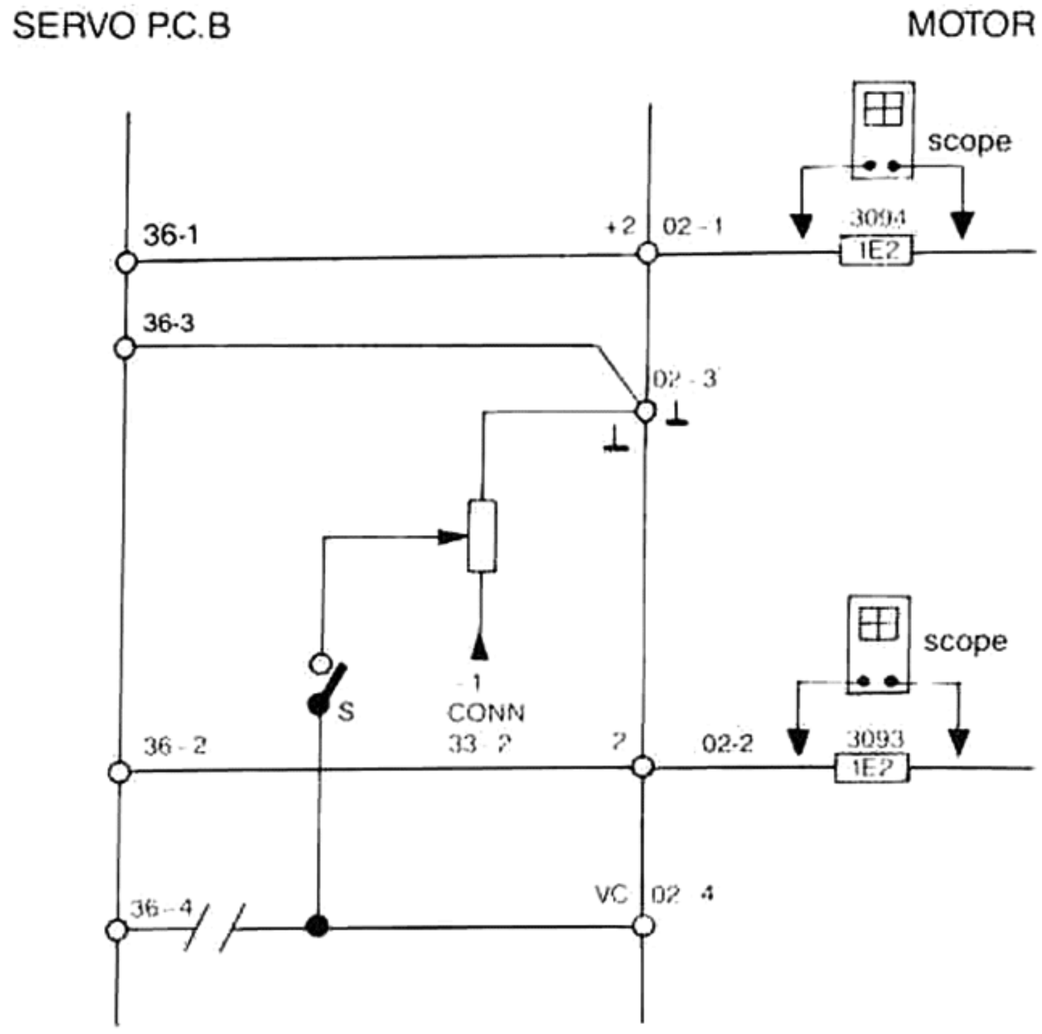


FIG 4



1. Interrupt the Vc connection by unsoldering the connector point 36−4 on the servo+preamplifier p.c.b.

2. Connect a trimming potentiometer of 22K Ohm to the motor print between 02-3(⊥) and connector 33−2(−1) on the servo board.

3. Connect the slider with 02−4 (Vc) via switch S.

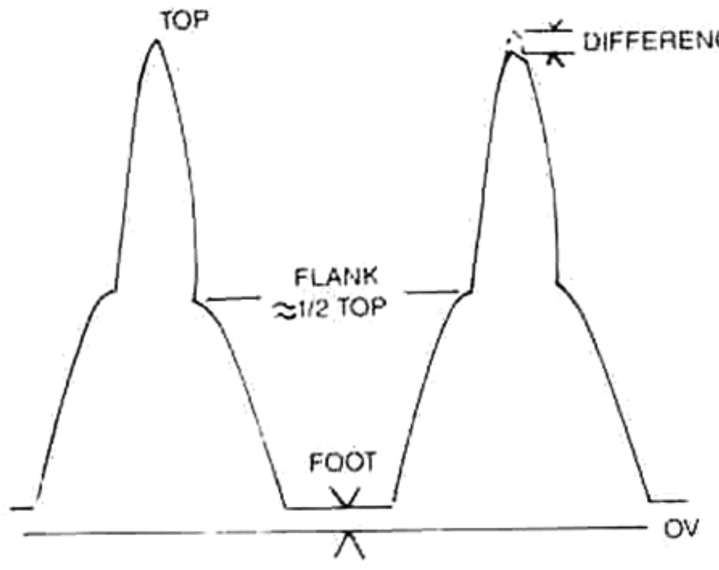
4. Measure with an oscilloscope first across 3094 and hereafter across 3093.
   Do not measure across both resistors at the sametime, since the currents are measured through the +2 lead and −2 lead.

5. Put the trimming potentiometer in the maximum position (the slider is then connected to connector 33−2 (−1)).

6. With a disc on the turntable, put the set in service-loop 0. Switch S on and adjust the trimming potentiometer back in such a way that 3 complete pulses are visible during 0.1 sec. (fig. 3). The polarity of the oscilloscope must be chosen so that the tops of the pulses are in upward position.
   The rotor magnet of the motor has 3 polespairs.
   Therefore the behaviour of the motor during one revolution with a speed of 600 r.p.m. is visible.

7. Measure with a DC-voltmeter on 02–4 (Vc).
   A. For statically adjusted motors: Vc= –2.5 V+/–0.3 V.
   B. For dynamically adjusted motors:
      Vc= –1.7 V+/–0.5 V.
   C. Measure across 3094, Value 1=maximum 56.4 mV.
   D. Measure across 3093, Value 2=maximum 58.8 mV.
   E. Difference: **(value 1-value 2)** maximum 6 mV. If the difference exceeds 6 mV, while value 1 and value 2 are below the maximum the motor is then wrong!.

