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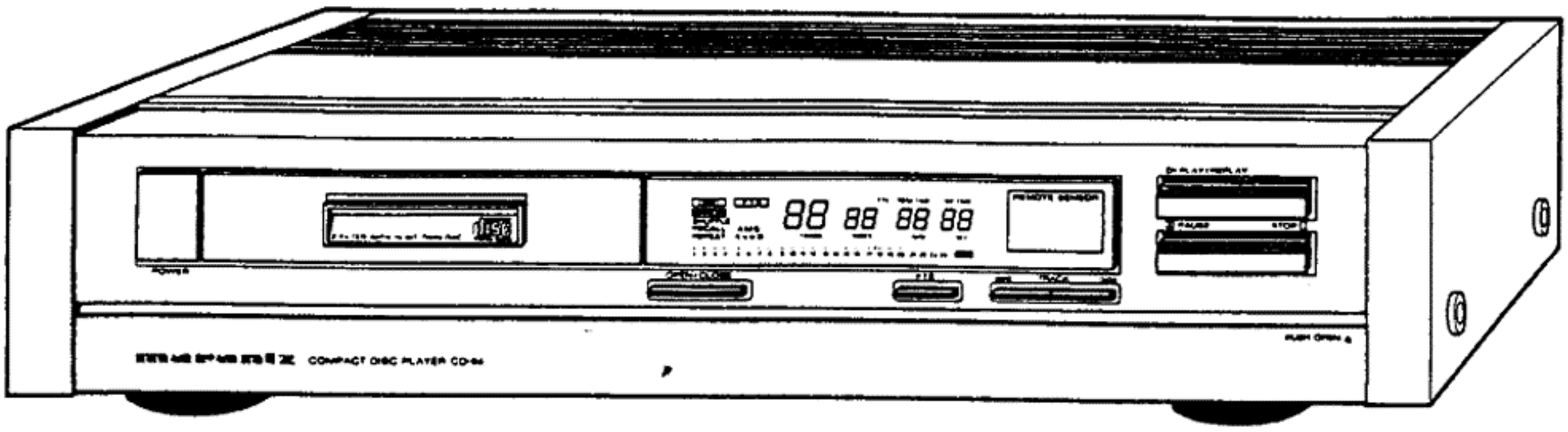
MODEL CD-94 COMPACT DISC PLAYER



INTRODUCTION

This service manual was prepared for use by Authorized Warranty Stations and contains service information for the Marantz Model CD-94 Compact Disc Player.

Servicing information and voltage data included in this manual are intended for use by knowledgeable and experienced personnel only. All instructions should be read carefully. No attempt should be made to proceed without a good understanding of circuitry operation.

The parts list furnishes complete ordering information. Most replacement parts should be ordered from the Marantz Company. However, a simple description is included for parts which can be obtained locally.

How to use this service manual

- The "Common parts" which Marantz Japan, Inc. has established are eliminated from this service manual.
- These "Common parts" are applied to all models in the service manuals arranged and issued by MJI.
- To indicate clearly the common parts in the schematic diagram, a line is drawn above or under the Ref. Desig. No. of applicable parts.
- "Common parts" can be supplied from the Marantz service center as ever.
  In case of ordering, please establish the parts number of 10 figures following the procedure mentioned in this service manual "How to establish the parts number for common parts".

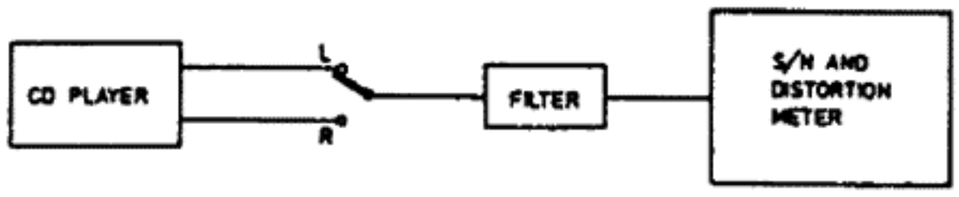
(NOTE)

When you order parts to the Marantz parts center, please take notice of the following points.

1) Please correctly write the parts number of 10 figures following the rule.
2) Since ordering parts by the Ref. Desig. No. or ratings indicated in the schematic diagram does not satisfy the above conditions, the Marantz parts supply system does not work properly.
   As this case is apt to cause a trouble, please pay attention to it.

ELECTRICAL MEASUREMENTS AND ADJUSTMENTS

Specification measurement



To measure the specification use can be made of audio test disc 4822 397 30085.
Use a 7th order filter, e.g. 4822 395 30204 (see Figure), to measure:
— Total harmonic distortion (THD).
— Intermodulation distortion.
— Signal-to-noise (S/N).

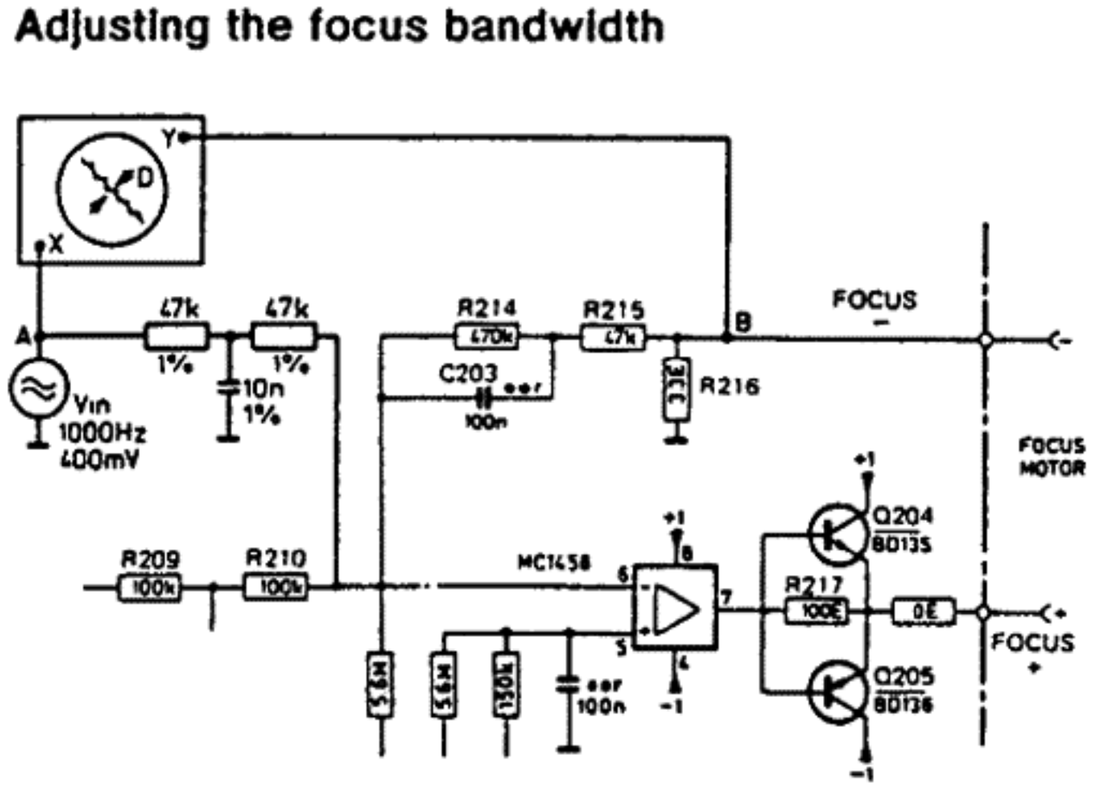
Laser power supply (POS. VOLT. SH.)

For check and preliminary adjustment of the laser supply see service manual C.D.M.-1.

Adjusting the laser supply

Play track 1 of test disc 4822 397 300096 (disc without defects).
Connect a DC voltmeter across resistor R309 on the servo PCB (= on emitter of transistor Q315 and ground).
Adjust the laser power supply with resistor 3180 until the voltage across resistor R309 is 575 ± 75 mV.

Adjusting the focus bandwidth



Make a measuring arrangement according to the figure.
Play track 1 of test disc 4822 397 30096 (disc without defects).
Adjust trimming resistor 3158 on PRE. AMPL. + LASER PCB for a 180° phase difference between signals A and B. This corresponds with a minimum distance D in the Lissajous pattern.

R=47 kΩ – 1% 5322 116 54671
C=10 nF –1% 5322 121 54154

Check of the AGC and offset circuits

(See SERVO PCB)
Play track 1 of test disc 4822 397 80096 (Disc without defects).
The voltage between pin 7 of IC Q303 (4/4) and ⊥ should be –4 V ± 2 V.
The voltage between pin 8 of IC Q302 (2/4) and ⊥ should be 0 V ± 2 V.

INITIATION OF THE SERVICING PROGRAMME OF THE μP

— **Servicing position "0"**

Simultaneously depress the STOP, PLAY and SEARCH ▷▷ buttons. Keep these three buttons depressed while the mains voltage is switched on.

This is the STAND-BY mode, "0" appears on the display.

In this state it is possible to move the arm by means of the SEARCH FORW and SEARCH REV keys with a minimum torque to the outside and the inside resp.
This enables a check of the free motion of the arm across the disc.

— **Servicing position "1"**

From servicing position "0" the player can be brought in servicing position "1" by depressing the NEXT key.

In this state the laser emits light and the objective starts to focus. When the focal point has been reached, "1" appears on the display.

When **no** disc has been inserted the objective goes 16 x to and fro. Then the player reassumes servicing position "0".

As in servicing position "0" the arm can be moved across the diameter of the disc by means of the SEARCH FORW and SEARCH REV keys.

— **Servicing position "2"**

To be reached by depressing the NEXT key after servicing position "1" has been reached.

The turntable motor starts to run

On the display appears "2".

In preparation of the transition to servicing position "3" the arm is sent to the centre of the disc.

— **Servicing position "3"**

To be reached by depressing the NEXT key after servicing position "2" has been reached.

The radial control is switched on. The subcode information is ignored. $\overline{\text{MUSB}}$ is high so that the music information **is released.**

On the display appears "3".

(Dependent on the length of the lead-in track music will be reproduced after approx 1 min.)

In this state it is possible to move the arm by means of the SEARCH FORW and the SEARCH REV keys to the outside and to the inside resp. Now the motion is controlled by the μ and the arm moves by steps of 64 tracks as long as the key is depressed.

If one of the servicing positions 1, 2 or 3 is disturbed (e.g. braking or removing the disc) the player reassumes servicing position "0".

The servicing programme can be left by switching the mains switch (POWER ON/OFF) off and on. (Hardware reset).

FAULTFINDING METHOD

Preface

In course of the development of the troubleshooting guide for the Compact Disc it has become clear that a different approach from the one applied so far was required.
For, it is no longer possible to use the classic strategy, i.e. basing the troubleshooting method on a number of possible faults in the unit.
Practice has shown that a certain fault, with the associated symptom, can have a wide variety of causes.
The reason is that this player incorporates a number of feedback loop configurations—which, moreover, might affect each other—and this impedes the obvious measurements.

The method below divides the player from diagram point of view into nine clearly distinguishable sub-groups and by performing some measurements, the sub-group being in failure can be isolated. Later the defective circuit can be further examined according to the method given.

PRACTICAL HINTS

Test discs

It is important to handle the test discs with great care.
For, the troubles (black dots, fingerprints, etc.) are exclusively and unambiguously positioned.
Damage can cause additional drop-outs etc. and as a result the conscious fault on this disc is no longer exclusive.
In that case it is no longer possible to check e.g. whether the track detector is working correctly.

Measurements on op-amps

In the electronic circuits of the servo systems op-amps are frequently being applied. These op-amps can be used as amplifiers, as filters, as investors, as buffers, etc.

In those cases where feedback is applied in one way or the other, the voltage difference at the differential inputs inclines to zero. This applies both to DC and to AC.
The cause can be traced back to the properties of an ideal op-amp ($Z_i=\infty$; $G=\infty$; $Z_o=0$).
In practice this means that it is nearly impossible to perform measurements on the inverting and non-inverting inputs of op-amps if one input is directly connected to ground.
In those cases only the output signal will be measurable.

That is why in most cases no AC voltages can be given to the inputs.
The DC voltages at the inputs are equal.

Stimulating with "0" and "1"

In the troubleshooting method certain pins should in a number of cases be connected to ground or be connected to the power supply voltage.
This way of acting offers the possibility to overrule certain circuits and to stimulate others.
In this way the diagnose time can be reduced.

In a number of cases the relevant pins appear to be **op-amp outputs**.

In this respect it should be mentioned that the outputs of the used op-amps are short-circuit protected.
This implies that the output of an op-amp can be made low (= usually ground potential) without consequences.
On the other hand should be pointed out that it is **not allowed** to connect the output of an op-amp directly to the **power supply voltage**.

I/Os of microprocessors should not be connected directly to power supply voltage.
These I/Os are allowed to be brought to "0" in case this is mentioned explicitlv.

Selection of ground point

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

Conditions for injecting

- It is should be pointed out that injection of levels or signals from a strange source is **never** allowed to occur when the power supply voltage is lacking in the circuit in question.
- Naturally, the injected level is never allowed to exceed the power supply voltage of the circuit in question.

Continuous burning of the laser

- Disconnect plug J203 on the servo PCB and connect pin J203-9 (laser) of the cable connector to ground.
  Now the focus loop and the radial loop are interrupted as well:
  J203-7 (RE1 = Radial Error 1), J203-8 (RE2 = Radial Error 2) and J203-10 (FE = Focus Error).
  The laser also burns continuously when the set is in service loop 2.

Irregular working of the display

Irregular working of the display when the set is opened and playing, might have been caused by incidental body effect in the region of the crystal oscillators.
Switching "off" and "on" of the mains voltage will eliminate this effect.

Indication of checkpoint

In the circuit diagram the checkpoints have been given a serial number (e.g. ⟨12⟩), to which the troubleshooting method will refer.
For oscillograms, amplitudes, time bases and position of set, see tables of checkpoints.

GENERAL CHECKPOINTS

In the detailed troubleshooting method following below a number of general conditions, required for proper functioning of the player, will **not** be repeated. Before starting the detailed troubleshooting method these general points should be checked.

a. Ensure that disc and objective are clean (remove dust, fingerprints, etc.) and use undamaged discs.
b. Convince yourself of the presence of the clock frequencies, viz.:
   - 12 MHz for μP servo (pin 18)
   - 11.2896 MHz for FILTER-B IC (pin 19)
   - 2.82–5.64 MHz for free-running PLL circuit on the DECODER-A IC (pin 27)
   - 3 MHz for control and display μP (pin 33).
c. Check whether all power supply voltages are present and have the correct level.
   See PCB drawings.
d. Check whether the two mutes (KILL and $\overline{\text{MUSB}}$ are inactive so that data are nowhere interrupted.
   This should go high about 2 seconds after the mains voltage is switched on.
   $\overline{\text{MUSB}}$=pin 23 of the FILTER-B IC on the decoder PCB.
   Normally this pin is high during play and low during search.

DETAILED TROUBLESHOOTING METHOD

A number of quick and efficient checks immediately give a definite answer on poorly functioning sections of the player.
To check the servo systems four service loops have been built in μP Q271.
Before calling in service loops, it should be checked (position power on) whether the bus (clock, data: pin 17 and 10 or 11 of μP Q271 resp.) is free. In other words, checking whether these lines do not have a short circuit to ground or supply voltage (level low or "high"). In such a case the buttons cannot be operated.
For troubleshooting the step-by-step method below is followed.

First step (with disc on turntable)

Bring the player in service loop 1 or 2

If one of the conditions for service loop 1 or 2 is not met, the questions below should be answered positively **in the sequence given**.

In practice this means that when one question has been answered positively, all the preceding circuits, to which the questions refer, are functioning well.

Example: if the eye pattern is present, we may conclude that the laser is working, the laser is in focus and that the turntable motor is running.

Note:
In some situations, certain faults in the radial servo circuit affect the focus servo circuit (e.g. if supply voltage + 1 of IC Q301 in the radial circuit fails, the focus coil starts oscillating).
To determine if this situation exists, connect point ⟨36⟩ on the servo PCB to ground.
In this way, the influence of the radial servo circuit on the focus servo circuit can be eliminated.

A. Is the laser giving light?
   (Test method: see sub A)

B. Is the angle disc-light pin within the tolerance, i.e 90°± 0.5°?
   (Test method: see description mentioned in chapter "Mechanical measurements and adjustments" of the C.D.M. manual).

C. Is the laser giving sufficient light?
   (Test method: see sub C).

D. Does the objective come in focus?
   (Test method: see sub D).

E. Is the turntable motor running and, if so, is it running at the correct speed?
   (Test method: see sub E).

If the answers to questions 1 or 2 through E are positive, it should be possible to bring the player in service loop 1 or 2.

Second step (with disc on turntable)

Bring the player in service loop 3.