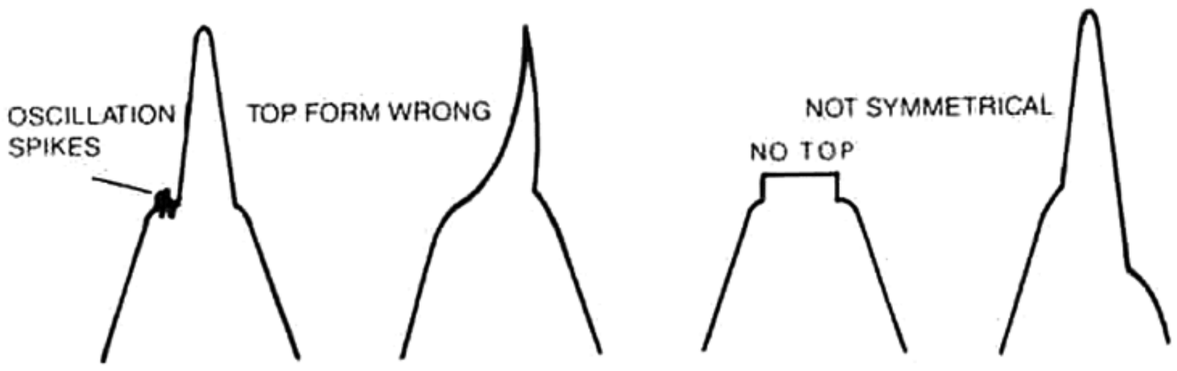
8. For a good functioning the signal has to meet the following values:



Top is not specified by value, see 7 (value 1 and value 2).	
Top difference	< 24 mV
Flank difference	< 36 mV
Foot	is not specified

Remark:
Flank difference is at one asymmetrical pulse.
Foot is DC offset.

9. Examples of the wave form faults:



10. Adjust the voltage on 02–4 (Vc) with the potentiometer back to –1.5V. The motor must still turn. Although the top height is much lower now the wave form has to be symmetrical and rounded.

DETAILED MEASURING METHOD FOR THE SERVO+PRE-AMPLIFIER CIRCUIT

HINTS

Test discs

It is important that the test discs be treated with great care.
The disturbances on the discs (black spots, finger-prints, etc.) are exclusive and are unambiguously positioned.
Damages may cause extra drop-outs etc., thus putting an end to the exclusivity of the intentional error on the disc.
In that case it is not possible anymore to check for example the good functioning of the track detector.

Measurements on op-amps

In the electronic circuits, op-amps have frequently been used. The applications include amplifiers, filters, invertors and buffers.

In those cases where in one way or the other feedback has been applied, the voltage difference at the differential inputs converges to zero.
This applies to both DC and AC signals.
The cause can be traced to the properties of an ideal op-amp ($Z_i = \infty$, $G = \infty$, $Z_o = 0$).
If one input of an op-amp is directly connected to ground, it will be virtually impossible to measure at the inverting and non-inverting inputs.
In such cases only the output signal will be measurable.

That is why in most cases the AC voltage at the inputs will not be given.
The DC voltages at the inputs are equal.

Stimulating with "0" and "1"

During faultfinding it is sometimes necessary to connect certain points to ground or to supply voltage.
As a result certain circuits can be brought in a desired state, thus shortening the diagnosis time.
In a number of cases the relevant points are outputs of op-amps.
These outputs are short-circuit-resistant, that is, they can be brought to "0" or ground without problems.
The output of an op-amp, however, should never be connected directly to the supply voltage.

Measurements on microprocessors

Inputs and outputs of microprocessors should **never** be connected directly to the supply voltage.
The inputs and outputs should only be brought to "0" or ground if this is stated explicitly.

Measurements with an oscilloscope

During measurements with an oscilloscope it is recommended to use a 1:10 test probe, since a 1:10 probe has a considerably smaller input capacitance than a 1:1 probe.

Selection of the ground potential

It is very important to select a ground point that is as close as possible to the test point.

Conditions for injection

— Injection of levels or signals from an **external** source should **never** take place if the relevant circuit has no supply voltage.

— The injected levels or signals should **never** be greater than the supply voltage of the relevant circuit.

Continuous burning of the laser

— Bridge capacitor 2305 on the decoder PCB.
— Connect $\overline{Si}$ (=pin 20 of IC6101 on the servo+pre-amplifier PCB) to ground.
— Switch on the power supply.
— The laser now burns continuously.

Indication of the test points

In the drawing of the diagrams and PCBs the test points are indicated by a number (e.g. ◇12◇) to which the measuring method refers.
In the following measuring method the symbol ◇ has been omitted for the test points indicated.

GENERAL CHECK POINTS

In the detailed measuring method below, a number of general conditions, required for a properly functioning set, will not be mentioned.
Before the detailed measuring method is started, these general points should be checked:

a. Ensure that the disc and objective are clean (remove dust, fingerprints, etc.) and use undamaged discs.

b. Check that all supply voltages are present and that they have the correct values.

c. Check the good working of the microprocessor by means of the built-in test programme and servicing programme.

Method:

See sub. self-test of the decoder μP in the service manual of the set.

Initiating the service programme of the μP

For the initiation of the service programme of the μP, see the service manual of the set.

1. PHOTODIODE SIGNAL PROCESSOR IC 6101

- **$\overline{Si}$ (pin 20; test point 21)**
  LO (pin 17; test point 9)
  LM (pin 16; test point 11)

— With the $\overline{Si}$ signal (=Start Initialization) the laser supply, among other things, is switched on.
When the $\overline{Si}$ signal is "low", the LO signal (=Laser Out) should be "high".
Via the LM signal (=Laser Monitor) the power supply for the laser diode is controlled.

Position of player	POWER ON	Servicing pos. 1*)	PLAY
$\overline{Si}$ signal	"high"	"low"	"low"
LO signal	"low"	"high"	"high"
LM signal	0 V	0,2 V ± 0,05 V	0,2 V ± 0,05 V

*) To ensure that the player stays in servicing pos. 1, there should be a disc on the turntable.

To check the laser supply, see "CHECK OF THE LASER SUPPLY", Page 4.

- **FE (pin 5; test point 26)**

— The FE signal (=Focus Error) is used to drive the focusing unit.
When the $\overline{Si}$ signal goes "high", the focal point will be searched for.

— When the player is brought into servicing position 1 without disc, the objective will search 16× for the focal point.
At test point 26 the FE signal varies 16× between +3 V and −3 V.

— The FE signal ensures that the spot stays in focus.
When an error signal is injected, the FE signal will correct.
Bring the player in servicing position 2 (with disc on turntable).

Inject successively a voltage of +5 V and −5 V (=+1B and −1B) via a 200 kΩ resistance to testpoint 25 and check the FE signal.

Signal injected testpoint 25	+5 V	−5 V
FE signal	negative	positive

- **RD signal (pin 21; test point 24)**
  HIGH-OHMIC MEASUREMENT

The RD signal (=READY) will go high when the starting procedure of IC6101 has been completed.

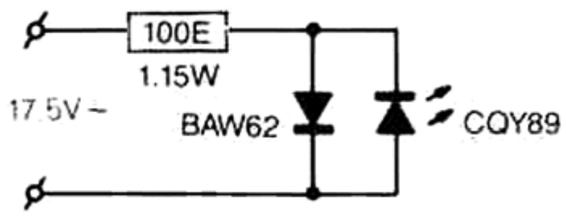
Position of player	POWER ON	Servicing pos. 1	PLAY
RD signal	"low"	"high"	"high"

- **D1 (pin 9; test point 4)**
  D2 (pin 10; test point 6)
  D3 (pin 8; test point 7)
  D4 (pin 7; test point 8)

— The signals D1÷D4 are the error signals from the photodetector circuits.
— When in servicing position 1 the disc is moved, the focusing unit should keep in track.
When the disc is moving, there should be a changing signal on test points 4, 6, 7 and 8.

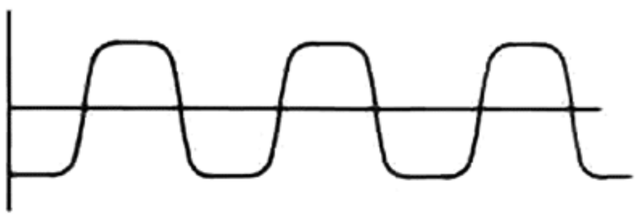
— Check of the photodiodes

Connected the circuit below to an alternating voltage of 17,5 V.



100 E-1.15W — 4822 116 51098
BAW 62 — 4822 130 30613
CQY 89 — 4822 130 31332

Switch on the supply voltage and bring the player in the stand-by mode or in servicing position 0.
In this measurement, infrared diode CQY89 replaces the function of the laser diode.
When this diode is held above the objective unit, the infrared light falls on the 4 photodiodes.
When the 4 photodiodes are functioning, the following voltage form will be visible on test point 4, 6, 7 and 8 on the servo+pre-amplifier PCB.
(The amplitude depends on the distance between the IR diode and the objective).



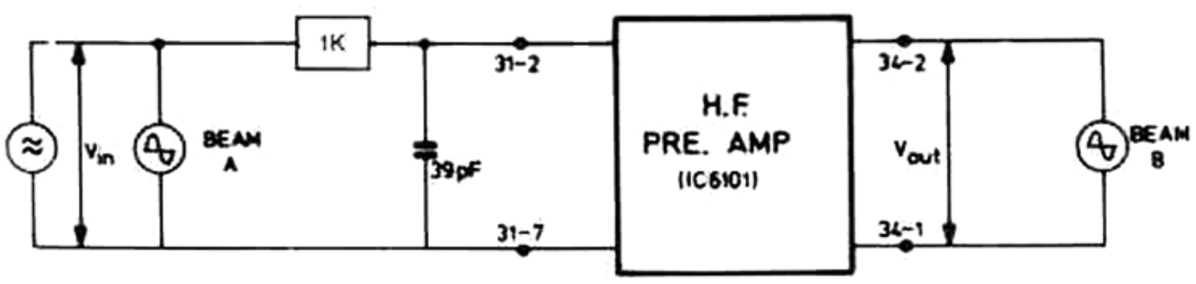
Position of the oscilloscope: 100 ms/div.

- **HF-in (pin 3, test point 3)**

— The HF-in signal (=High Frequency in) is the information signal from the 4 photodiodes.

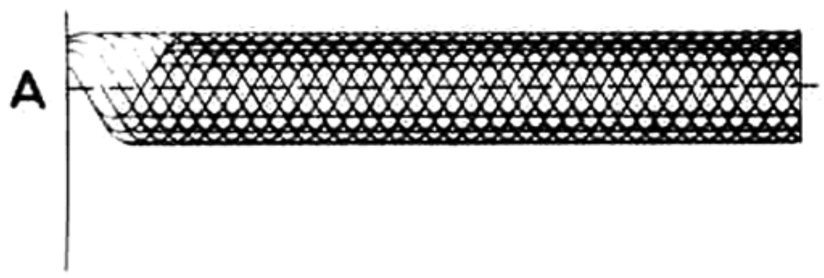
Check of the HF amplifier in IC6101

— Take the flexible PCB out of connector 31.
— Switch on the supply voltage.
— Inject a signal V-in of about 10 mV_{pp}, 50 kHz, via the RC network, between connector pin 31–2 and connector pin 31–7 according to the diagram below.
— The output voltage between connector pins 34–14 and 34–13 should be about 1 V_{pp}.



- **HF-out (pin 27; measure at connector pin 34-14)**

— The HF-out signal (=High-Frequency) is the amplified information signal for the decoder circuit.
During playback of test disc no. 5 (4822 897 30096), a so-called "eye pattern" should be present on test point 17 (see figure below).
— The HF signal should be present and stable in:
— The PLAY mode and in
— Servicing position 3 after the lead-in track has been read.
— In servicing postion 2 and during the reading of the lead-in track, the HF signal is present, but is not stable.



Position of the oscilloscope: 0,5 μs/div.
Amplitude about 1,5 Vpp.

- **DET (pin 26)**
  HFD (pin 19; test point 23)
  $\overline{TL}$ (pin 18; test point 16)

— The DET signal (=Detector) gives information on the level of the HF signal to the high-frequency Level/Drop-out detector of IC6101.
— When the level of the HF signal is too low, the HFD signal (=High-Frequency Detector) will go "low".
— The $\overline{TL}$ signal (=Track Lost) will then go "low" in order to tell the servo μP that the tracking signals are unreliable.

Method:
(Can only be used in a playing set).

— Put test disc 5A (4822 397 30096) on the turntable.
— Switch on the power-supply switch and press the PLAY key.
— Play track number 10 or 15 and check the HFD signal at test point 23.
When drop-out pulses are present on the DET signal (pin 26), the HFD pulses should also be present at test point 23.
(Position of oscilloscope: 2 ms/div).

When the disc is lowly braked by hand, $\overline{TL}$ pulses will be visible at test point 16.

- **RE 1 (pin 11; test point 18)**
  RE 2 (pin 12; test point 22)

— Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

— In servicing position 2, the following signals should be visible at test point 18 and 22:

Position of the oscilloscope: 2 ms/div.-AC.
The frequency strongly depends on the eccentricity of the disc.

- **$\overline{DODS}$ (pin 24; test point 19)**

The $\overline{DODS}$ signal (=Drop Out Detector Suppression) avoids that Drop-Out signals influence the arm control during track jumping.

Stand speler	POWER ON	Service pos. 3	PLAY	SEARCH
$\overline{DODS}$-signal	"Low"	"High"	"High"	"Low"

• **SC (pin 25)**
SC (=Start Capacitor)

HIGH-OHMIC MEASUREMENT

Pos. speler	SC (pin 25)
POWER ON	−4 V
PLAY	+5 V
Service pos. 1	+5 V

• **FE lag (pin 6, test point 27)**

— In service position 1 and in the PLAY mode, a voltage of about 100 mV is present at this point.
When the disc is moved by hand in service position 1, the signal will vary.

2. RADIAL ERROR PROCESSOR

• **Check the signals that come from the decoder μP and from photodiode signal processor IC6101**

• **RE-dig (pin 3; test point 37)**

— With the RE dig signal (=Radial Error digital=Radial Polarity), the movement of the arm is controlled/corrected in case of track jumping and bumping against the player).

— In servicing position 3 or in the PLAY mode a square wave should be present at test point 37.
Because of frequency variations this square wave is hard to trigger.

— In the positions PREVIOUS and NEXT the frequency of the square wave decreases.

• **DAC (pin 10; test point 38).**

— With the DAC signal (=Digital to Analogue Converter) the track jumping speed is controlled.
This signal is derived from the signals B0÷B3 coming from the decoder μP.