This means that the eye pattern on point ⟨65⟩ (on the decoder PCB has to be stable, while MSC on point ⟨17⟩ on the servo PCB has to be more stable too).
(Test method: see DECODER-A IC)

Note that the set is not only tracking a song in loop 3, but also playing the song, provided the digital circuit is working (however music cannot be hard).

If this does not work, return to service loop 2 and answer the questions below positively in the sequence given.

F. Are $\overline{\text{DO}}$ and HFL detectors functioning?
   (test method: see sub F)

G. Is track detector functioning?
   (test method: see sub G)

H. Is the radial control functioning properly?
(test method: see sub H)

If the answers to questions F, G and H are positive, it should be possible to bring the player in service loop 3.

Third step (with disc on turntable)

Note that the set is not only tracking a song in loop 3, but also playing the song, provided the digital circuit is working (music cannot be heard).

If this does not work, return to service loop 3 and answer the question below positively.

I. Is $\overline{TL}$ functioning, i.e. polarity of RE?
(test method: see sub I)

J. Is information transmission subcode functioning?
(test method: see DECODER-AIC)

Check the Q-channel signals.

If the answers to questions I and J are positive, it should be possible to bring the player in the Play mode.

Fourth step (with disc on turntable)

If no music is heard in position "play" or service loop 3 answer the last question.

K. Is digital decoder circuit functioning according to specification (test method: see II. FILTER-B IC and V. KILL CIRCUIT)

Sub. A. IS THE LASER GIVING LIGHT?

Test method

Bring the player in service loop 1 without placing a disc on the turntable. Now the laser is giving light for an unlimited period of time.

Another method for which the laser gives light during an unlimited period of time and the objective is standing still, is disconnecting plug J203 on the servo PCB and connecting point J203-9 of the cable connector to ground.
In case of power-on the laser should burn. This is checked with the aid of a light-sensitive component which is slightly screened from ambient light.

Hereafter follow some examples:

a. Connect photosensitive diode type BPW4, code number 4822 12032108, with correct polarity to an analogue multimeter (e.g. PM2412) at range 10 kΩ.
If the laser is burning, the meter will give virtually full scale deflection.

b. Connect LDR, code number 4822 116 10002, to digital multimeter PM2517E.
If the laser is burning, the resistance will drop to approx. 8 kΩ.

If the laser is not giving any light, proceed to Annex 1.

Sub. C. IS THE LASER GIVING SUFFICIENT LIGHT?

Test method (Test points on Pre-amp PCB)

— Interrupt the collector of Q203 on the servo PCB or ground-the-side of electrolytic capacitor C201. Disconnect plug J203 on the servo PCB and connect pin **J203-9 (laser)** of the cable connector to ground.
Now the laser should continue to give light while FE, RE1 and RE2 are interrupted.
— Place disc on turntable and switch power on.
— Directly inject with AF generator ($Z_i \leq 600$ Ohms) to test point ◇1 FE a sine-wave signal between 25 and 60 Hz (exact frequency is player-dependent) and $2V_{pp}$.
— Select such a frequency that the monitor diodes of the light pin give output signals as indicated on test points ◇5, ◇6, ◇7 and ◇8. Amplitude 40–80 mV.
— If the amplitude is not sufficient, proceed to Annex 1.

Sub. D. IS THE OBJECTIVE COMING INTO FOCUS?

Test method

- **No disc on turntable**

Switch power on and actuate Play button.
Now the arm should move inwards. Immediately after that the objective should move two times up-and downwards (this happens during searching of the focusing point).
After this the action will stop.
These actions are software-controlled from the servo μP. If this is not working, check μP servo, end stage focus circuit or focus coil.

- **With disc on turntable**

Quick test procedure:

For a rough check on the working of the focus circuit, proceed as follows:
— place disc on turntable.
— set player in service loop 1.
— remove disc from turntable.
— now examinate if the objective focuses by bringing a reflective object (e.g. mirror) above it.

Detailed test procedure

— Check **Q203** (on servo PCB) as follows:
Check whether FN becomes, with each passage of the nominal focusing **low for a short period of time**. Only when focusing point FN has been found, FE will be released via Q203 (base will become negative).
Check whether base of Q202 is driven low from servo μP (= $\overline{FCO}$). If not, check servo μP.
If so, proceed.

— Test focusing circuit as follows:
Interrupt the collector of Q203 on the servo PCB and disconnect **plug J203** on the servo PCB. Con-

nect pin **J203-9 (laser)** of the cable connector to ground.
Now the laser is burning continuously, FE has been released and the focus loop has been interrupted at test point ◇1◇ (=FE) on servo PCB.

Testing of circuit, between test point ◇1◇ and focusing coil
(Test points on servo PCB)

- Directly inject a sine-wave signal of 10 Hz, $2V_{pp}$, to test point ◇1◇ by means of an AF generator ($Z_i \leq 600\ \Omega$).
- Check visually whether focusing coil "--" and thus objective too "--" responds.
- Check whether this voltage is 0.6 V_{pp} on test point ◇2◇.
- Check whether this voltage is 6 V_{pp} on test point ◇3◇.
- Check whether this voltage is 5 V_{pp} on test point ◇4◇.

Testing the subchassis (Test points on Pre Amp PCB, injection point on servo PCB)

- Place a disc on the turntable.
- Directly inject to test point ◇1◇ a sine-wave signal between 25 Hz and 60 Hz at 2 V_{pp} by means of an AF generator ($Z_i \leq 600\ \Omega$). The exact frequency is player-dependent.
- Select such a frequency that the monitor diodes of the light pin give output signals as indicated on test points ◇5◇, ◇6◇, ◇7◇ and ◇8◇.
- Check test points ◇9◇, ◇10◇, ◇11◇ and ◇12◇.
- Check test point ◇13◇.
- Check test point ◇14◇.

  Is the same as signal on test point ◇13◇ but amplitude is dependent on position of potentiometer 3138.

If all the checks are positive, close focus loop (insert plug J203). Now the focusing circuit should be able to operate. Reconnect transistor Q203.
It should be noted here that the amplitudes on test points ◇5◇ through ◇13◇ are slightly dependent on the characteristic of the monitor diodes.

Sub. E. IS TURNTABLE MOTOR RUNNING AND, IF SO, IS IT RUNNING AT THE CORRECT SPEED?

Test method (Test points on servo PCB)

- Place disc on turntable and bring set in service loop 2.
- If focusing point is found, check whether $\overline{FCO}$ is low on point ◇15◇.
  If not, check focus circuit sub D.
  If so, proceed.
- Now only power on, disconnect plug J201 on the servo PCB and check MSC=point ◇12◇ of cable connector J201 or point ◇81◇ on the decoder PCB.
  If not, check Decoder-A IC (Q501) circuit.
  If so, proceed.
- Reconnect plug J201, disconnect plug 15 on the preamplifier PCB and inject a DC signal to the cable connector of the motor or directly to the turntable motor.
  The turntable motor should be running now.
  (A DC voltage of 2,5 V approximately corresponds with the rpm during scanning of the innermost tracks).
  In this condition the player should be brought in service loop 2 (depress Stop button while mains voltage is switched on).
  If DC < 2.5 V Figure G should be visible on test point ◇17◇ (servo PCB).
  If DC > 2.5 V Figure H should be visible on test point ◇17◇.

  If so, check turntable control circuit (circuit from point ◇17◇ to turntable motor).
  If not, check whether MSC is released by means of $\overline{SSM}$ at pin 16 of IC Q271.
  This connecting plug J201 on the servo PCB and measure on pin 12 of cable connector J201.
  If MSC is working now, check circuit around IC Q271.
- Take player out of service loop 2, depress Power-on button and then Play button and check eye pattern on point ◇65◇ (on decoder PCB).
  To stabilize the eye pattern, bring light pin above tracks by hand, or by briefly (5 s) depressing Fast Forward button.
  If eye pattern not point ◇65◇ is not present or unstable, check RF pre amplifier (see Annex IV).
- If eye pattern is correct, proceed.
- Check whether point ◇55◇ (=$\overline{HFLS}$) on the servo PCB is correct in service loop 2 (see Figure Y). If not, check $\overline{HFLS}$ detector circuit (is circuit between point ◇65◇ and ◇55◇). If so, proceed.
  Take player out of service loop 2 by depressing the power button.
- Check locking-in of PLL circuit of Decoder-A IC.
  (See CEFM signal pin 27: point ◇68◇)
  If PLL is locking-in, proceed.
- Check timing signals on output of Decoder-A IC as indicated in "DECODER-A IC".
  Is the digital decoder circuit functioning according to specification? If timing signals are correct, proceed.
- If MSC is still not functioning properly, replace the relevant specific digital IC according to the trial and error method with the aid of service IC box.
- MSC has to be present now.

Sub. F. ARE THE $\overline{DO}$ and $\overline{HFLS}$ DETECTORS FUNCTIONING?

Test method (Test points on servo PCB)

Starting point is:
$\overline{HFLS}$ = 1 when spot is exactly on track
$\overline{HFLS}$ = 0 between tracks (e.g. during track jumping)
$\overline{DO}$ = 0, or DO = 1 in case of drop-out
$\overline{DO}$ = 1, or DO = 0 when there is no drop-out.

Approximative method
(applicable in service loop 2)

- Place disc on turntable.
- Bring player in service loop 2.
- Check whether DO (test point ◇57 is not continuously "high". Normally test point ◇57 is "low", however small spikes of approximately 100mV are present in case of scratches on the disc.
- Check $\overline{HFLS}$ (test point ◇55).

Precise method
(can be checked in playing set only)

- Place test disc 5A on turntable. Switch power on and depress Play button.
- Select track no. 10: Check point ◇55.
  $\overline{HFLS}$ pulses should be present.
- Select track no. 15: Check point ◇56.
  $\overline{DO}$ pulses should be present. With this track the $\overline{HFLS}$ pulses on point ◇55 should also be present.
- In case of track jumping $\overline{HFLS}$ pulses are always present on point ◇55.

Sub. G. IS TRACK DETECTOR FUNCTIONING WELL?

Test method (Test points on servo PCB)

Switch off the offset circuit:
Loosen resistor 3315 (at the side where it is in contact with pin 8 of IC Q302).
Mount a 47 kΩ trimming potentiometer between +1 and −1 supply voltage (for example between pins 4 and 11 of IC Q302). Connect the wiper of the trimming potentiometer to the loose side of resistor 3315.

- Place a disc on the turntable.
- Bring the set in service loop 2.
- Adjust the signal on test point ◇21 symmetrically round 0V by means of the external 47 kΩ trimming potentiometer. The amplitude of the signal may change during this adjustment.
- Measure F.S on point ◇36.
  Here too the frequency variation depends on the eccentricity of the disc.
- Check point ◇60.
- Check point ◇61. Signal cannot be triggered.
- Check point ◇62.
- Switch the offset circuit on again.

Sub. H. IS THE RADIAL CONTROL FUNCTIONING PROPERLY?

Attention: The offset circuit (d-multipuller) and the AGC circuit (k-multipller) are correction circuits. This means that under optimal conditions (new disc, minimum tolerances of components) the set may be working properly even if a fault is preset in offset or AGC circuit.

Test method (Testpoints on servo PCB)

a. Place disc on turntable.

b. Switch off AGC circuit (k-multiplier) and switch off offset circuit (d-multiplier).

   Method:
   Switching off AGC circuit: interconnect points ◇5 and ◇6 of IC Q309.

- Place a disc on the turntable.
- Bring the set in service loop 2.
- Adjust the signal on test point ◇21 symmetrically round 0V by means of the external 47 kΩ trimming pot. The amplitude of the signal may change during this adjustment.

c. Bring set in service loop 3.
   At this moment there is a high probability that the set is working.
   If so, check d and k factor (see Annexes II and III).

   If not, proceed.

d. Bring set in service loop 2 and check signal on point ◇21.
   The AC-component has to be 12-14 V symmetrically, around a DC level of zero volt.
   If this is correct, proceed to e).
   If this is not correct check following testpoints
   ◇22, ◇23: value should be 0.7 V_{pp}
   ◇24: value should be 0.2 V_{pp}
   ◇25: value should be 0.25 V_{pp}
   ◇26: value should be 20 mV_{pp}
   ◇27, ◇28: value should be 800 mV_{pp}

   Note:
   The frequency variation strongly depends on the eccentricity of the disc.
   If points ◇22 ÷ ◇28 are OK, check point ◇21 again.
   If ◇21 is OK, proceed.

e. Check point ◇29 (is RE + 650 Hz).
   Value should be Vpp If so, proceed.
   When the set is in the normal stand-by position 650 Hz at 300 mV is present on point ◇29.

f. To check radial output stage, do not use a disc, only power on. Inject on points ◇30 and ◇31 respectively a sine-wave signal of 8 to 10 Hz 3 Vpp.
   Then the radial motor will go back and forth.

At this moment radial tracking must be possible in service loop 3..

- Switch the AGC circuit on again.
  If the original fault symptom is still present proceed

to Annex III:
Check of the k-factor.
— Switch the offset circuit on again.
If the original fault symptom is still present, proceed to Annex II:
Check of the d-factor.

Sub. I. IS $\overline{INT}$ FUNCTIONING. O.E. POLARIOTY OF RE? (Measure points on servo PCB)

Test method
Bring player in service loop 3 and measure $\overline{INT}$ on pin 12 of μP servo IC Q271.
A square-wave voltage (0-5V) should be measured on th is pin. As a result of the frequency variation th is square-wave is hard to trigger.

I DECODER-A IC

- **Check the MC signal (pin 17; test point ◈)**

— In stand-by mode, the MC signal (Motor Control) corresponds to the figure below.

Note:
The repetition time of the MC signals is 11.3 μsec.

— Place a disc on the turntable.
— In position PLAY or SERVICE POSITION 3, the MC signal corresponds to the figure below.

Note:
During start-up the duty cycle is 98%, then the duty cycle of the signal becomes about 50%.

See also Service Manual CDM-1: "Check of the motor control".

- **Check the HF signal on test point ◈ (eye pattern)**

— Place a disc on the turntable.
— The HF signal should be present and be stable in the PLAY mode and in:
SERVICING POSITION 3 after the run-in track has been read.
— In SERVICING POSITION 2 and during reading of the lead-in track the HF signal is not stable.

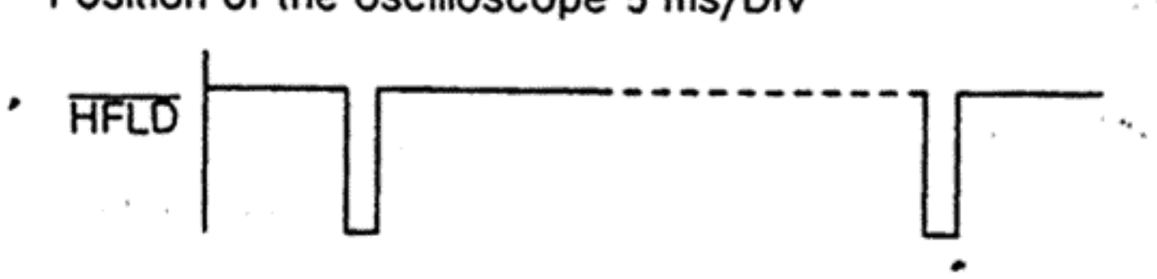
Position of oscilloscope 0.5 μs/DIV.

Amplitude ≈ 1.5 V_{pp}

- **Check the $\overline{HFLD}$ signal on test point ◈**

— Place a disc on the turntable.
— In the PLAY mode and in SERVICING POSITION 3 the $\overline{HFLD}$ signal is "high"; however, minor pulses may be present and in cause of disorders on the disc.
— In SERVICING POSITION 2 and during playback of track no. 15 of test disc 5A $\overline{HFLD}$ pulses are visible.

Position of the oscilloscope 5 ms/DIV



- **Check if the $\overline{MUTE}$ signal (pin 11; test point ◈) is "high"**
When Filter-B IC is applied, the $\overline{MUTE}$ input will nct be used.

- **Check the CEFM signal (pin 27; test point ◈)**

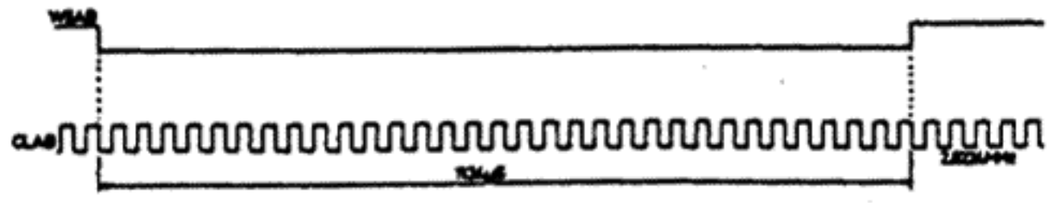
— Place a disc on thr turntable.
— In stand-by mode (only the main s switch is depressed), the frequency lies between 2.82 MHz and 5.64 MHz.
— In the position PLAY and SERVICE POSITIONS 2 and 3, the frequency is 4.32 MHz.