• **RE (pin 7; test point 39)**

— With the RE signal (=Radial Error) the light spot is kept on the track.
When an error signal is injected, the RE signal will correct.
— Bring the player in servicing position 3.
— Inject successively a voltage of +5 V and −5 V (=+1B and −1B),via a 120 kΩ resistance, to pin 5 of IC6104B and check the RE signal.

Signal injected test point 38	+5 V	−5 V
RE signal	Negative	Positive

• **RE lag (pin 8; test point 41)**

Capacitor 2156 in the RE-lag circuit has a memory function. It memorizes the degree of inclination of the disc. When a jump is made to a certain track on the disc, the memory should be cleared.
This takes place by the decoder μP ($\overline{\text{RPU}}$ signal) via transistor 6109.

During track jumping (SEARCH), slow pulses should be visible at test point 43 (position of the oscilloscope 0,1 ms/div). In that case pulses should also be visible on the collector of transistor 6109.

• **RE 1 (pin 11; test point 18), RE 2 (pin 12; test point 22)**

— Signals RE1 and RE2 (Radial Error) are the control signals for the arm during tracking.

— In servicing position 2, the following signals should be visible at test point 18 and 22:

Position of the oscilloscope: 2ms/Div.-AC.
The frequency strongly depends on the eccentnicity of the disc.

• **B0 (pin 12; test point 36)**
B1 (pin 13; test point 34)
B2 (pin 14; test point 33)
B3 (pin 15; test point 32)

With the B0÷B3 signals
• The radial control is switched on and
• The level on the DAC output is controlled.
— In the SEARCH mode, there should be activity on all 4 test points.

	STOP	PLAY	SERVICING POSITION 0, 1, 2	SERVICING POSITION 3
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high	"high"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

Adjusting the offset on RAD+(test point 40).

— Render B0, B1, B2 and B3 low by grounding them.
— Measure at test point 40 relative to ground.
— Adjust potentiometer 3165 for a voltage of 0 V ± 0,1 V at test point 40.

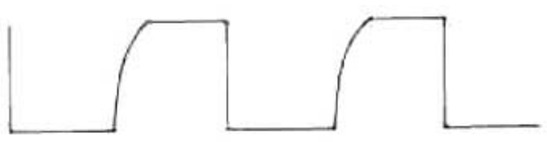
• **C agc (pin 5, test point 35)**

Adjusting the offset on C agc (test point 35)
— connect pins 18 and 19 to ground.
— Measure with a high-ohmic voltmeter at test point 35 relative to the −1C supply voltage.
— Adjust potentiometer 3167 until the voltage at test point 35 is 4,5 V ± 0,1 V relative to the −1C supply voltage.

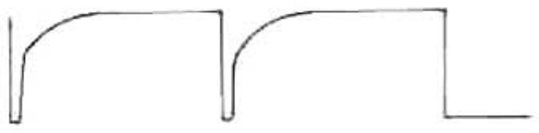
• **MC (test point 12)**

The MC signal (=Motor Control) is used to control the speed of the turntable.

— In the standby position (=power on), a signal as shown in the figure below is present at test point 12.
The frequency is 88,2 kHz.
— With a disc on the turntable and with the player in service position 3 or in the PLAY mode, a signal as shown in the figure below should be present at test point 12. The frequency is 44,7 kHz.



POSITION: STAND BY



POSITION PLAY (BEGINNING)

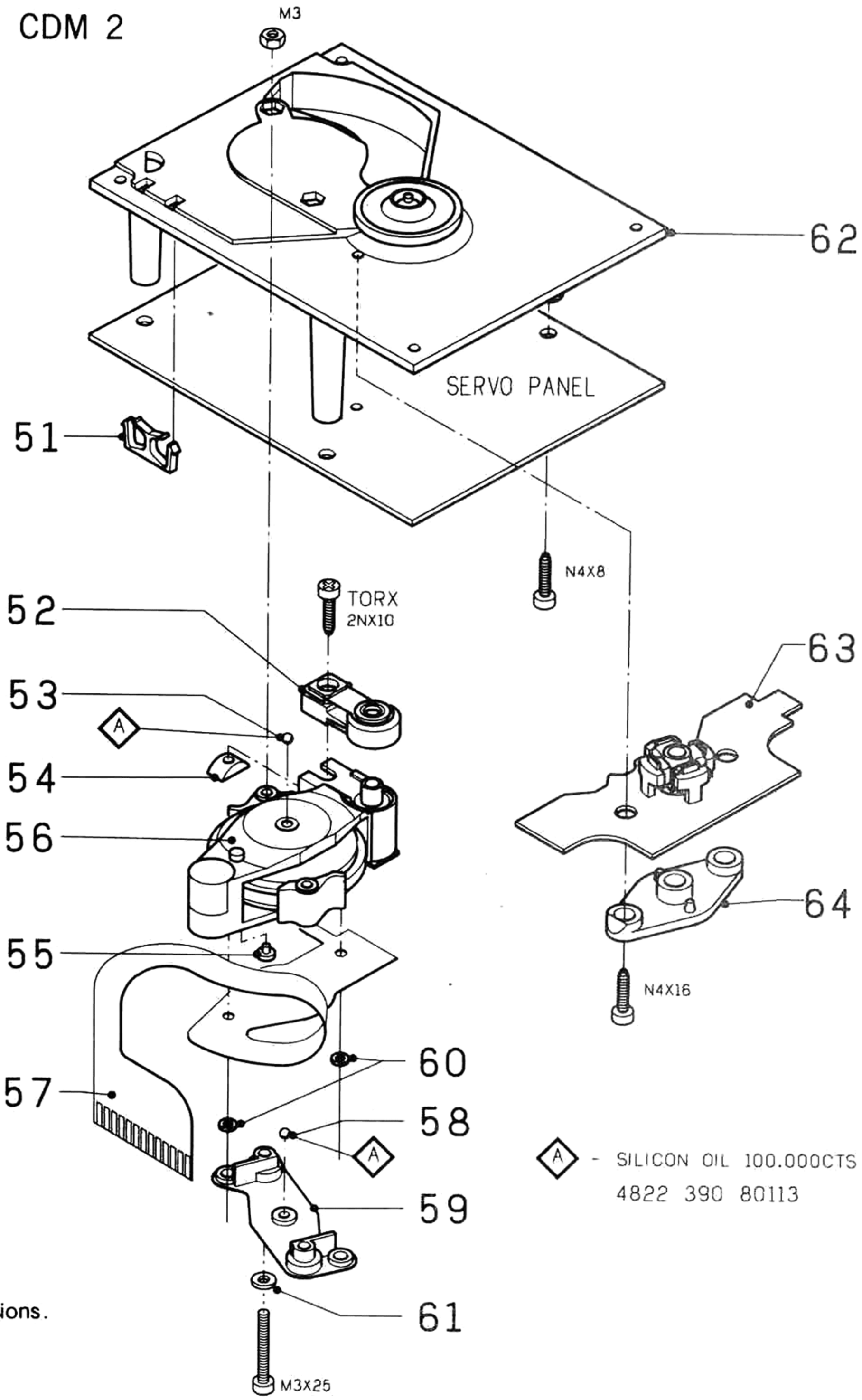
POSITION PLAY (NORMAL)

When the MC signal is correct and is released by the RD signal, the turntable motor must be rotating.
(See also "Check of the motor control Hall (control) page 5).

- **VC (connector point 36–1)**

Fast check.
— Place a disc on the turntable. The voltage at connector point 36–1 will be about –2,5 V during playback of the first piece of music (inside of the disc) and about –1,5 V during the last piece (outside of disc).

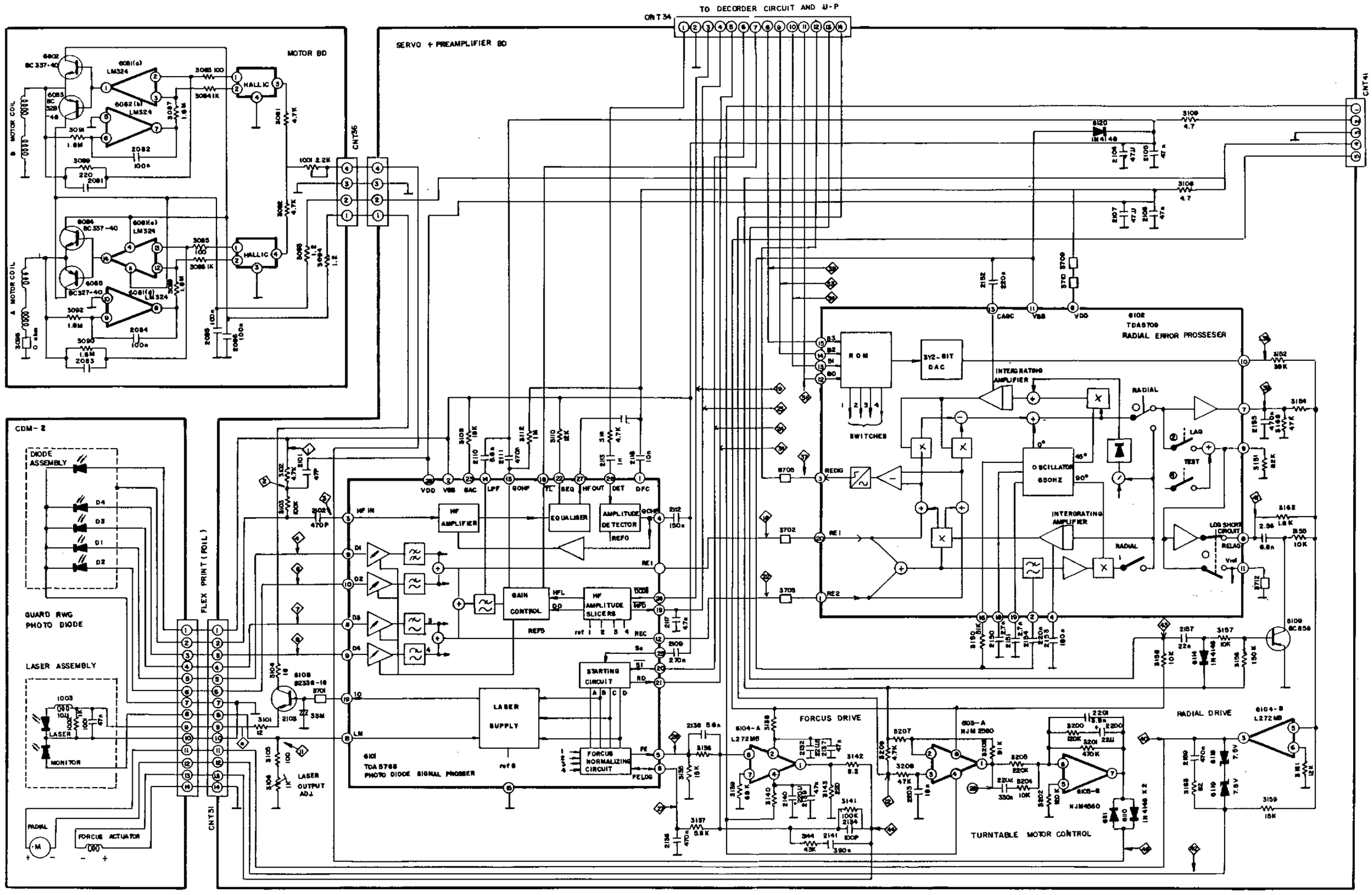
Exploded View C.D.Mechanism



MECHANISM PARTS	
	Parts No.
51	4822 401 10895
52	4822 691 30133
53	4822 520 40177
54	4822 401 10896
55	4822 462 71374
56	4822 691 30134
57	4822 323 50107
58	4822 520 40177
59	4822 520 10555
60	4822 532 50268
61	4822 530 80178
62~64	4822 691 30135

for C.D.M-2 and derived versions.

Servo+Pre-Amp+Motor Circuit.



Parts List

SERVO+PRE−AMPLIFIER PCB

Ref. No.	Description	Parts No.
●IC		
6101	TDA5708	4822 20983202
6102	TDA5709	482220983203
6103	NJM4560D	482220983274
6104	L272MBH	482220970705
●TRANSISTOR(Include Chip Tr)		
6109	BC858BC	532213041983
6108	BC338-16	482213040892
●D10DE		
6110. 6111 6114. 6120	1N4148	482213030621
6118. 6119	HZ7C2	482213032862
●CAPACITOR		
2150. 2151	3.6nF-160 V-1%	482212151001
2159	1.5μF-50V-131P	482212421918
For chip capacitors see list on page15		
●RESISTOR		
3101	12Ω-NFR25	482211130511
3104	18Ω-NFR25	482211130515
3106	1kΩ-Trimpot	482210020151
3107. 3108	4.7Ω-NFR25-5%	482211130499
3138. 3140	1Ω-NFR25	482211130483
3160	4.7Ω-MRS25	482211652858
For chip resistors see list on page15		