- **Check the Xin signal (pin 19; test point ◈)**

— The Xin frequency is 11.2896 MHz.
— If this frequency deviates, check test point 70; Xout signal, on Filter-B IC.
This frequency should also be 11.2896 MHz.

- **Check the timing signals meant for Filter-B IC**

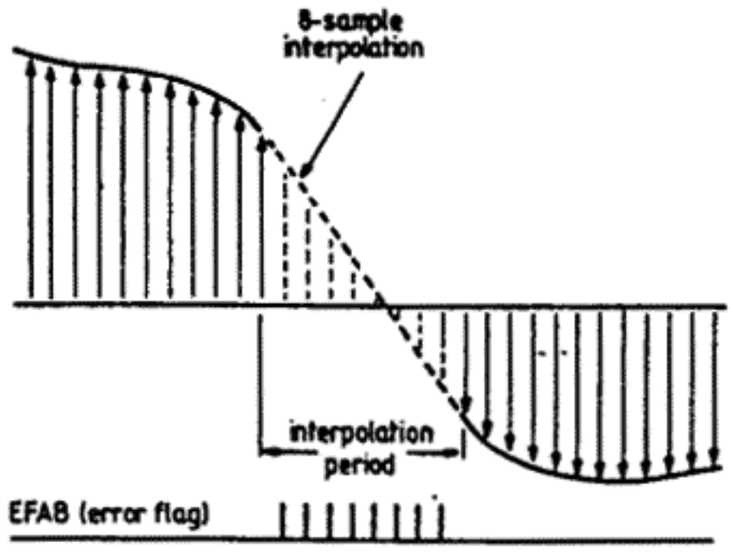
— Place a disc on the turntable.
— Select one of the following positions:
SERVICE POSITION 2 or 3, or position PLAY.
— Trigger the oscilloscope with the WSAB signal (test point ◈, pin 39).
— Check signals:
WSAB at test point ◈ (pin 39)
(Word Select from Decoder-A to Filter-B)
CLAB at test point ◈ (pin 38)
(Clock from Decoder-A to Filter-B)
and their interrelation.
— There must be activity at test point ◈ (pin 37), DAAB signal (DATA from Decoder-A to Filter-B).



- **Check the EFAB signal (Error Flag from Decoder-A to Filter-B) at test point ◇74 (pin 36)**

— Place test disc 5A on the turntable.
— During playback, EFAB fulses should be present at test point ◇74 for soft braking of the disc and during fast search (F.Forward, F.Reverse).

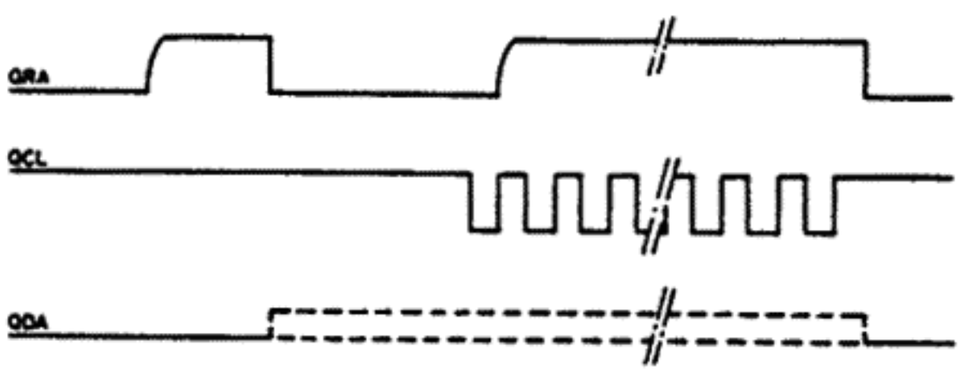
Note:
Filter-B IC is capable of interpolating linearly 8 successive EFAB pulses.



- **Check the Q-channel signals**

— Place a disc on the turntable.
— Select one of the following positions: SERVICE POSITION 3 or position PLAY.
— Trigger on the QRA signal (Q-channel Request Acknowledge) test point ◇75; pin 30.
— Check signals QRA at test point ◇75 (pin 30).
QCL at test point ◇76 (pin 31).
(Q-channel-clock)
and their interrelation.
— There should then be activity at test point ◇77 (pin 29) QDA (Q-channel Data).

Note:
The QRA request is initiated by decoder μP (QRA "high"). Then Decoder-A answers this request (QRA goes "low"). With the next leading clock pulse (QCL) the QRA signal is rendered "high" again by the decoder μP.
As soon as the decoder μP has taken in enough information via QDA, QRA will go low again. That is why the QRA times vary each time.



- **Check the $\overline{SSM}$ signal (test point ◇78; pin 33) = Start-Stop turntable motor**

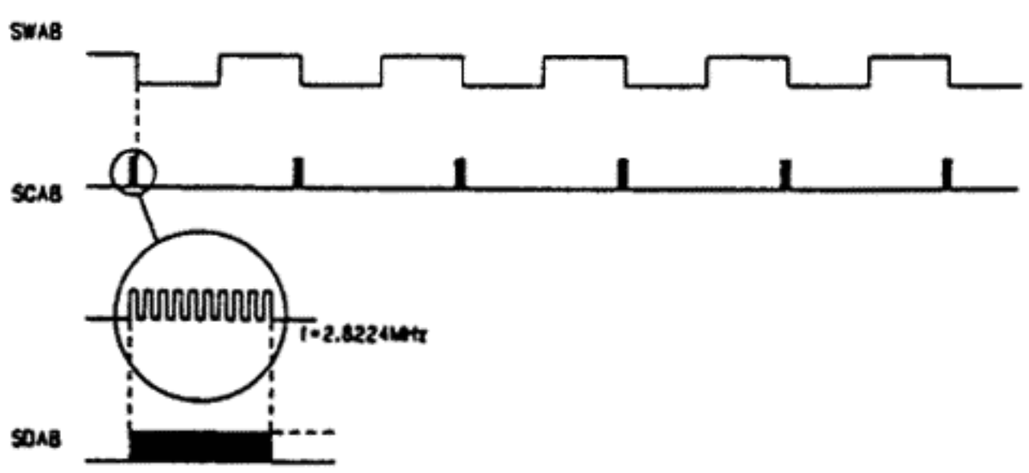
— Motor start pulse when test point ◇78 is "high" for ≥ 0.2 sec.
— Motor start pulse when test point ◇78 is "low" for ≥ 0.2 sec.

Note:
After the motor start pulse, SWAB information (Subcoding Word clock) will become visible at this point. The period time of that signals is 136 μsec.

- **Check the subcode clock signals**

— Place a disc on the turntable.
— Select one of the following positions: SERVICE POSITION 3 or position PLAY.
— Trigger the oscilloscope with the SWAB signal at test point ◇78.
— Check the following signals:
SWAB at test point ◇78; pin 33
SCAB at test point ◇79; pin 35 (Subcode Clock from Decoder-A to Filter B)
SDAB at test point ◇80; pin 34 (Subcode Data from Decoder-A to Filter B)I
and their interrelations.

Note:
While the burst of 10 clock pulses, appear on SCAB the Q-channel information is transferred on SDAB. Hereafter the P-bit indication follows.
The P-bit "high" between two bursts of 10 clock pulses in case of pause indication and "low" in case of music indication.



- **Check the $\overline{CRI}$ signal**

The $\overline{CRI}$ is "low" in case of track jumping.
Player in position SEARCH.

- **Check the $\overline{DEEM}$ signal (test point ◇84; pin 32)**

— Place test disc 5 on the turntable.
— During playback of track no. 14 (recorded without PRE-EMPHASIS), the $\overline{DEEM}$ signal should be "low".
— During playback of track no. 15 (recorded with PRE-EMPHASIS), the $\overline{DEEM}$ signal should be "high".

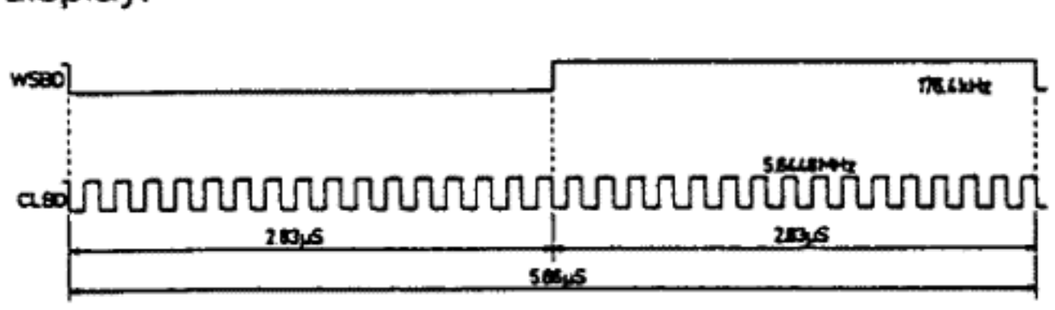
II FILTER-B IC

- **Check the signals between Decoder-A IC and Filter-B IC**

See sub. "I Decoder-A IC".
— Check the X IN signal (test points ◈69 and ◈70)
— Check the timing signals meant for Filter B (WSAB, CLAB, DAAB signals; test points ◈71, ◈72 and ◈73).
— Check the EFAB signal (test point ◈74)
— Check the subcode clock signals (SWAB, SCAB, SDAB signals; test points ◈78, ◈79 and ◈80).

- **Check the timing signals between Filter-B IC and DAC IC**

— Place disc on the turntable.
— Select one of the following positions:
SERVICE POSITION 3 or position PLAY.
— Trigger the oscilloscope with the WSBD signal (Word Select from Filter B to DAC) test point ◈85 (pin 18).
Check the following signals:
WSBD at test point ◈85; pin 18
CLBD at test point ◈87; pin 16 (Clock signal from Filter B to DAC) and their interrelation.
If an Audio disc is used, there should be activity at test point ◈86 (pin 15) DABD signal (DATA from Filter B to DAC). If a disc with Digital Data (CD-ROM) is used, this point is continuously switched "low" by transistor Q537. In that case the word "data" appears on the display.



- **Check the DOBM signal (Digital Output)**

— Place a disc on the turntable.
— Select the stand-by mode (only mains switch depressed).
— Trigger the oscilloscope with the SWAB signal (test point ◈78).
— Check the DOBM signal (test point ◈88; pin 14).
An empty audio signal has a fixed pattern.
See drawing, "Stand-by".
— Select the PLAY mode.
Check the DOBM signal. See drawing "PLAY".

- **In position SEARCH the $\overline{\text{ATSB}}$ signal is "low" test point ◈89; pin 22 (Attenuation Audio Signal)**

— When the "µP panel" is applied, (a sub-printed circuit board) that houses IC Q271, test point ◈89 is not connected.

- **Check the $\overline{\text{MUSB}}$ signal test point ◈90; pin 23 (Soft Mute)**
This signal is "low" in positions:
PAUSE
NEXT or PREVIOUS when jumping form one track to another.
Fast SEARCH when the Search button is kept depressed for some time.

III DAC IC (Dual Digital Analog Converter)

- **Check the signals between Filter-B IC and DAC IC**

See sub. "II Filter-B IC":
— Check the timing signals between Filter-B IC and DAC IC.

- **Check the output of the OP-AMP after the DAC IC**

— Place a disc on the turntable.
— In position PLAY or in SERVICE POSITION 3, the analog (music) signal should be present at the output of the OP-AMP, after the lead-in track has been read.

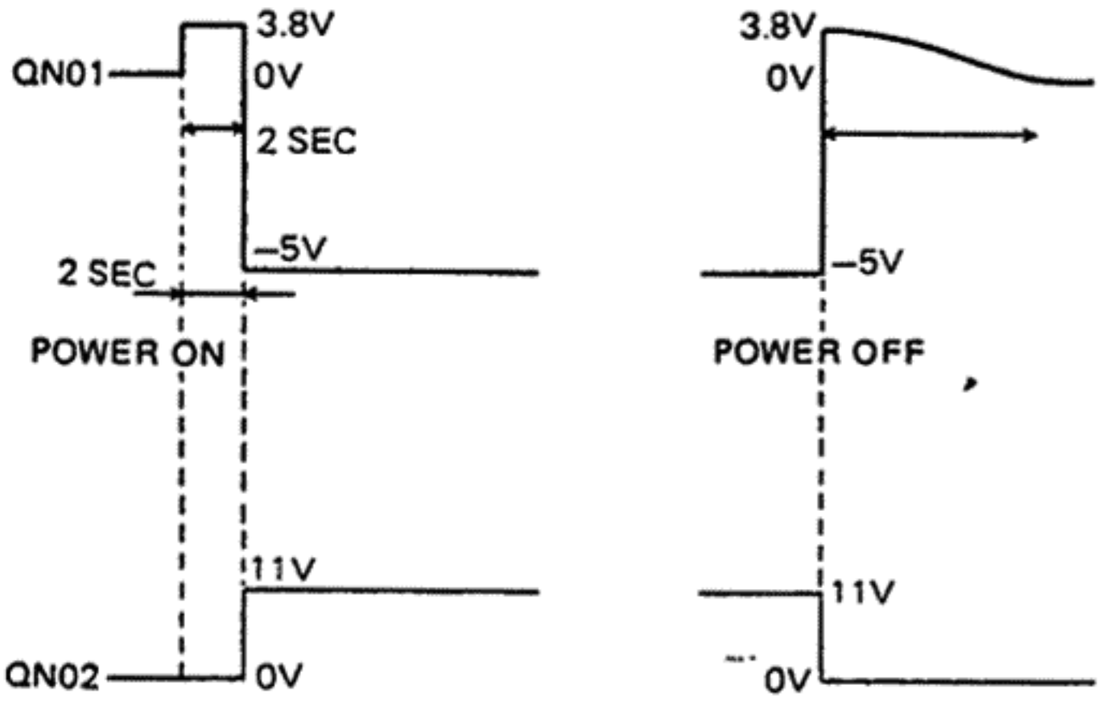
IV $\overline{\text{DEEM}}$ CIRCUIT

- **Check $\overline{\text{DEEM}}$ circuit**

— Place test disc 5 on the turntable.
— During playback of track no. 14 (recorded without PRE-EMPHASIS) the $\overline{\text{DEEM}}$ signal at test point ◈84 should be "low".
— During playback of track no. 15 (recorded with PRE-EMPHASIS), the $\overline{\text{DEEM}}$ signal at test point ◈84 should be "high".
— During playback of track no. 14 the analogue signal should be present at the source of R564 (test point ◈91) and R565 (test point ◈92).
— During playback of track no. 15 the analog signal at the source of R564 (test point ◈91 and R565 (test point ◈92) should be 0 V..

V KILL CIRCUITL

— During switching on and off the mains voltage the signal on the collector of QN01 and QN02 should be as indicated in the figure below.



VI FAVOURITE TRACK SELECT (FTS)

Attention:
When repairing a CD player it is important that the cxontents of the FTS memory (EEPROM) should not unnecessarily be damaged.
If no complaints are reported about the functioning of the FTS, a check of the functions of the EEPROM should be left undone.
The EEPROM IC is in the Stand-by mode when $\overline{CE}$ and RDY are both high.

Selftest of the FTS μP

During the self-test of the FTS μP, I/O Gate will not be tested.
Therefore this self-test can be executed without damage to the memory as indicated in General Test Points.

Annex I: LASER IS GIVING NO OR INSUFFICIENT LIGHT

Together with laser supply and the monitor diode the laser forms a feedback system.
A defect in the laser supply might thus result in destruction of the laser. Replacement of th laser (=new light pin) will not solve anything. The new laser will also be destroyed since the original fault in the laser supply is still present.

On the other hand it is impossible to check and repair a feedback system when one link is missing.

For this reason the so-called laser simulator 3 is supplied. Code number 4822 395 30229.
This laser simulator consists of a PCB which contains the laser and monitor simulation, a switch to test the On/Off position and a number of sockets.

This PCB can be connected to the laser supply instead of the light pin so that the feedback system is closed.

Repair procedure:

Since the light pin is very sensitive to static charges, care should be taken that during measurements and adjustments of the laser power supply the potential of the aids and yourself equal the potential of the CD mechanism.

Detach light pin an connect laser simulator as follows: (connections on pre-amp PCB).
Take the flex PCB out of socket 11 and connect the simulator PCB with the socket.
Remove plug 16 and insert it in the socket on the simulator PCB.
Connect the plug with 4 wires to socket 16. Take out plug 17 and insert the plug with 1 wire in socket 17.