CHIP COMPONENTS LIST

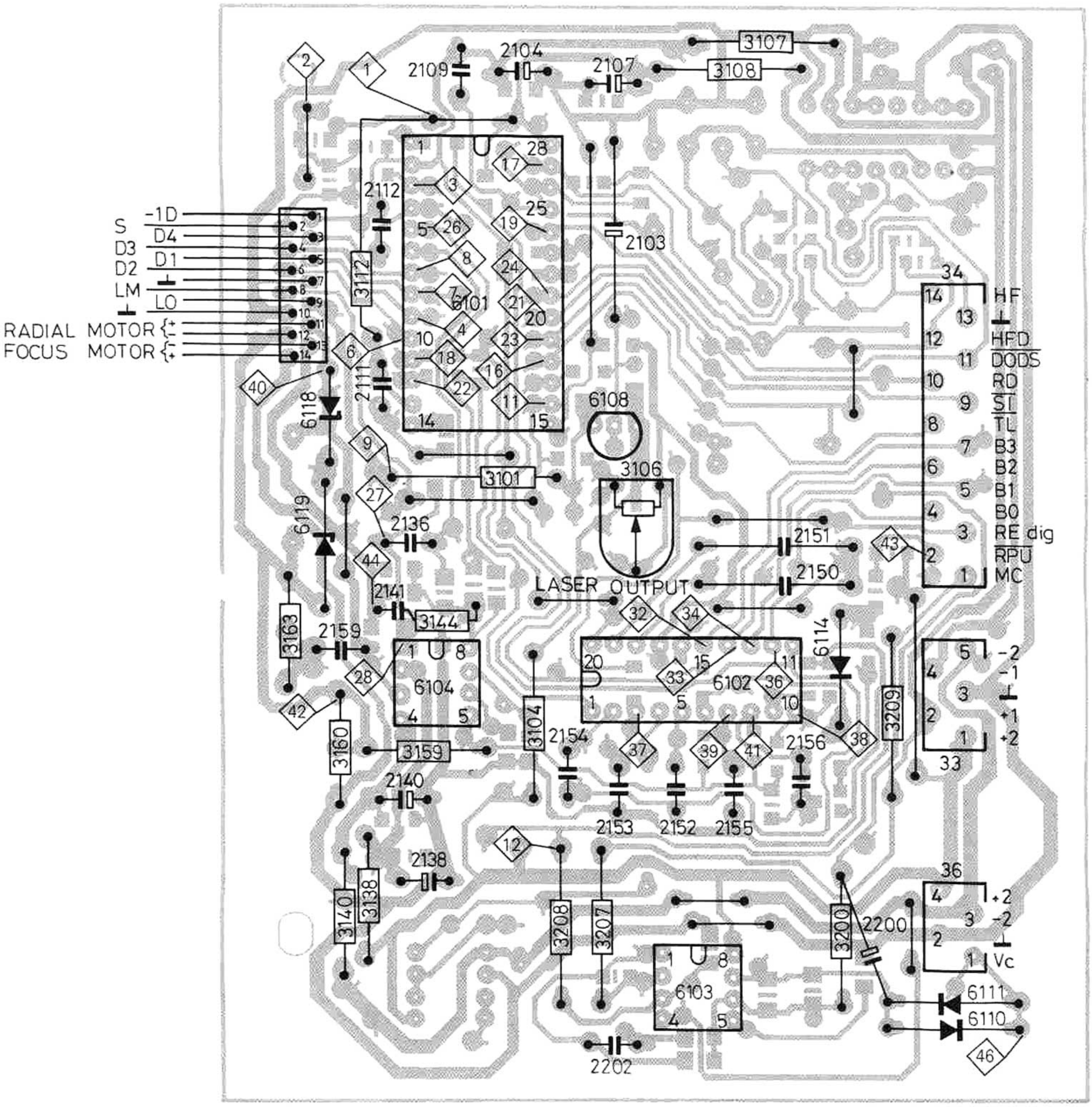
Description	Tolerance	Parts No.
●Chip Capacitors 50V NPO S1206		
1 PF	5%	482212232479
1.5 PF	5%	482212231792
1.8 pF	5%	482212232087
2.2 pF	5%	482212232425
3.3 pF	5%	482212232079
3.9 pF	5%	482212232081
4.7pF	5%	482212232082
5.6 pF	5%	482212232506
6.8 pF	5%	482212232507
8.2 pF	5%	482212232083
10 pF	5%	482212231971
12 pF	5%	482212232139
15 pF	5%	482212232504
18 pF	5%	482212231769
22 pF	10%	482212231837
27p F	5%	482212231966
33 pF	5%	482212231756
39 pF	5%	482212231972
47 pF	5%	482212231772
56 pF	5%	482212231774
68 pF	5%	482212231961
82 pF	10%	482212231839
100 pF	5%	482212231765
120 PF	5%	482212231766
150 pF	5%	482212231767
180 pF	2%	482212231794
220 pF	5%	482212231965
270 pF	5%	482212232142
330 pF	10%	482212231642
390 pF	5%	482212231771
470 pF	5%	482212231727
560 pF	5%	482212231773
680 pF	5%	482212231775
820 pF	5%	482212231974
1 nF	10%	532212231647
1.2 nF	5%	482212231807
1.5 nF	10%	482212231781
1.8 nF	10%	482212232153
2.2 nF	10%	482212231644
2.7 nF	10%	482212231783
3.3 nF	10%	482212231969
3.9 nF	10%	482212232566
4.7 nF	10%	482212231784
5.6 nF	10%	482212231916
6.8 nF	10%	482212231976
10 nF	10%	4 82212231728
12 nF	10%	532212231648
15 nF	10%	482212231782
18 nF	10%	482212231759
22 nF	10%	482212231797
27 nF	10%	482212232541
33 nF	10%	482212231981
47 nF	10%	482212232542
56 nF	10%	482212232183
100 nF	10%	482212231947
180 nF	10%	482212232915
●Chip Resistors 1/8W S1206		
0 E	jumper	482211190163
1 E	5%	482211190184
1.1 E	5%	482211190377
1.2 E	5%	482211190378
1.3 E	5%	482211190379
1.5 E	5%	482211190381
1.6 E	5%	482211190382
1.8 E	5%	482211190383
2 E	5%	482211190384
2.2 E	5%	532211190104
2.4 E	5%	482211190385
2.7 E	5%	482211190386
3 E	5%	482211190387
3.3 E	5%	482211190388
3.6 E	5%	482211190389
3.9 E	5%	482211190391
4.3 E	5%	482211190392
4.7 E	5%	532211190376
5.1 E	5%	482211190393

Description	Tolerance	Parts No.
5.6 E	5%	482211190394
6.2 E	5%	482211190395
6.8 E	5%	482211190254
7.5 E	5%	482211190396
8.2 E	5%	482211190397
9.1 E	5%	482211190398
10 E	2%	532211190095
11 E	2%	482211190338
12 E	2%	482211190341
13 E	2%	482211190343
15 E	2%	482211190344
16 E	2%	482211190347
18 E	2%	532211190139
20 E	2%	482211190352
22 E	2%	482211190186
24 E	2%	482211190355
27 E	2%	532211190105
30 E	2%	482211190356
33 E	2%	482211190357
36 E	2%	482211190359
39 E	2%	482211190361
43 E	2%	532211690125
47 E	2%	482211190217
51 E	2%	482211190365
56 E	2%	482211190239
62 E	2%	482211190367
68 E	2%	482211190203
75 E	2%	482211190371
82 E	2%	482211190124
91 E	2%	482211190375
100 E	2%	532211190091
110 E	2%	482211190335
120 E	2%	482211190339
130 E	2%	482211190164
150 E	2%	532211190098
160 E	2%	482211190345
180 E	2%	532211190242
200 E	2%	482211190348
220 E	2%	482211190178
240 E	2%	482211190353
270 E	2%	482211190154
300 E	2%	482211190156
330 E	2%	532211190106
360 E	1%	482211190288
360 E	2%	482211190358
390 E	2%	532211190138
430 E	2%	482211190362
470 E	2%	532211190109
510 E	2%	482211190245
560 E	2%	532211190113
620 E	2%	482211190366
680 E	2%	482211190162
750 E	2%	532211190306
820 E	2%	482211190171
910 E	2%	482211190372
1 k	2%	532211190092
1.1 k	2%	482211190336
1.2 k	2%	532211190096
1.3 k	2%	482211190244
1.5 k	2%	482211190151
1.6 k	2%	532211190265
1.8 k	2%	532211190101
2 k	2%	482211190165
2.2 k	2%	482211190248
2.4 k	2%	482211190289
2.7 k	2%	482211190569
3 k	2%	482211190198
3.3 k	2%	482211190157
3.6 k	2%	532211190107
3.9 k	2%	482211190571
4.3 k	2%	482211190167
4.7 k	2%	532211190111
5.1 k	2%	532211190268
5.6 k	2%	482211190572
6.2 k	2%	482211190545
6.8 k	2%	482211190544
7.5 k	2%	482211190276
8.2 k	2%	532211190118
9.1 k	2%	482211190373
10 k	2%	482211190249