— Switch on the mains switch and ensure that the drawer is closed or else that the tray-end-in switch on the tray PCB (S004) is depressed.
Now press the play key and check if the L-line of the servo μP, pin 21-2 on the pre-amplifier PCB, goes "low".
— In rest position the current through the laser diode should be ≤ 1 mA. For NEG. VOLT. lasers this can be checked as follows:
Set the switch on the simulator PCB in the OFF position and the mains switch in the ON position.
Turn trimming resistor 3180 counterclockwise (min. R) and measure the voltage across resistor 3194 on the pre-amp. PCB.
On pre-amplifier PCBs with discrete components turn resistor 3180 clockwise (min. R) and measure the voltage across resistor 3194.
The voltage should be ≤ 15 V.

Check of laser supply control

Set the switch on the simulator PCB in the ON position and measure the voltages between points +V and=V on the simulator PCB.
Resistor 3180 clockwise (max. R): U_{+v-v}=225 mV ±45 mV. On pre-amplifier PCBs with discrete components resistor 3180 counterclockwise (max. R): U_{+v-v}=225 mV ±45 mV.

R3180 counterclockwise (min. R): U_{+v-v}=750 mV ± 150 mV.
On preamplifier PCBs with discrete components resistor 3180 clockwise (min. R): U_{+v-v}=750 mV ±150 mV.

Set resistor 3180 in the mid-position.
This is a preliminary adjustment. After the simulator PCB has been removed the laser current must be adjusted.

Fine adjustment of laser current

— Playback track 1 of test disc 4822 397 30096 (Disc without defects). Connect a DC voltmeter across resistor 3308 on the SERVO PCB circuit

diagram D. Adjust the laser power supply with resistor 3308 is 575 mV ± 50 mV.

Annex II: **CHECKING d-FACTOR**
(Test points on servo PCB)

— Switch off AGC circuit (k-multiplier) and switch off offset circuit (d-multiplier). See sub G and H.

Place disc on turntable and set player in service loop 2.

— Check points ◈22◈ and ◈23◈.
Value should be o.7 V_{pp}.
Frequency variation strongly depends on the eccentricity of the disc.
— Check points ◈25◈.
Value should be 250 mV_{pp}.
— Check point ◈35◈.
Value should be 200 mV_{pp}.
— Check point ◈36◈.
Value should be 2 V_{pp}.
— Check points ◈37◈ and ◈38◈.
Value should be 10 V_{pp}.
The signals is more sine-shaped now due to filtering out of 650 Hz.
— Point ◈39◈ is hard to measure since switch is in position Yoc and thus connected with input of op-amp Q302 (pin 9).
However, a signal of 200 mVpp is present.
— Check point ◈40◈.
Value should be 9 V_{pp}.

Bring the player in service loop 3. With a disc on turntable and the AGC and offset-circuits are still switched off.

— Check point ◈41◈.
— Check point ◈40◈ on beam A of oscilloscope and check point ◈39◈ on beam B of oscilloscope while oscilloscope is triggered with point ◈41◈.
— Switch on the AGC-circuit and offset circuit.

Annex III: **CHECKING k-FACTOR**
(Test points on Servo PCB)

a. Static

Switch power on **without** depressing the Play button.
I.e. RC0=high; $\overline{RC0}$=low so switch Ya is in position 0 and switch Yc is in position 0.
— Check point ◈45◈.
Value should be 9 V_{pp}.
— Check point ◈46◈.
— On point ◈29◈ now appears a sine-wave signal of 650 Hz, 300 mV, and 180-45=360°shifted in phase relative to signal on point ◈45◈.
— Check point ◈47◈.
Value should be 1.5 V_{pp}.
— Check point ◈48◈.
Value should be 1 V_{pp}.
— Check points ◈49◈, ◈50◈, ◈51◈ and ◈46◈ relative to each other.
Amplitudes are 5V.
— Check integrator IC Q303 (4/4)

b. Dynamic

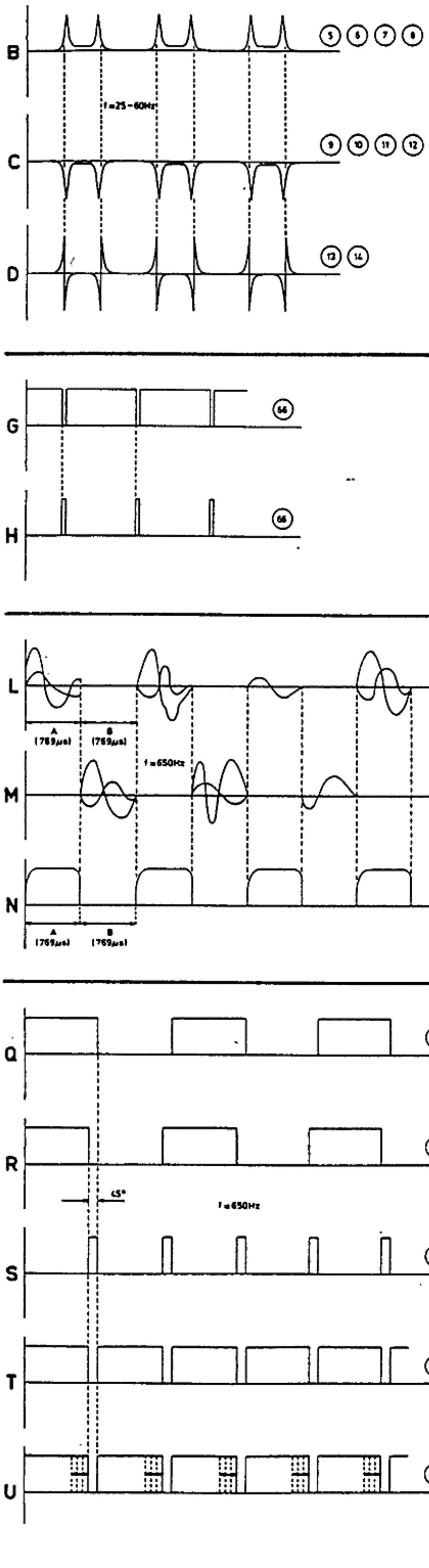
Insert disc, select service loop 2 and check if the signal on point ◈21◈ equals to 7 V_{pp}.
— Select service loop 3.
Now $\overline{RC0}$=high and RC0=low.
So switch Y_a is in position1.
Switch Y_c switches at f=650 Hz.
Point ◈52◈ is low; so point ◈51◈ is in phase point ◈50◈.
Now fig. U should be present on point ◈51◈ with duly cycle jittering round 50%.

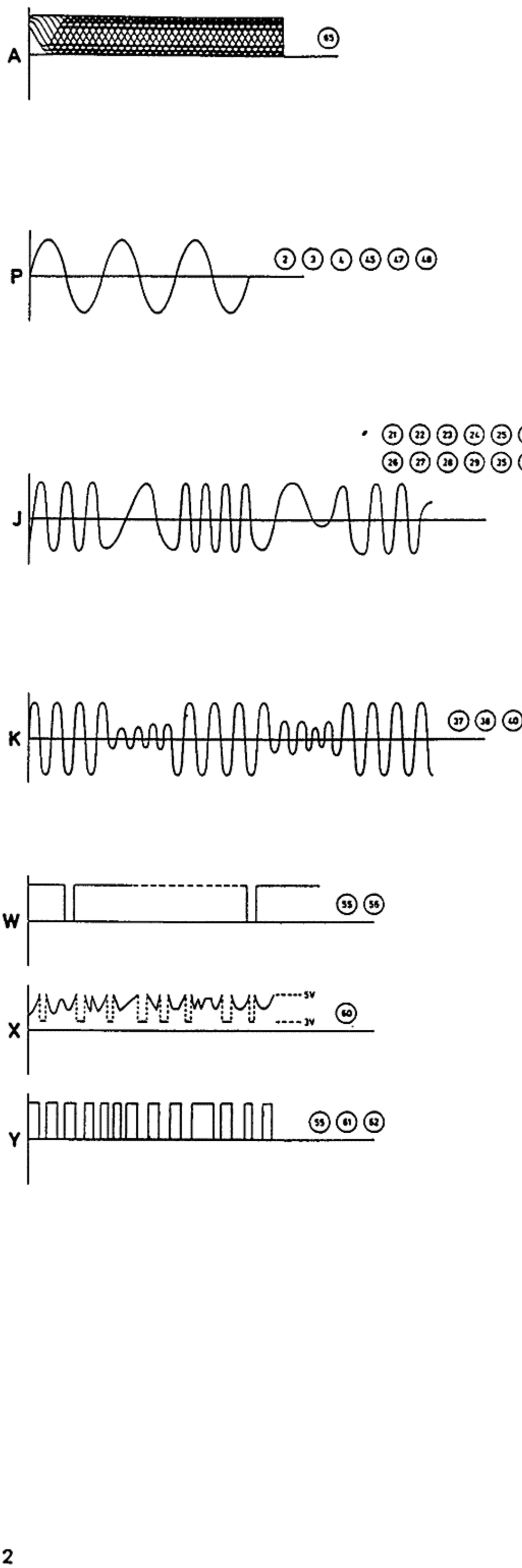
Annex IV: **CHECKING RF PRE-AMPLIFIER**
(measure points on pre-amp. PCB)

a. Check DC-voltages on transistor 6103, 6104, 6105, 6109, 6110, 6111.

b. For checking sensitivity, frequency and delay characteristic, proceed as follows:
— Take flex PCBs of sockets 10 and 11.
— Take plugs 18, 17, 12, 13, 14 and 15 out of sockets.

SERVO


B
C
D
f=25-60Hz
5 6 7 8
9 10 11 12
13 14
G
H
66
66
L
M
N
A (769µs)
B (769µs)
f=650Hz
39
40
41
Q
R
S
T
U
45°
f=650Hz
46
49
50
51
51


A
65
P
2 3 4 45 47 48
21 22 23 24 25 67
26 27 28 29 35 36
J
K
37 38 40
W
55 56
X
5V
3V
60
Y
55 61 62

SERVO

Nr.	See	Position	Amplitude	f	Time base
1		see fault finding meth.			
2	P	see fault finding meth.	0,6 Vp-p	10 Hz	
3	P	see fault finding meth.	6 Vp-p	10 Hz	
4	P	see fault finding meth.	5 Vp-p	10 Hz	
5	B	see fault finding meth.	40-80 mV	25-60 Hz	
6	B	see fault finding meth.	40-80 mV	25-60 Hz	
7	B	see fault finding meth.	40-80 mV	25-60 Hz	
8	B	see fault finding meth.	40-80 mV	25-60 Hz	
9	C	see fault finding meth.	—2 V	25-60 Hz	
10	C	see fault finding meth.	—2 V	25-60 Hz	
11	C	see fault finding meth.	—2 V	25-60 Hz	
12	C	see fault finding meth.	—2 V	25-60 Hz	
13	D	see fault finding meth.	—8 V, +8 V	25-60 Hz	
14	D	see fault finding meth.	depends on R3158	25-60 Hz	
15		see fault finding meth.			
20		see fault finding meth.			
21	J	see fault finding meth.	12-14 Vp-p		
22	J	see fault finding meth.	0,7 Vp-p		
23	J	see fault finding meth.	0,7 Vp-P		
24	J	see fault finding meth.	0,2 Vp-p		
25	J	see fault finding meth.	0,25 Vp-p		
26	J	see fault finding meth.	20 mVp-p		
27	J	see fault finding meth.	800 mVp-p		
28	J	see fault finding meth.	800 mVp-p		
29	J	see fault finding meth.	6 Vp-p		
29	P	ON	0,3 Vp-p		
30		see fault finding meth.			
31		see fault finding meth.			
32	•	see fault finding meth.			
33	•	see fault finding meth.			
35	J	see fault finding meth.	200 mVp-p		
36	J	see fault finding meth.	2 Vp-p		
37	K	see fault finding meth.	10 Vp-p		
38	K	see fault finding meth.	10 Vp-p		
39	L	see fault finding meth.	0-4 Vp-p		A = 769 µs B = 769 µs
40	K	see fault finding meth.	9 Vp-p		A = 769 µs B = 769 µs
40	M	see fault finding meth.	0-4 Vp-p		A = 769 µs B = 769 µs
41	N	see fault finding meth.	6 Vp-p		A = 769 µs B = 769 µs
45	P	ON	9 Vp-p	650 Hz	
46	Q	ON	0-5 V	650 Hz	A = 769 µs B = 769 µs
47	P	ON	1,5 Vp-p	650 Hz	
48	P	ON	1 Vp-p	650 Hz	
49	R	ON	0-5 V	650 Hz	
50	S	ON	0-5 V	650 Hz	
51	T	ON	5-0 V	650 Hz	
51	U	service loop B	5 V	650 Hz	
52		see fault finding meth.			
55	Y	service loop A	5-0 V		
55	W	play (with test disc)	5-0 V		
56	W	play (with test disc)	5-0 V		
57		see fault finding meth.			
60	X	service loop A	5-3 V		
61	Y	service loop A	5-0 V		
62	Y	service loop A	5-0 V		
65	A	play	1 Vp-p		
66	G	see fault finding meth.	5-0 V		
66	H	see fault finding meth.	0-5 V		
67	J	see fault finding meth.			

BLOCK DIAGRAM WARDS INFOMATION

DAC0 – DAC3	Control bit for radial circuit
DAC	Cirrent output for track jumping
$\overline{DO}$	Drop out detector signal
D1 – 4	Photodiode Currents
FE	Focus error signal
HF	HF output for DEMOD
$\overline{HFLD}$	HF detector output for DEMOD
MSC	Motor control signal
RE	Radial error signal (Amplified RE2 – RE1 currents)
RE1	Radial error signal 1 (Summation of amplified currents D3 and D4)
RE2	Radial error signal 2 (Summation of amplified currents D1 and D2)
$\overline{TL}$/INT	Track loss signal
Vc	Control voltage for turntable motor
$\overline{ATSB}$	Attenuation of Audio level in search position (cueing)
CEFM	Clock 4.3218 MHz
CLAB	Clock signal Decoder-A to Filter-B
CLBD	Clock signal Filter-B to DAC
CRI	Counter Reset Inhibit
DAAB	Data signal Decoder-A to Filter-B
DABD	Data signal Filter-B to DAC
$\overline{DEEM}$	Deemphasis ON-OFF signal
DOBM	Digital out signal
EFAB	Error flag Decoder-A to Filter-B
IREF	Reference current

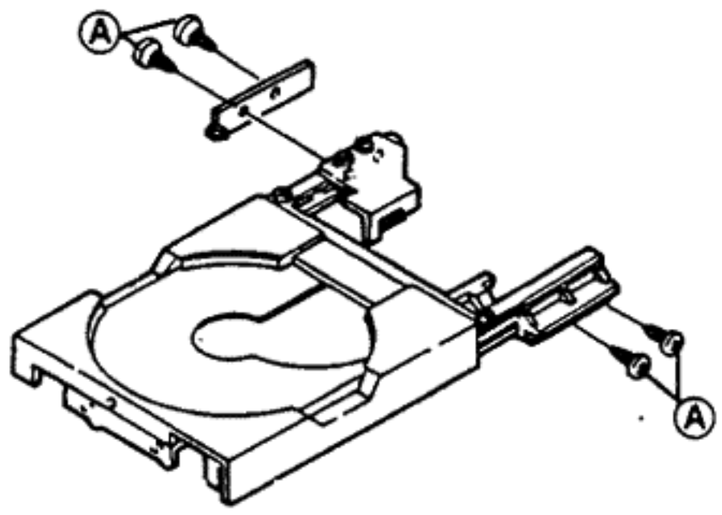
$\overline{SSM}$	Motor Start-Stop signal
$\overline{MUTE}$	Mute signal
$\overline{MUSB}$	Soft Mute signal
PD/OC	Phase detector-oscillator control
QCL	Q-channel Clock signal
QDA	Q-channel Data signal
QRA	Q-channel Request Aknowledge
SCAB	Subcode clock Decoder-A to Filtor-B
SDAB	Subcode data Decoder-A to Filter-B
SWAB/$\overline{SSM}$	Subcode Word/Start-Stop Motor signal
WSAB	Word select Decoder-A to Filter-B
WSBD	Word select Filter-B to DAC
XIN	Oscillator signal in Decoder-A
XSYS	Oscillator signal OUT Filter-B
RDIR	Radial current switch control signal Nomal, or Revers
RP	Radial puls after Track Jump
FN	Focus Neutral
ANIN	
$\overline{HFLS}$	HF Loss signal
$\overline{SRDO}$	Signal Radial ON/OFF for Track jump
RCO	Switch Digital to Analogue
FC1, FC2	Focus UP/DOWN signal
$\overline{FCO}$	Focus ON/OFF signal
L	Laser ON/OFF signal
BUSY	μ-COM Communication Clock
RXD	μ-COM Communication Recive Data
TXD	μ-COM Communication Telex Data

Loading Tray Mechanism

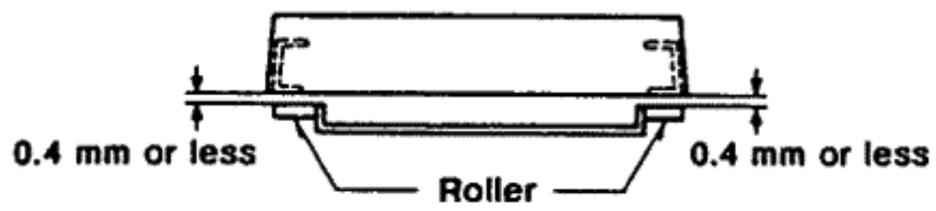
Cautions When Servicing

1. Installation of Tray and Tray Case
(Upon replacement of the tray case due to breakage, etc.)

(1) If the position with respect to the tray's front panel window is incorrect, lossen screws (A) and move the tray within the range of play of the hole to adjust. For the inclination of the tray, refer to diagram below.

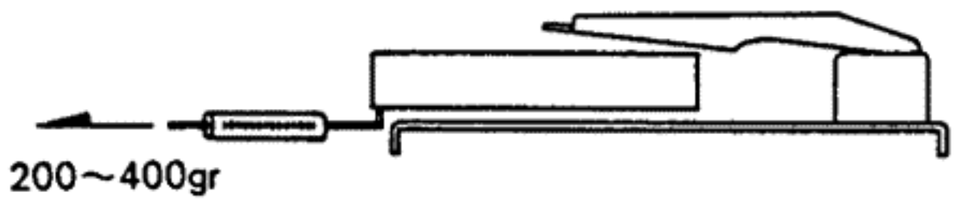


The tray should not be more than 0.4 mm above the rollers on the bottom side.

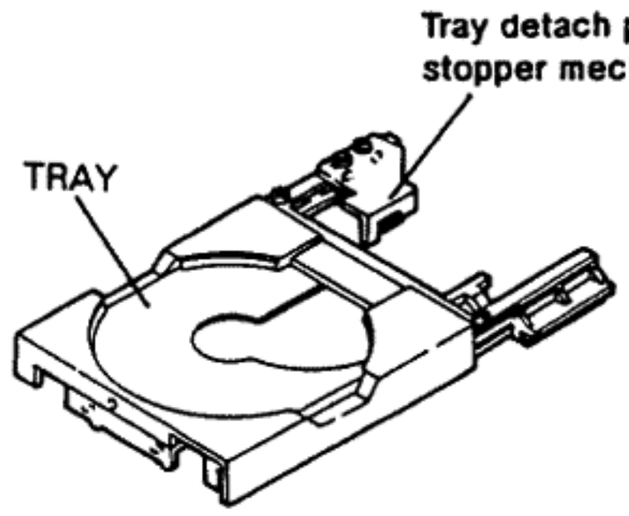


Adjust the inclination as well with screws (A).

(2) The tray's working force should be set to between 200 and 400 gr (when power is off).



2. If Tray has become detached downward

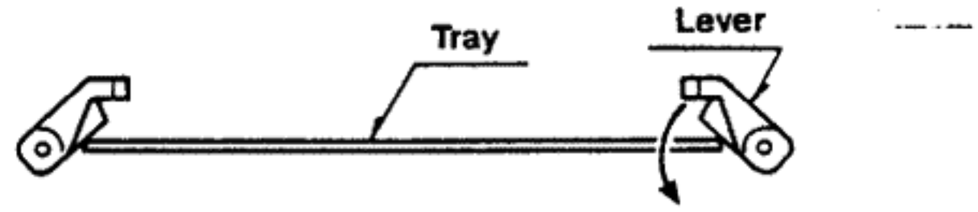


Take care in the following instances as the tray will become detached downward.

- The tray will become detaced if pressed downward with the stopper mechanism removed while the drawer is open.
- The tray will become detaced if pressed downward when there is no subchassis (CDM-1).
  (The same is true when the tray is closed with no subchassis.)

Use the following procedure to reinstall.

(1) Lower the lever and place the tray on the projection.



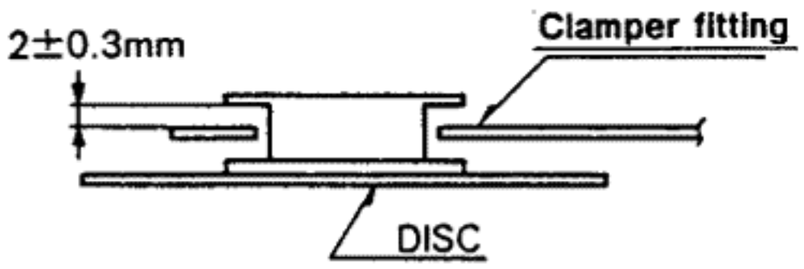
(2) Next, with the tray pressed down, lower the other lever and place the tray on its projectin.

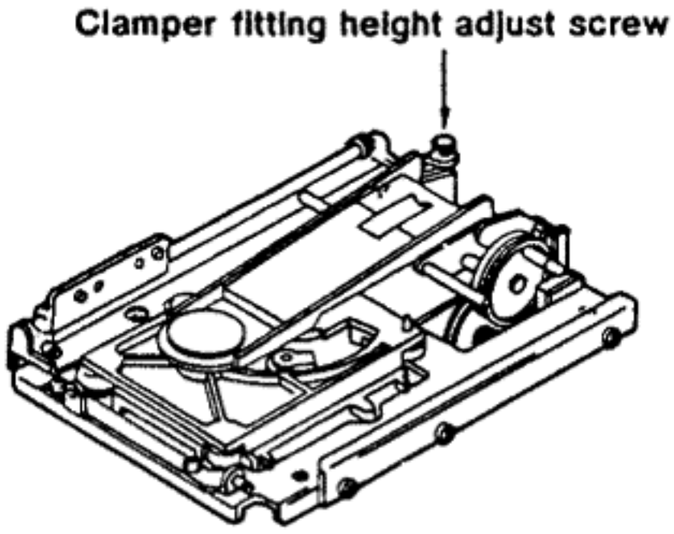
NOTE:
Be sure to lower only one lever at a time as the tray cannot be lifted if they are both lowered.

NOTE:
If the tray is forced back to its original position, the two pins in the tray case may bend.

3. If Subchassis (CDM-1) has been replaced

① The height of the subchassis turntable differs from one unit to the next, so it is necessary to adjust according to the height of the turntable so that the magnet clamper is not in contact with the clamper fitting. (Standard 2±0.3 mm)



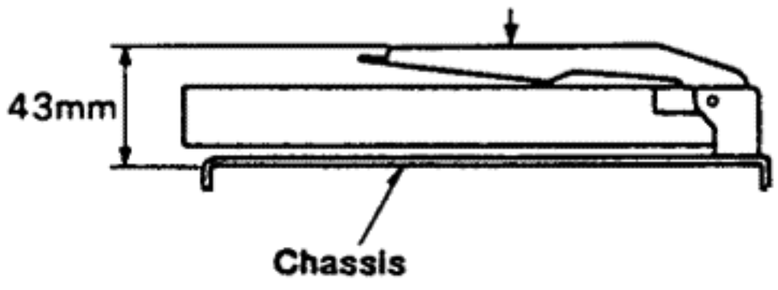


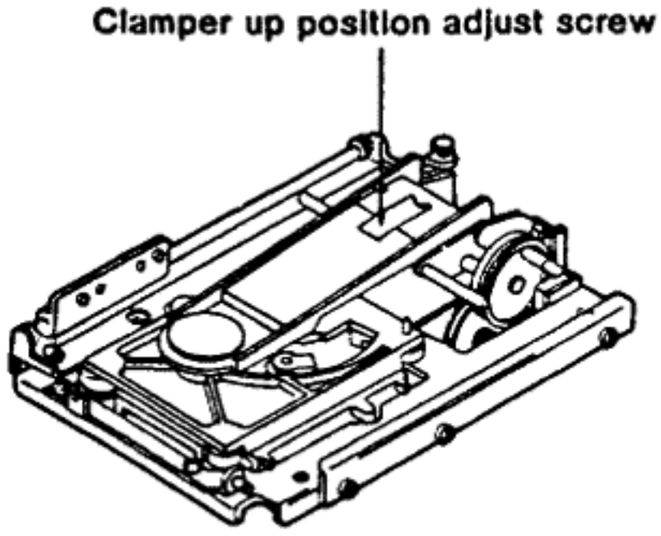
② When the height of the clamper fitting is adjusted, the position when the clamper is up must be readjusted. Use the following procedure.

Disc clamper position

When up Max. 43 mm
(Tray and clamper should not come into contact when try is opened and closed.)

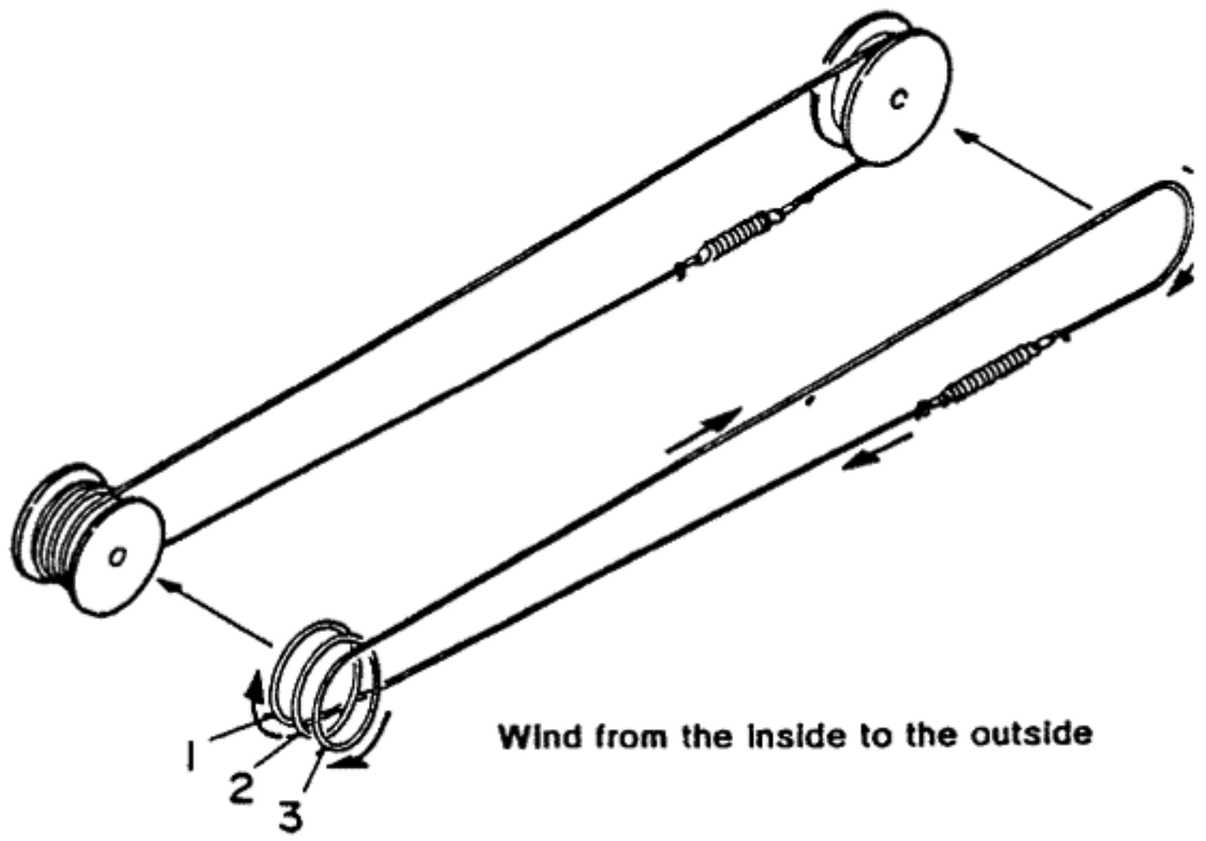
To the eye, this fitting appears parallel to the chassis.





4. Others

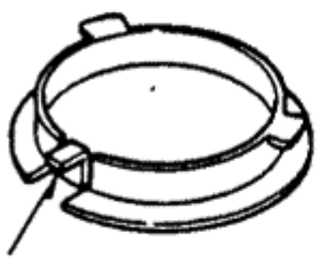
① Refer to the diagram below to install the loading wire.



Wind from the inside to the outside

② All switches on the mechanism are of the socket type. If a switch breaks, remove the socket to replace.

③ Use to the structure of the hooks of the magnet clamper (094M), incline as indicated below to remove and install the magnet clamper when replacing it.



The narrowest hook inclines

TECHNICAL SPECIFICATIONS

Audio Characteristics

Number of channels	2
Frequency response	2 – 20,000 Hz ±0.1 dB
Digital to analogue convarsion	16 bit 4 times oversamping
Dynamic range	Better than 96 dB
Signal-to-noise ratio	101 dB
Channel separation	Better than 100 dB (1000 Hz)
Total harmonic distortion	0.0015% (1000 Hz)
Wow & flutter	Unmeasurable (quartz accuracy)
Error correction system	Cross Interleave Reed Solomon code (CIRC)
Audio output level	2 Vrms

Optical Data Read System

Laser	AlGaAs semiconductor laser
Wave length	780 nm

Signal Format

Sampling frequency	44.1 kHz
Quantization	16-bit linear/channel

Power Supply Section

Power requirements	220/240V AC, 50/60 Hz
Power consumption	Approx. 30 W
Fuse capacitance	0.2A

Cabinet and Others

Dimensions (W x H x D)	462 x 86 x 333 mm
Weight	Approx. 10 kg
Allowable operating temperature	+5°C – +35°C
Allowable operating humidity	5 – 90% (No condensation)

Provided Accessories

Remote control unit (RMC-94)	1
Dimensions (W x D x H)	63 x 18 x 149 mm
Weight (without batteries)	100 g
Battery (AA/R06)	2
Audio connection (RCA pin-jack) cord	1 pair

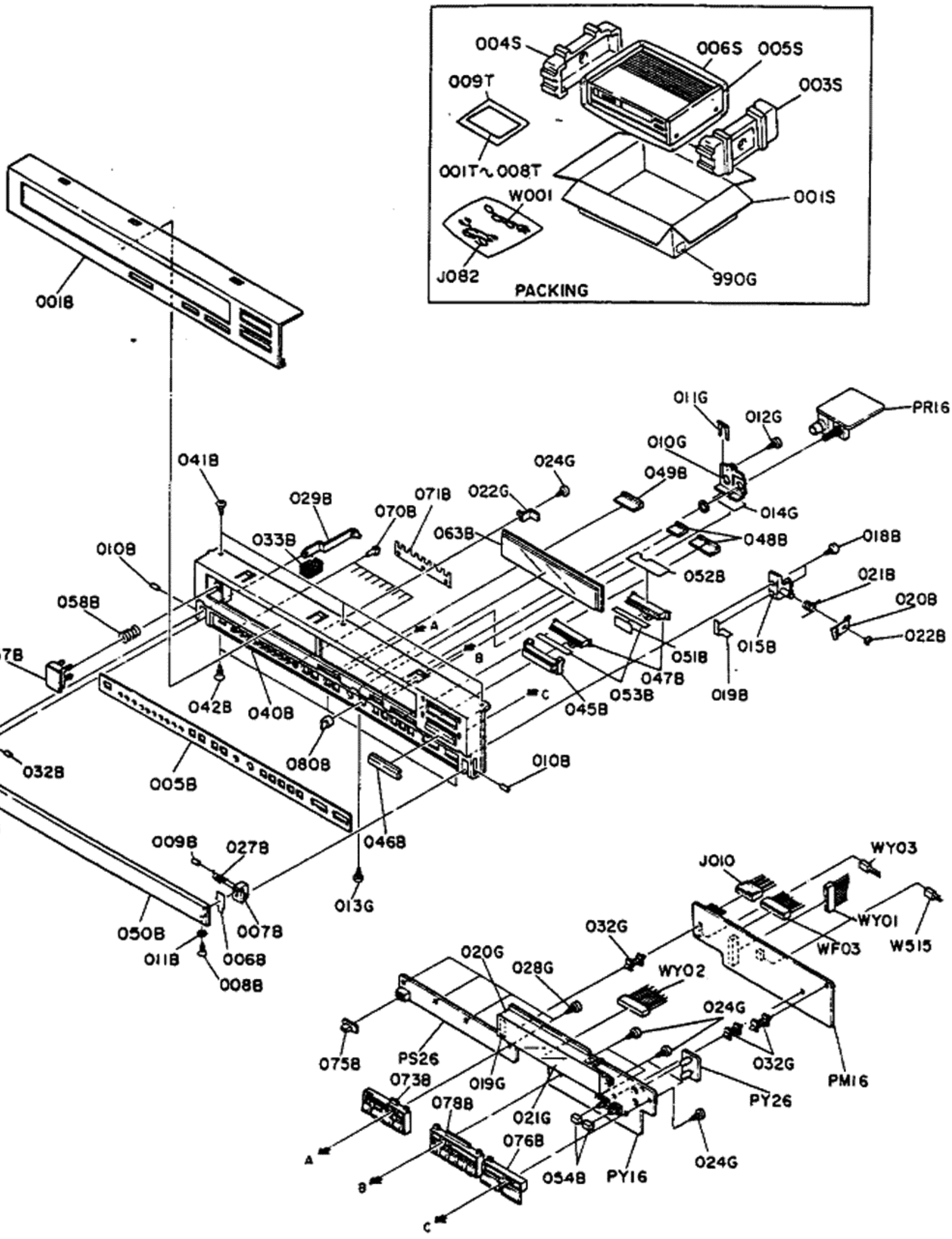
Compact Discs

Diameter of disc	120 mm
Thickness	1.2 mm
Rotating direction	Counterclockwise (viewed from the laser pickup side)
Scanning velocity	1.2 – 1.4 m/sec
Revolution (spindle) speed	500 – 200 rpm
Playing time (theoretical)	74 minutes max. (stereo)
Track pitch	1.6 μm
Material	Plastic (polycarbonate)

* Improvement may result in changes in specifications and design without notice.