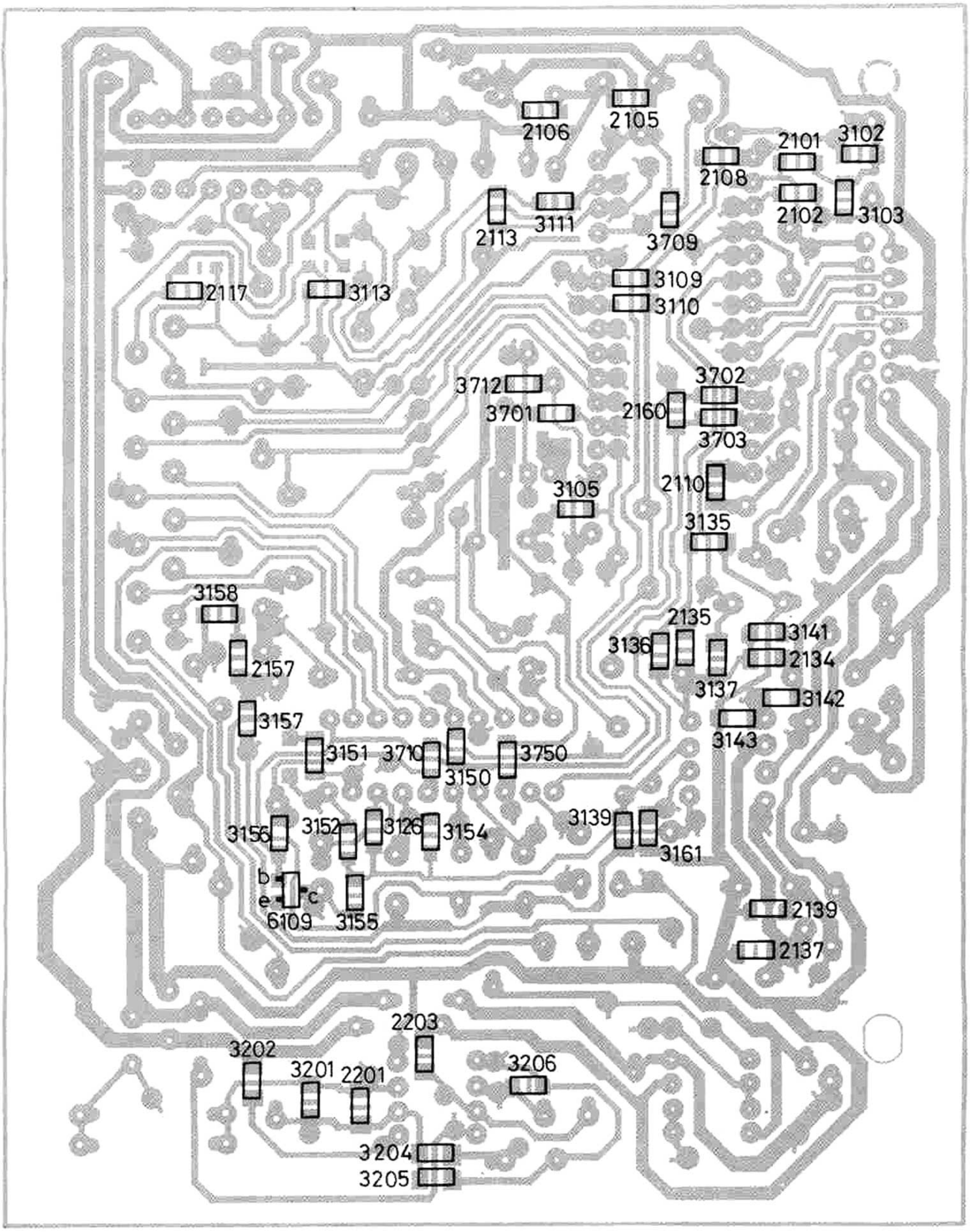
Description	Tolerance	Parts No.
11 k	2%	482211190337
12 k	2%	482211190253
13 k	2%	482211190509
15 k	2%	482211190196
16 k	2%	482211190346
18 k	2%	482211190238
20 k	2%	482211190349
22 k	2%	482211190251
24 k	2%	482211190512
27 k	2%	482211190542
30 k	2%	482211190216
33 k	2%	532211190267
36 k	2%	482211190514
39 k	2%	532211190108
43 k	2%	482211190363
47 k	2%	482211190543
51 k	2%	532211190274
56 k	2%	482211190573
62 k	2%	532211190275
68 k	2%	482211190202
75 k	2%	482211190574
82 k	2%	482211190575
91 k	2%	532211190277
100 k	2%	482211190214
110 k	2%	532211190269
120 k	2%	482211190568
130 k	2%	482211190511
150 k	2%	532211190099
160 k	2%	532211190264
180 k	2%	482211190565
200 k	2%	482211190351
220 k	2%	482211190197
240 k	2%	482211190215
270 k	2%	482211190302
300 k	2%	532211190266
330 k	2%	482211190513
360 k	2%	482211190515
390 k	2%	482211190182
430 k	2%	482211190168
470 k	2%	482211190161
510 k	2%	482211190364
560 k	2%	482211190169
620 k	2%	482211190213
680 k	2%	482211190368
750 k	2%	482211190369
820 k	2%	482211190205
910 k	2%	482211190374
1 M	2%	482211190252
1.1 M	5%	482211190408
1.2 M	5%	482211190409
1.3 M	5%	482211190411
1.5 M	5%	482211190412
1.6 M	5%	482211190413
1.8 M	5%	482211190414
2 M	5%	482211190415
2.2 M	5%	482211190185
2.4 M	5%	482211190416
2.7 M	5%	482211190417
3 M	5%	482211190418
3.3 M	5%	482211190191
3.6 M	5%	482211190419
3.9 M	5%	482211190421
4.3 M	5%	482211190422
4.7 M	5%	482211190423
5.1 M	5%	482211190424
5.6 M	5%	482211190425
6.2 M	5%	482211190426
6.8 M	5%	482211190235
7.5 M	5%	482211190427
8.2 M	5%	482211190237
9.1 M	5%	482211190428
10 M	5%	532211191141