EXPLODED VIEW AND PARTS LIST

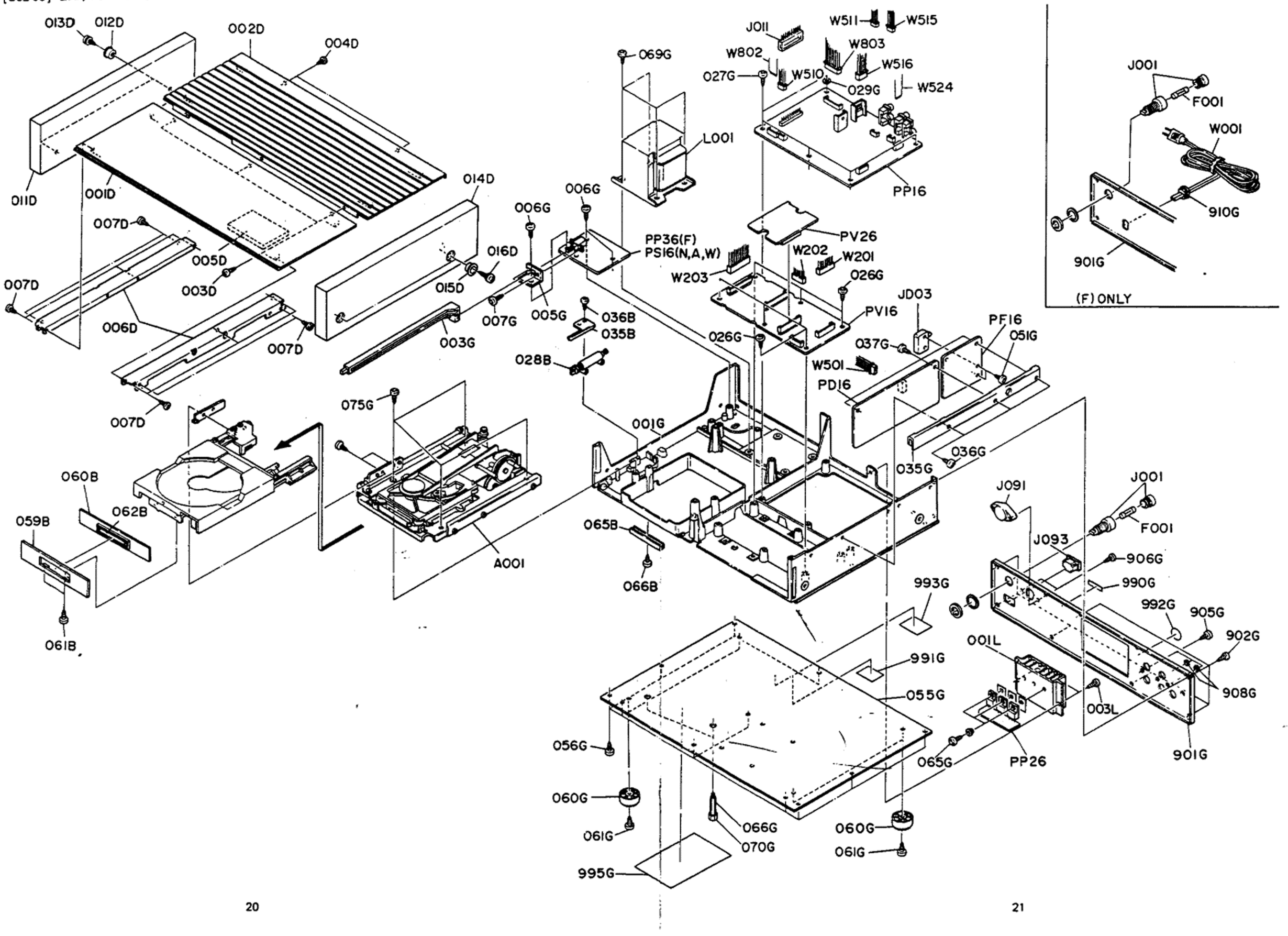
[C01-99] FRONT PANEL AND PACKING MATERIALS



REF. DESIG.	PART NO.	DESCRIPTION	
001B	157K248010	Front Panel	
002B	274H251020	Badge	
005B	157K063020	Escutcheon, Front Panel	
006B	157K265030	Indicator	
007B	157K153010	Hinge (R)	
008B	5150260BU0	F.H. Taptite Screw	F2.6 x 8
009B	157K112010	Shaft, Lock	
010B	157K112030	Shaft, Hinge	
011B	54050200R0	T.L. Washer	
015B	157K160500	Bracket (K), Lock	
018B	51280308M0	B.H. Tapped Screw	B3 x 8
019B	157K123010	Contactor	
020B	157K258010	Hook, Lock	
021B	157K115010	Spring	
022B	64002500R0	RG Ring, E Type	ϕ2.5
025B	157K153020	Hinge (L)	
026B	5150260880	F.H. Taptite Screw	F2.6 x 8
027B	157K115020	Spring, Open	
029B	157K125500	Joint (K), Dumper	
032B	157K112050	Shaft	
033B	203C056010	Buffer	
040B	157K105010	Chassis, Front	
041B	51500308M0	F.H. Taptite Screw	F3 x 8
042B	51500308M0	F.H. Taptite Screw	F3 x 8
045B	157K270060	Button, Play/Replay	
046B	157K270090	Button, Pause/Stop	
047B	157K355010	Lens	
048B	157K270040	Button, FTS/Track	
049B	157K270070	Button, Open/Close	
050B	157K063010	Escutcheon, Door	
051B	157K056010	Buffer	
052B	157K109010	Shield	
053B	157K107010	Sheet	
054B	416C056050	Buffer	
057B	157K270050	Button, Power	
058B	157K115030	Spring, Power Button	
063B	157K158010	Window	
070B	157K270080	Button	
071B	157K116010	Leaf Spring	
073B	157K270030	Button, Select/Cancel	
075B	157K154010	Knob, Timer	
076B	157K270010	Button, REV-FF/Index	
078B	157K270020	Button, LAP/AMS	
080B	135K154110	Knob, Level	
010G	157K160010	Bracket, Phone Jack	
011G	198T114010	Stopper	
012G	51280308M0	B.H. Tapped Screw	B3 x 8
013G	51500308M0	F.H. Taptite Screw	F3 x 8
014G	157K123020	Contactor	
019G	2818056040	Buffer	
020G	157K271010	Holder, FL	
021G	157K303010	Mask, FL	
022G	157K104030	Retainer, Display P.W. Board	
024G	51280308M0	B.H. Tapped Screw	B3 x 8
025G	213H118010	Spacer	
028G	5128030880	B.H. Tapped Screw	B3 x 8
032G	157K118010	Spacer	

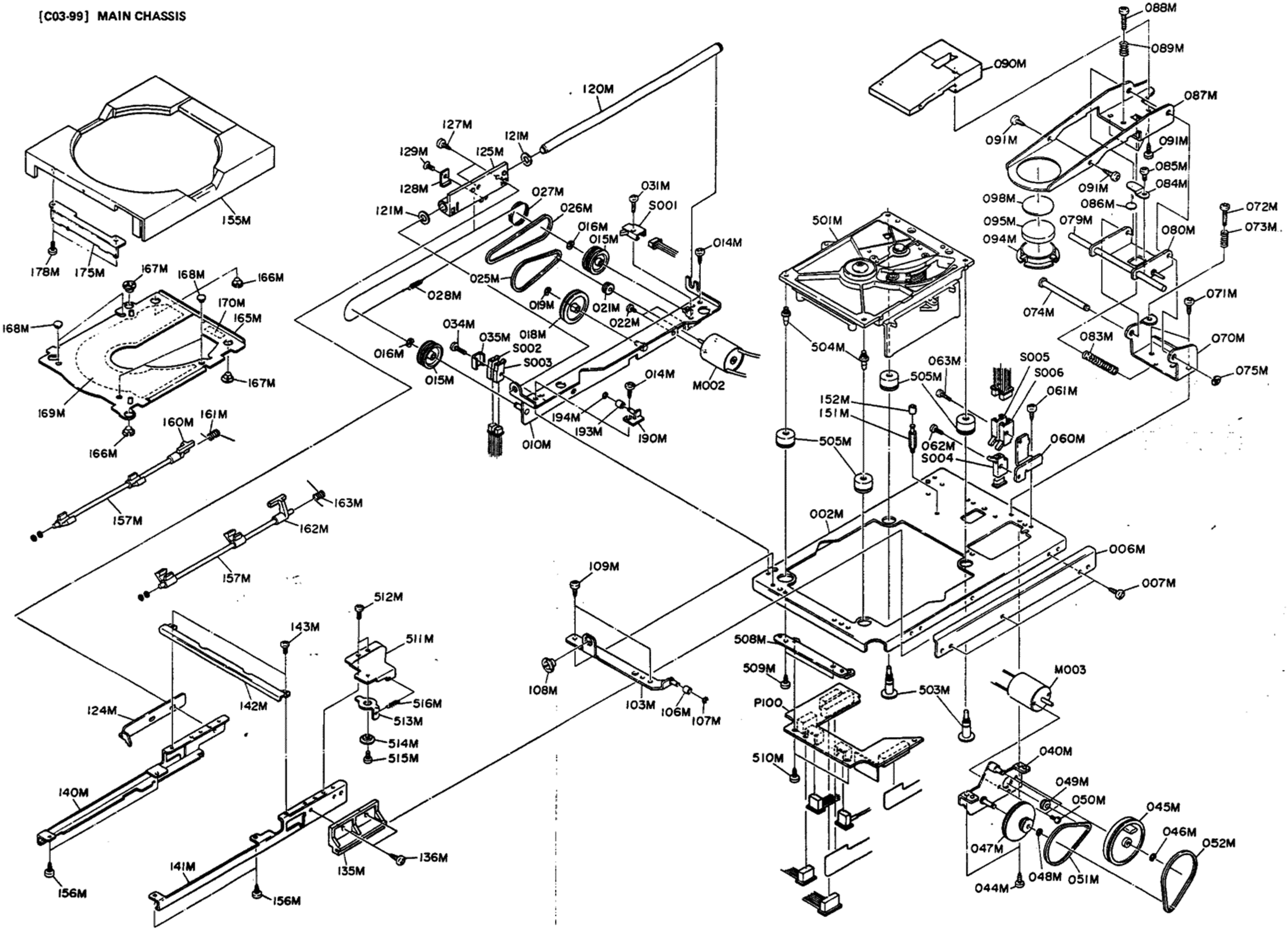
REF. DESIG.	PART NO.	DESCRIPTION
J010	YJ06001050	Jack, 5P
W515	YB00390120	Connective Cord, 3P
WF03	YB00700250	Connective Cord, 14P
WY01	YB00180330	Connective Cord, 13P
WY02	YB00230290	Connective Cord, 13P
WY03	YB00130360	Connective Cord, 5P
		PACKING
001T	157K851310	User Manual (N, A, W)
	157K851110	User Manual (F)
002T	157K851320	User Manual, Spec (N, A, W)
003T	157K856010	Circuit Diagram (N, W)
004T	158K861020	Label, FTS (F)
005T	9631000090	Warranty Card (A)
	157K813500	Envelope (F)
006T	157K854010	Warranty Card (F)
007T	9611000050	User's Card (F)
008T	9540000010	License
009T	9012540010	Polyethylene Bag
001S	157K801010	Packing Case
003S	157K809010	Cushion (R)
004S	157K809020	Cushion (L)
005S	175H107010	Sheet
006S	9091111030	Polyethylene Sheet
J082	ZD01000230	Connective Cord, Audio
△W001	ZC01805010	A.C. Power Cord (N, W)
	ZC02006020	A.C. Power Cord (A)
990G	9510901180	Label (A, F)
	9510911100	Label (N)

[C02-99] LID, TOP COVER



REF. DESIG.	PART NO.	DESCRIPTION
028B	120T276010	Piston, Dumper
035B	157K160030	Bracket, Dumper
036B	51280308M0	B.H. Tapped Screw B3 x 8
059B	157K063030	Escutcheon, Drawer
060B	157K104010	Retainer, Drawer
061B	51280308M0	B.H. Tapped Screw B3 x 8
062B	157K251010	Badge
065B	158K053010	Cover
066B	51280308M0	B.H. Tapped Screw B3 x 8
001D	157K257010	Lid, Top Cover (Front)
002D	157K257020	Lid, Top Cover (Rear)
003D	51280308M0	B.H. Tapped Screw B3 x 8
004D	51280308M0	B.H. Tapped Screw B3 x 8
005D	158K056010	Buffer
006D	157K104020	Retainer, Top Cover
007D	51280308M0	B.H. Tapped Screw B3 x 8
011D	157K249010	Side Panel (L)
012D	3906259010	Bushing
013D	51280430U0	B.H. Tapped Screw B4 x 30
014D	157K249020	Side Panel (R)
015D	3906259010	Bushing
016D	51280430U0	B.H. Tapped Screw B4 x 30
001G	158K105010	Chassis, Main
003G	158K121010	Link, Power Switch
005G	158K160050	Bracket, Power Switch
006G	51280308M0	B.H. Tapped Screw B3 x 8
007G	51100306M0	B.H.M. Screw B3 x 6
026G	51280308M0	B.H. Tapped Screw B3 x 8
027G	51280308M0	B.H. Tapped Screw B3 x 8
029G	4214118010	Spacer
035G	158K104040	Retainer, Front
036G	51280308M0	B.H. Tapped Screw B3 x 8
037G	51280308M0	B.H. Tapped Screw B3 x 8
051G	51500308M0	F.H. Taptite Screw F3 x 8
055G	158K257020	Lid, Bottom Cover
056G	51280308M0	B.H. Tapped Screw B3 x 8
060G	176H057020	Leg
061G	51280308M0	B.H. Tapped Screw B3 x 8
065G	51280308M0	B.H. Tapped Screw B3 x 8
066G	157K112060	Shaft, Transport
069G	51260408M0	B.T. Screw B4 x 8
070G	158K067010	Cap, Transport Shaft
075G	51280308M0	B.H. Tapped Screw B3 x 8
901G	157K250010	Rear Panel (N, A, W)
	157K250020	Rear Panel (F)
902G	51280308M0	B.H. Tapped Screw B3 x 8
905G	51280308M0	B.H. Tapped Screw B3 x 8
906G	51280308M0	B.H. Tapped Screw B3 x 8 (N,A,W)
908G	54050300R0	T.L. Washer
910G	1455259120	Bushing, AC Power Cord (F)
990G	9510901180	Label (A, F)
	9510911100	Label (N)
991G	2911861110	Label, Caution (N, A, W)
992G	187H265010	Indicator, Made in Japan (N, A, W)
993G	105K861070	Label, Laser (N, A, W)
	101K861030	Label, Laser (F)
995G	158K861010	Label, Transport

REF. DESIG.	PART NO.	DESCRIPTION
001L	158K267010	Heatsink
003L	51280308W0	B.H. Tapped Screw B3 x 8
A001	167K304510	Mechanism (K)
⚠F001	FS10020800	Fuse T200mA (N, A, W)
	FS10050610	Fuse 0.5A (F)
⚠J001	YJ08000290	Jack, Fuse Holder (N, A, W)
	YJ08000300	Jack, Fuse Holder (F)
J011	YJ06001070	Jack, 9P
⚠J091	BY05030040	Voltage Selector (N, A, W)
⚠J093	YP04000580	Plug, AC Inlet (N, A, W)
JD03	YJ15000010	Jack
⚠L001	TS16810010	Power Transformer (N, A. W)
	TS16810020	Power Transformer (F)
⚠W001	YC01800390	A.C. Power Cord (F)
W201	YB000820250	Connective Cord, 15P
W202		Connective Cord,
W203	YB00450190	Connective Cord, 14P
W501	YB00430040	Connective Cord, 2P
W510	YB00230300	Connective Cord, 4P
W511	YB00500420	Connective Cord, 3P
W515	YB00390120	Connective Cord, 3P
W516	YB00060240	Connective Cord, 8P
W803	YB00060240	Connective Cord, 9P