Servo + Pre-Amplifier PCB

—TOP VIEW—



—BUTTOM VIEW—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3143
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3154
3139
3161
b
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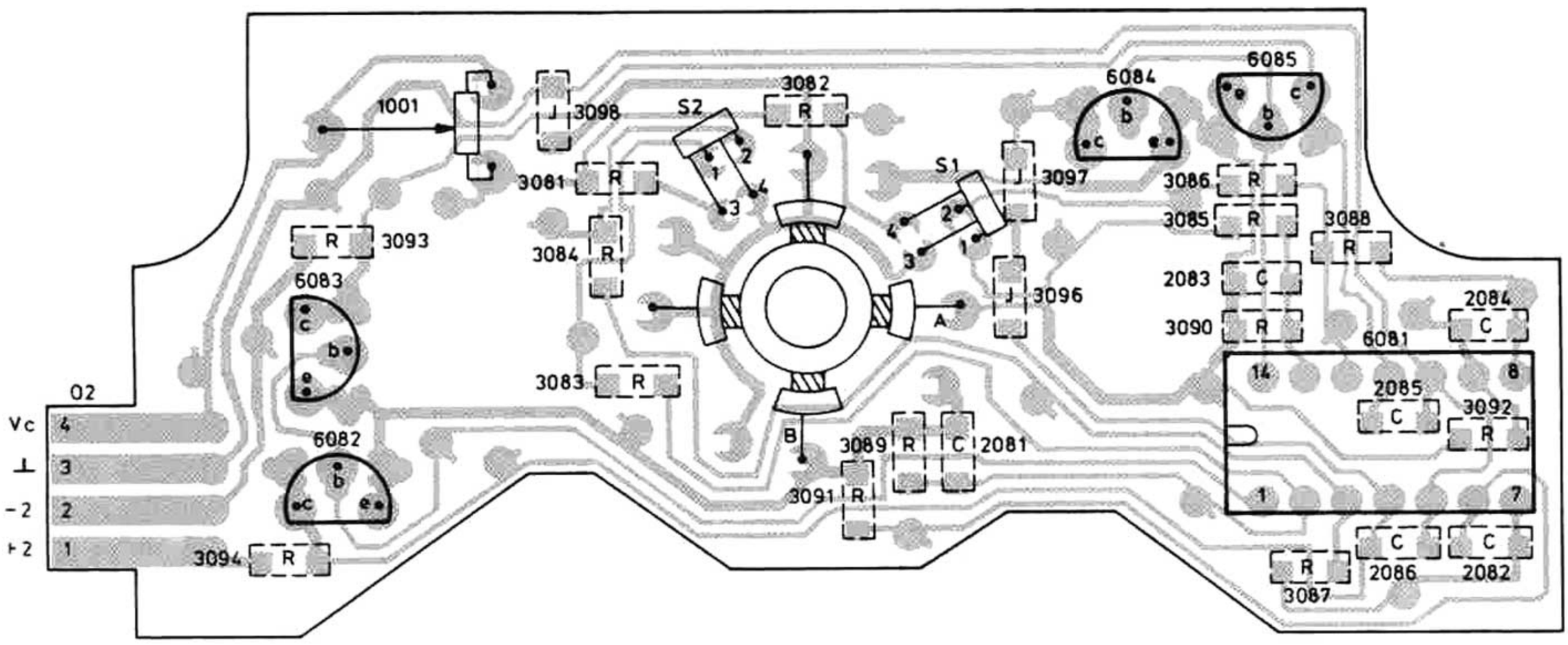
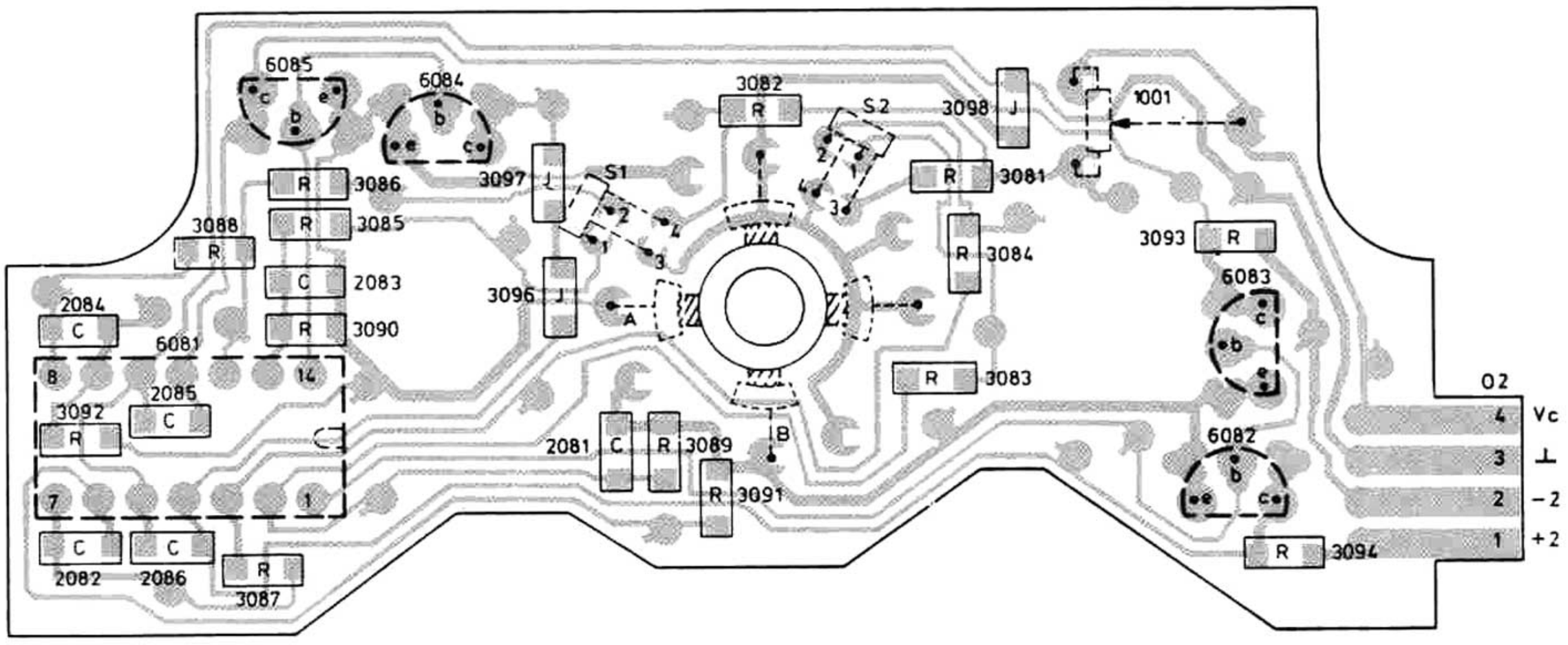
3204
3205

Motor PCB

—TOP VIEW—



—BUTTOM VIEW—



For codenumber of the motorassembly see the C.D mechanism exploded view page 12.