155M
178M
175M
167M
168M
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167M
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160M
161M
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162M
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031M
S001
016M
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S002
S003
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M002
194M
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190M
010M
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S005
S006
061M
152M
151M
505M
062M
S004
060M
002M
006M
007M
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512M
143M
511M
108M
103M
106M
107M
516M
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514M
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124M
142M
140M
156M
141M
156M
136M
135M
508M
509M
P100
510M
503M
M003
040M
049M
050M
045M
046M
052M
047M
044M
048M
051M

REF. DESIG.	PART NO.	DESCRIPTION	
002M	167K105030	Chassis, Main	
006M	167K051010	Tray Guide, Right	
007M	51280308M0	B.H. Tapped Screw	B3 x 8
010M	167K160500	Tray Guide (K), Left	
014M	5128030880	B.H. Tapped Screw	B3 x 8
015M	167K262010	Pulley, Wire Wheel	
016M	64002500R0	RG Ring, E Type	ϕ2.5
018M	167K262030	Pulley, Tray Drive	
019M	64002500R0	RG Ring, E Type	ϕ2.5
021M	167K262040	Pulley, Motor	
022M	51102604A0	B.H.M. Screw	B2.6 x 4
025M	167K264010	Belt, Motor	
026M	167K264030	Belt, Tray Drive	
027M	167K125010	Joint, Wire Rope	
028M	167K115020	Spring	
031M	51100208A0	B.H.M. Screw	B2 x 8
034M	51100214A0	B.H.M. Screw	B2 x 14
035M	167K160190	Bracket, Switch	
040M	167K160510	Bracket (K), Motor	
044M	51280308M0	B.H. Tapped Screw	B3 x 8
045M	167K054010	Cam, Clamper Drive	
046M	64002500R0	RG Ring, E Type	ϕ2.5
047M	167K262020	Pulley, Clamper Drive	
048M	64002500R0	RG Ring, E Type	ϕ2.5
049M	167K262040	Pulley, Motor	
050M	51102604A0	B.H.M. Screw	B2.6 x 4
051M	167K264010	Belt, Motor	
052M	167K264020	Belt, Cam Drive	
060M	167K160130	Bracket, Switch	
061M	51280308M0	B.H. Tapped Screw	B3 x 8
062M	51100208A0	B.H.M. Screw	B2 x 8
063M	51100214A0	B.H.M. Screw	B2 x 14
070M	167K160110	Bracket, Clamper	
071M	51280308M0	B.H. Tapped Screw	B3 x 8
072M	51100315A0	B.H.M. Screw	B3 x 15
073M	167K115030	Spring, Down Adj.	
074M	167K112060	Shaft, Clamper Bracket	
075M	64002500R0	RG Ring, E Type	ϕ2.5
079M	167K112040	Shaft, Tray Lever	
080M	167K354520	Lever (K), Clamper Drive	
083M	167K115010	Spring, Pull Down	
084M	167K116010	Leaf Spring	
085M	51282604U0	B.H. Tapped Screw	B2.6 x 4
086M	167K056030	Buffer	
087M	167K354010	Lever, Clamper	
088M	51100310A0	B.H.M. Screw	B3 x 10
089M	167K115030	Spring, Up Adj.	
090M	167K271030	Holder	
091M	51280308M0	B.H. Tapped Screw	B3 x 8
094M	167K005010	Clamper, Magnet Case	
095M	167K305500	Magnet (K)	
098M	167K056010	Buffer, Clamper	
103M	167K160530	Bracket (K), Tray Guide	
106M	167K358010	Roller, Tray Guide	
107M	64001200R0	RG Ring, E Type	ϕ1.2
108M	167K259020	Bushing, Front Guide	
109M	51280308M0	B.H. Tapped Screw	B3 x 8
120M	167K112010	Shaft, Tray Guide	
121M	167K056020	Buffer	
124M	167K160260	Bracket, Slide Bearing	

REF. DESIG.	PART NO.	DESCRIPTION	
125M	167K271500	Holder (K), Slide Bearing	
127M	51280308M0	B.H. Tapped Screw	B3 x 8
128M	167K118010	Spacer, Wire clamper	
129M	51500306U0	F.H. Taptite Screw	F3 x 6
135M	167K271010	Holder (R), Slide Guide	
136M	51280308M0	B.H. Tapped Screw	B3 x 8
140M	167K160140	Bracket (L), Tray	
141M	167K160150	Bracket (R), Tray	
142M	167K126010	Stay	
143M	51282604U0	B.H. Tapped Screw	B2.6 x 4
151M	167K101010	Support	
152M	167K259050	Bushing	
155M	167K064010	Case, Tray	
156M	51280308M0	B.H. Tapped Screw	B3 x 8
157M	167K112050	Shaft, Tray Guide	
160M	167K354500	Lever (L), Tray Lift	
161M	167K115040	Spring (L)	
162M	167K354510	Lever (R), Tray Lift	
163M	167K115050	Spring (R)	
165M	167K163010	Tray, Disc	
166M	167K259010	Bushing, Tray Guide	
167M	167K259020	Bushing, Tray Guide	
168M	167K259040	Bushing, Disc Buffer	
169M	167K056050	Buffer, Silencer	
170M	167K056060	Buffer, Silencer	
175M	167K160520	Bracket (K), Front Guide	
178M	51280308M0	B.H. Tapped Screw	B3 x 8
190M	167K160540	Bracket (K), Tray Front Guide	
193M	167K358010	Roller	
194M	64001200R0	RG Ring, E Type	ϕ1.2
501M	158K304500	Mechanism (CDM-1)	
503M	167K112020	Shaft	
504M	167K112110	Shaft	
505M	167K259030	Bushing	
508M	167K160220	Bracket, P.W. Board	
509M	51280308M0	B.H. Tapped Screw	B3 x 8
510M	51060303A0	P.H.M. Screw	P3 x 3
511M	167K160250	Bracket, Stopper	
512M	51282604U0	B.H. Tapped Screw	B2.6 x 4
513M	167K354250	Lever, Stopper	
514M	302T118050	Spacer	
515M	5157030480	P. Taptite Screw	P3 x 4
516M	4397115210	Spring	
M002	MM01200130	D.C. Motor, Tray Drive	
M003	MM01200130	D.C. Motor, Clamper Drive	
S001	SS01020590	Slide Switch, Tray In	
S002	SS01020590	Slide Switch, Tray Out	
S003	SS01020590	Slide Switch, Push In	
S004	SS01020590	Slide Switch, Clamper Down	
S005	SS01020590	Slide Switch, Clamper Up	
S006	SS01020590	Slide Switch, Laser Safety	

ASSIGNMENT OF COMMON PARTS CODES.

RESISTOR

R***: (1) GD05 --- 140, Carbon film fixed resistor, ±5%, 1/4W
R***: (2) GD05 --- 160, Carbon film fixed resistor, ±5%, 1/6W

① — Resistance value

Examples

① Resistance value

0.1Ω...001	10Ω...100	1kΩ...102	100kΩ...104
0.5Ω...005	18Ω...180	2.7kΩ...272	680kΩ...684
1Ω...010	100Ω...101	10kΩ...103	1MkΩ...105
6.8Ω...068	390Ω...391	22kΩ...223	4.7MkΩ...475

(Note) Please distinguish 1/4W from 1/6W by the shape of parts used actually.

C***: CERAMIC CAP.
(1) DD1 ---- 370, Ceramic condenser
Disc type
①② Temp. coeff. P350 ~ N1000, 50V
② — Capacity value
① — Tolerance

Examples

① Tolerance (Capacity deviation)
±0.25pF...0
±0.5pF...1
±5%...5

* Tolerance of COMMON PARTS handled here are as follows:
0.5pF ~ 5pF...±0.25pF
6pF ~ 10pF...±0.5pF
12pF ~ 560pF...±5%

② Capacity value

0.5pF...005	3pF...030	100pF...101
1pF...010	10pF...100	220pF...221
1.5pF...015	47pF...470	560pF...561

C***: CERAMIC CAP.
(1) DK16 --- 300, High dielectric constant ceramic condenser
Disc type
① Temp. chara. 2B4, 50V
① — Capacity value

Example

② Capacity value

100pF...101	1000pF...102	10000pF...103
470pF...471	2200pF...222	

C***: ELECTROLY CAP. (⫢), FILM CAP. (⫨)
(1) EA ------ 10, Electrolytic condenser
One-way lead type. Tolerance ±20%
①② Dielectric strength
① — Capacity value

Examples

① Capacity value

0.1μF...104	4.7μF...475	100μF...107
0.33μF...334	10μF...106	330μF...337
1μF...105	22μF...226	1100μF...108
		2200μF...228

② Working voltage

6.3V...006	25V...025
10V...010	35V...035
16V...016	50V...050

(2) DF15 --- 350, Plastic film condenser
One-way type. Mylar ±5% 50V
① — Capacity value

Examples

① Capacity value

0.001μF (1000pF)...102	0.1μF...104
0.0018μF.....182	0.56μF...564
0.01μF.....103	1μF...105
0.015μF.....153	

ELECTRICAL PARTS LIST

REF. DESIG.	PART NO.	DESCRIPTION		
		PD16-DEMO CIRCUIT BOARD		
PD16	YK158K1820	P.W. Board, Demo		
	ZZ157K8820	P.W. Board Assembly		
		PD16-CAPACITOR		
C502	OA10505010	Elect	1μF	50V
C504	EA68505010	Elect	6.8μF	50V
C511	DD15270300	Ceramic	27pF ±5%	
C512	DD15270300	Ceramic	27pF ±5%	
C520	DF15471350	Film	470pF ±5%	
C521	DF15471350	Film	470pF ±5%	
		PD16-SEMICONDUCTORS		
D544 ~ D549	HD20002000	Diode	1SS133, etc.	
D551	HD20002000	Diode	1SS133, etc.	
Q501	HC10009490	IC	SAA7210	
Q502	HC10158060	IC	μPD41416C-20	
Q503	HC10010490	IC	SAA7220	
Q504	HC10010320	IC	IR2339	
Q510	HT111752D0	Transistor	2SA1175(FF, EF)	
Q511	HT111752A0	Transistor	2SA1175(FF, EF)	
Q513	HT107332A0	Transistor	2SA733(P, Q)	
Q514	HT327852D0	Transistor	2SC2785(FF, EF)	
Q530	HT327852A0	Transistor	2SC2785	
Q531	HT327852A0	Transistor	2SC2785	
Q537	HT309452A0	Transistor	2SC945(Q, R)	
		PD16-MISCELLANEOUS		
J501	YP06003410	Plug, 2P		
W201	YB00080250	Connective Cord, 15P		
W516	YB00060240	Connective Cord, 8P		
X501	XB006001Q0	Crystal	11.2896MHz	
		PF16-OPTICAL OUT CIRCUIT BOARD		
PF16	YK158K1830	P.W. Board, Optical Out		
	ZZ157K8830	P.W. Board Assembly		
QD01	HC40490080	IC	TC4049BP	
QD02	HC40490080	IC	TC4049BP	
JD03	YJ15000010	Jack, Receptacle with OPT Diode		
WD01	YU04100260	Jumper Lead, 4P		

REF. DESIG.	PART NO.	DESCRIPTION
		PM16-FEATURE U-COM CIRCUIT BOARD
PM16	W8157K1410	P.W. Board, Feature U-Com
	ZZ157K8410	P.W. Board Assembly
		PM16-CAPACITOR
CF11	DK56331300	Ceramic 330pF ±10%, Chip
CF12	DD55331300	Ceramic 330pF ±5%, Chip
CF13	DK56331300	Ceramic 330pF ±10%, Chip
CF21 ~ CF29	DK56331300	Ceramic 330pF ±10%, Chip
CF38 ~ CF43	DK56331300	Ceramic 330pF ±10%, Chip
CF50	OA22703510	Elect 220μF 35V
CF61 ~ CF67	DK56331300	Ceramic 330pF ±10%, Chip
CF85	DK56331300	Ceramic 330pF ±10%, Chip
CF87 ~ CF91	DK56331300	Ceramic 330pF ±10%, Chip
CM01	OA47601610	Elect 47μF 16V
		PM16-RESISTORS (All Resistors are ±5% and 1/10W)
RF01	NI05022110	2.2Ω, Chip
RF14	NI05103110	10KΩ, Chip
RF15	NI05103110	10KΩ, Chip
RF16	NI05103110	10KΩ, Chip
RF19	NI05103110	10KΩ, Chip
RF20	NI05103110	10KΩ, Chip
RF21	NI05104110	100KΩ, Chip
RF22	NI05104110	100KΩ, Chip
RF23	NI05022110	2.2Ω, Chip
RF24	NI05022110	2.2Ω, Chip
RF26	NI05102110	1KΩ, Chip
RF27	NI05100110	10Ω, Chip
RF28	NI05222110	2.2KΩ, Chip
RF29	NI05100110	10Ω, Chip
RF30	NI05102110	1KΩ, Chip
RF31	NI05102110	1KΩ, Chip
RF50	NH05010140	1Ω ¼W
RF51	NI05102110	1KΩ, Chip
		PM16-SEMICONDUCTORS
DF01	HZ20003020	Diode MA151K, Chip
DF02	HZ30002050	Zener 02CZ5.1V(Y), Chip
DF03	HZ20001020	Diode MA151WK, Chip
DF05	HZ20001020	Diode MA151WK, Chip
DF50	HD20003000	Diode RL103F
DF51	HD30561000	Zener 5.6V
DM01	HZ30005050	Zener 02CZ6.8, Chip
DM02	HZ30004050	Zener 02CZ8.2, Chip

REF. DESIG.	PART NO.	DESCRIPTION
QF01	HC10016260	IC MSM80C59
QF02	HC10015260	IC MSM80C51
QF03	HC10011000	IC MSM2816A
QF06	BA20002020	Semicon Composit UN2214, Chip
QF07	BA20002020	Semicon Composit UN2214, Chip
QF08	BA20002020	Semicon Composit UN2214, Chip
QF10	BA20002020	Semicon Composit UN2214, Chip
QM01	HC10148030	IC LB1645N
QM02	HC10148030	IC LB1645N
		PM16-MISCELLANEOUS
JF01	YJ06006330	Jack, 13P
JF02	YJ06006250	Jack, 5P
JF03	YP06004420	Plug, 14P
JF10	YP06001050	Plug, 5P
LM01	LC14730040	Choke Coil 47μH
WF03	YB00700250	Connective Cord, 14P
W202	YB00080240	Connective Cord, 7P
W515	YB00390120	Connective Cord, 3P
XF01	FQ01205030	Seramic Vibrator, 12.0MHz
XF02	FQ01205030	Seramic Vibrator, 12.0MHz
		PP16-DAC CIRCUIT BOARD
PP16	YK158K1310	P.W. Board, DAC
	ZZ157K8310	P.W. Board Assembly
		PP16-CAPACITORS
C551	OA47601650	Elect 47μF 16V
C552	OF15473010	Film 0.047μF ±5%
C556 ~ C569	OF15224010	Film 0.22μF ±5%
C570	DF15681350	Film 680pF
C571	OF15473010	Film 0.047μF ±5%
C572	OF15473010	Film 0.047μF ±5%
C573	OA47602550	Elect 47μF 25V
C574	OA47602550	Elect 47μF 25V
C575	OA10601650	Elect 10μF 16V
C576	OA10601650	Elect 10μF 16V
C580	OF54222520	Film 2200pF ±2%
C581	OF54222520	Film 2200pF ±2%
C582	DF74153520	Film 0.015μF ±2%
C583	DF74153520	Film 0.015μF ±2%
C584	OF54512510	Film 5100pF ±2%
C585	OF54512510	Film 5100pF ±2%
C586	OF54222510	Film 2200pF ±2%
C587	OF54222510	Film 2200pF ±2%
C588	OF54102520	Film 1000pF ±2%
C589	OF54102520	Film 1000pF ±2%
C590	OA10702510	Elect 100μF 25V
C591	OA10702510	Elect 100μF 25V
C592	OA10601610	Elect 10μF 16V
C593	OA10601610	Elect 10μF 16V
C596	OA10702550	Elect 100μF 25V
C597	OA10702550	Elect 100μF 25V
C598	OA10702550	Elect 100μF 25V
C599	OA10702550	Elect 100μF 25V

REF. DESIG.	PART NO.	DESCRIPTION		
⚠ C805	OB68802510	Elect	6800μF	25V
⚠ C806	OB68802510	Elect	6800μF	25V
C807	OA47602550	Elect	47μF	25V
C808	OA47602550	Elect	47μF	25V
C811	OA47702550	Elect	470μF	25V
C812	OA47702550	Elect	470μF	25V
⚠ C836	OA33802520	Elect	3300μF	25V
⚠ C837	OA33802520	Elect	3300μF	25V
⚠ C845	OA68801620	Elect	6800μF	16V
		PP16-RESISTORS		
R560	GM21417810	1.78KΩ	±2%	¼W
R561	GM21417810	1.78KΩ	±2%	¼W
R562	GM21410010	1KΩ	±2%	¼W
R563	GM21410010	1KΩ	±2%	¼W
R568	GM21423710	2.37KΩ	±2%	¼W
R569	GM21423710	2.37KΩ	±2%	¼W
R570	GM21423710	2.37KΩ	±2%	¼W
R571	GM21423710	2.37KΩ	±2%	¼W
⚠ R580 ~ ⚠ R583	NH05033140	3.3Ω	±5%	¼W, Fusible [N,A,W]
⚠ R801	NH05010120	1Ω	±5%	½W, Fusible
⚠ R802	NH05010120	1Ω	±5%	½W, Fusible
⚠ R803	NH05010140	1Ω	±5%	¼W, Fusible
⚠ R804	NH05010140	1Ω	±5%	¼W, Fusible
R807	GM21456200	562Ω	±2%	¼W
R808	GM21456200	562Ω	±2%	¼W
R809	GM21438310	3.83KΩ	±2%	¼W
R810	GM21438310	3.83KΩ	±2%	¼W
R813	GM21412110	1.21KΩ	±2%	¼W
R814	GM21412110	1.21KΩ	±2%	¼W
R815	GM21414710	1.47KΩ	±2%	¼W
R816	GM21414710	1.47KΩ	±2%	¼W
R817	GM21412110	1.21KΩ	±2%	¼W
R818	GM21412110	1.21KΩ	±2%	¼W
⚠ R821	NH05010120	1Ω	±5%	½W, Fusible
R822	GM21410010	1KΩ	±2%	¼W
⚠ R831	NH05010120	1Ω	±5%	½W, Fusible
⚠ R832	NH05010120	1Ω	±5%	½W, Fusible
		PP16-SEMICONDUCTORS		
DB01	HD20001000	Diode	1S2473	
DN01 ~ DN06	HD20001000	Diode	1S2473	
DN08	HD20001000	Diode	1S2473	
DN09	HD20001000	Diode	1S2473	
DN10	HD30063060	Zener	3.9V	RD3.9EB1
DN11	HD30063060	Zener	3.9V	RD3.9EB1
D801	HD20005010	Diode	W06B	
D802	HD20005010	Diode	W06B	
D803	HD20005010	Diode	W06B	
D804	HD20005010	Diode	W06B	
D805	HD30015060	Zener	5.6V	
D806	HD30015060	Zener	5.6V	
⚠ D807	HD20005010	Diode	W06B	
⚠ D808	HD20005010	Diode	W06B	
⚠ D809	HD20005010	Diode	W06B	
⚠ D810	HD20005010	Diode	W06B	

REF. DESIG.	PART NO.	DESCRIPTION	
D821	HD30024060	Zener	6.8V
⚠ D831	HD20005010	Diode	W06B
⚠ D832	HD20005010	Diode	W06B
⚠ D833	HD20005010	Diode	W06B
⚠ D834	HD20005010	Diode	W06B
⚠ D841	HD20009010	Diode	U05B
⚠ D842	HD20009010	Diode	U05B
⚠ D843	HD20009010	Diode	U05B
⚠ D844	HD20009010	Diode	U05B
QN01	HT107332A0	Transistor	2SA733(P, Q)
QN02	HT112962A0	Transistor	2SA1296(Y, GR)
QN03	HT309452A0	Transistor	2SC945(Q, R)
Q551	HC10011490	IC	TDA1541
Q552	HC10027090	IC	NJM5534
Q553	HC10027090	IC	NJM5534
Q554	HC10027090	IC	NJM5534
Q555	HC10027090	IC	NJM5534
Q556	HF203722A0	F.E.T.	2SK372(GR, BL)
Q557	HF203722A0	F.E.T.	2SK372(GR, BL)
Q801	HT403131D0	Transistor	2SD313(D)
Q802	HT309452A0	Transistor	2SC945(Q, R)
Q803	HT107332A0	Transistor	2SA733(P, Q)
Q804	HT205071D0	Transistor	2SB507(D)
Q805	HT327852A0	Transistor	2SC2785(RF, JF)
Q806	HT111752A0	Transistor	2SA1175(RF, JF)
Q821	HT113582A0	Transistor	2SA1358(O, Y)
⚠ F841	FS10200800	Fuse	
JB21	YT02020550	Terminal, IN/OUT; 2P	
JD20	YT02010320	Terminal, 1P	
JG01	YL01010110	Terminal, Earth	
JG02	YJ08000270	Jack, Fuse Holder	
J510	YJ06006240	Jack, 4P	
J511	YP06003330	Plug, 3P	
J515	YJ06006230	Jack, 3P	
J516	YJ06006280	Jack, 8P	
J519	YT02020290	Terminal, Audio Out	
J524	YJ06002440	Jack, 4P	
J010	YJ06001050	Jack, 5P	
J011	YJ06001070	Jack, 7P	
J801	YP06001070	Plug, 9P	
J802	YJ06002450	Jack, 6P	
J803	YP06003340	Plug, 9P	
LD01	TP41042010	Pulse Transformer	
L502	LY20045010	Relay	SZ-2101
		PP26-REGULATOR CIRCUIT BOARD	
PP2β	YK158K1320	P.W. Board, Regulator	
	ZZ157K8320	P.W. Board Assembly	
D845	HD20001000	Diode	1S2473
⚠ Q831	HC10044060	IC	μPC7912H
⚠ Q832	HC10043060	IC	μPC7812H
⚠ Q841	HC10056060	IC	μPC7805H

REF. DESIG.	PART NO.	DESCRIPTION
W803	Y800060240	Connective Cord, 9P
		PP36-POWER SWITCH CIRCUIT BOARD [F]
PP36	YK158K1330	P.W. Board, Power Switch [F]
⚠GH01	DF16104510	Film Cap. 0.1μF 200V [F]
⚠SH01	SP01010650	Push Switch, Power [F]
		PR16-HEADPHONE AMP CIRCUIT BOARD
PR16	YK158K1880	P.W. Board, Headphone Amp
	ZZ157K8880	P.W. Board Assembly
R900	RM01030340	Variable Resistor 10KΩ(A)
Q901	HC10016090	IC NJM4556D
Q903	HT328781A0	Transistor 2SC2878
Q904	HT328781A0	Transistor 2SC2878
Q905	HT328781A0	Transistor 2SC2878
Q906	HT328781A0	Transistor 2SC2878
J901	YJ01002340	Jack, Headphone
W510	Y800230300	Connective Cord, 4P
W511	Y800500420	Connective Cord, 3P
		PS16-POWER SWITCH CIRCUIT BOARD [A, N, W]
PS16	YK158K1850	P.W. Board, Power Switch
	ZZ157K8850	P.W. Board Assembly
⚠GH01	DK18103840	Ceramic Cap. 0.01μF 400V [N,A,W]
⚠SH01	SP01010650	Push Switch, Power [N, A, W]
		PS26-TEN KEYS CIRCUIT BOARD
PS26	YK157K0510	P.W. Board, Ten Keys
	ZZ157K8510	P.W. Board Assembly
SS01 ~ SS15	SP01010970	Push Switch
SS16	SS02020850	Slide Switch, Timer/Play
		PV16-SERVO CIRCUIT BOARD
PV16	YK158K1810	P.W. Board, Servo
	ZZ157K8810	P.W. Board Assembly
		PV16-CAPACITOR
C201	OA47602510	Elect 47μF 25V
C204	OA10505010	Elect 1μF 50V
C257	EQ47503530	Elect 4.7μF 35V
C271	OA47601610	Elect 47μF 16V
C273	OA10505010	Elect 1μF 50V
C279	OA10601610	Elect 10μF 16V

REF. DESIG.	PART NO.	DESCRIPTION
		PV16-RESISTORS
R211	GM11656240	5.62MΩ ±1% 1/6W
R212	GM11656240	5.62MΩ ±1% 1/6W
R231	NH05100140	10Ω ±5% ¼W, Fusible
R232	NH05100140	10Ω ±5% ¼W, Fusible
R233	NH05121140	120Ω ±5% ¼W, Fusible
R234	NH05121140	120Ω ±5% ¼W, Fusible
R254	GM11690920	90.9KΩ ±1% 1/6W
R274	GM11613020	13KΩ ±1% 1/6W
R275	GM11690920	90.9KΩ ±1% 1/6W
R277	GM11635730	357KΩ ±1% 1/6W
R282	NH05100140	10Ω ±5% ¼W, Fusible
		PV16-SEMICONDUCTORS
D253	HD30751000	Zener 7.5V
D271 ~ D275	HD20002000	Diode 1SS133, etc.
Q201	HC10003090	IC NJM4558D
Q202	HT107332A0	Transistor 2SA733(P, Q)
Q203	HT309452A0	Transistor 2SC945(Q, R)
Q204	HT334212A0	Transistor 2SC3421(O, Y)
Q205	HT113582A0	Transistor 2SA1358(O, Y)
Q231	HT113582A0	Transistor 2SA1358(O, Y)
Q232	HT334212A0	Transistor 2SC3421(O, Y)
Q233	HC10011320	IC IR3741
Q251	HC10003090	IC NJM4558D
Q252	HT107332A0	Transistor 2SA733(P, Q)
Q253	HT309452A0	Transistor 2SC945(Q, R)
Q254	HT107332A0	Transistor 2SA733(P, Q)
Q255	HT309452A0	Transistor 2SC945(Q, R)
Q256	HT309452A0	Transistor 2SC945(Q, R)
Q271	HC10017260	IC 80C51
Q272	HT309452A0	Transistor 2SC945(Q, R)
		PV16-MISCELLANEOUS
J201	YJ06006350	Jack, 15P
J202	YJ06006280	Jack, 8P
J203	YP06003350	Plug, 14P
J205	YP07002270	Plug, 16P
J206	YP07002270	Plug, 16P
L231	LC14730040	Choke Coil 47μH
L232	LC14730040	Choke Coil 47μH
W802	YU06080260	Jumper Lead, 6P
		PV26-SERVO MODULE CIRCUIT BOARD
PV26	WB157K1430	P.W. Board, Servo Module
	ZZ157K8430	P.W. Board Assembly
		PV26-CAPACITORS
C301	DF74682520	Film 6800pF ±2%
C302	DF74682520	Film 6800pF ±2%
C305	DF74562520	Film 5600pF ±2%
C306	DF74562520	Film 5600pF ±2%
C308	DD55391300	Ceramic 390pF ±5%
C309	OA33601610	Elect 33μF 16V
C310	DF74681520	Film 680pF ±2%
C311	DF74182520	Film 1800pF ±2%
C312	DF74682520	Film 6800pF ±2%
C314	DF74682520	Film 6800pF ±2%
C315	DF74682520	Film 6800pF ±2%
C316	DK46104200	Ceramic 0.1μF ±10%, Chip

REF. DESIG.	PART NO.	DESCRIPTION
		PV26-RESISTORS
		(All Resistors are ±5% and 1/10W)
R300	NI01103110	10KΩ ±1%, Chip
R301	NI01103110	10KΩ ±1%, Chip
R302	NI01272110	2.7KΩ ±1%, Chip
R303	NI01471110	470Ω ±1%, Chip
R304	NI05222110	2.2KΩ, Chip
R306	NI01103110	10KΩ ±1%, Chip
R307	NI01103110	10KΩ ±1%, Chip
R308	NI01272110	2.7KΩ ±1%, Chip
R309	NI01471110	470Ω ±1%, Chip
R310	NI05222110	2.2KΩ, Chip
R311	NI05103110	10KΩ, Chip
R312	NI05103110	10KΩ, Chip
R313	NI05683110	68KΩ, Chip
R314	NI05473110	47KΩ, Chip
R315	NI05473110	47KΩ, Chip
R316	NI05472110	4.7KΩ, Chip
R317	NI05473110	47KΩ, Chip
R318	NI05683110	68KΩ, Chip
R320	NI01562110	5.6KΩ ±1%, Chip
R321	NI01133110	13KΩ ±1%, Chip
R323	NI01334110	330KΩ ±1%, Chip
R324	NI05182110	1.8KΩ, Chip
R325	NI05152110	1.5KΩ, Chip
R326	NI05223110	22KΩ, Chip
R327	NI05223110	22KΩ, Chip
R328	NI05563110	56KΩ, Chip
R329	NI05563110	56KΩ, Chip
R330	NI05471110	470Ω, Chip
R331	NI05471110	470Ω, Chip
R332	NI05821110	820Ω, Chip
R333	NI05152110	1.5KΩ, Chip
R334	NI05471110	470Ω, Chip
R335	NI05823110	82KΩ, Chip
R336	NI05683110	68KΩ, Chip
R337	NI01134110	130KΩ ±1%, Chip
R338	NI05563110	56KΩ, Chip
R339	NI05223110	22KΩ, Chip
R340	NI05104110	100KΩ, Chip
R341	NI05474110	470KΩ, Chip
R342	NI05103110	10KΩ, Chip
R343	NI05472110	4.7KΩ, Chip
R345	NI05682110	6.8KΩ, Chip
R346	NI05474110	470KΩ, Chip
R347	NI05104110	100KΩ, Chip
R348	NI05333110	33KΩ, Chip
R349	NI05822110	8.2KΩ, Chip
R351	NI05822110	8.2KΩ, Chip
R352	NI05683110	68KΩ, Chip
R355	NI05563110	56KΩ, Chip
R356	NI01243110	24KΩ ±1%, Chip
R357	NI05105110	1MΩ, Chip
R358	NI01364110	360KΩ ±1%, Chip
R359	NI05223110	22KΩ, Chip
R360	NI01682110	6.8KΩ ±1%, Chip
R361	NI01682110	6.8KΩ ±1%, Chip
R362	NI01823110	82KΩ ±1%, Chip
R363	NI01823110	82KΩ ±1%, Chip
R364	NI05472110	4.7KΩ, Chip
R365	NI05103110	10KΩ, Chip

REF. DESIG.	PART NO.	DESCRIPTION
R366	NI05474110	470KΩ, Chip
R367	NI05333110	33KΩ, Chip
R368	NI05103110	10KΩ, Chip
R369	NI05472110	4.7KΩ, Chip
R370	NI01363110	36KΩ ±1%, Chip
R371	NI01392110	3.9KΩ ±1%, Chip
R372	NI01364110	360KΩ ±1%, Chip
R373	NI05272110	2.7KΩ, Chip
R374	NI05104110	100KΩ, Chip
R375	NI05472110	4.7KΩ, Chip
R376	NI05333110	33KΩ, Chip
R379	NI05273110	27KΩ, Chip
R380	NI05472110	4.7KΩ, Chip
R381	NI05683110	68KΩ, Chip
R382	NI05472110	4.7KΩ, Chip
R385	NI01273110	27KΩ ±1%, Chip
R386	NI01184110	180KΩ ±1%, Chip
R387	NI05473110	47KΩ, Chip
R388	NI05473110	47KΩ, Chip
R389	NI05104110	100KΩ, Chip
R390	NI01753110	75KΩ ±1%, Chip
R391	NI01753110	75KΩ ±1%, Chip
R393	NI01334110	330KΩ ±1%, Chip
R394	NI05224110	220KΩ, Chip
R395	NI05104110	100KΩ, Chip
R396	NI05124110	120KΩ, Chip
R397	NI05473110	47KΩ, Chip
R398	NI05473110	47KΩ, Chip
		PV26-SEMICONDUCTORS
D301	HZ30003050	Zener 2.4V, Chip
D302	HZ20001020	Diode MA151WK, Chip
D303	HZ20001020	Diode MA151WK, Chip
D304	HZ20005020	Diode MA153, Chip
D305	HZ30002050	Zener 5.1V, Chip
D306	HZ20003020	Diode MA151K, Chip
Q301	HC10042090	IC NJM2902M
Q302	HC10042090	IC NJM2902M
Q303	HC10042090	IC NJM2902M
Q304	HC10043090	IC NJM2901M
Q305	HC40300Z0	IC 4030
Q306	HC40530Z0	IC 4053
Q307	HC10011090	IC NJM4558M
Q308	HX32351010	Transistor 2SC2351, Chip
Q309	HC10059210	IC FMW1
Q311	HC10059210	IC FMW1
Q312	HX111621A0	Transistor 2SA1162(G), Chip
Q314	BA20005020	Semicon Caomposit UN2210, Chip
Q315	HX327121A0	Transistor 2SC2712(G), Chip
Q316	HX310091A0	Transistor 2SC1009, Chip
Q317	HX310091A0	Transistor 2SC1009, Chip
Q318	BA20005020	Semicon Composit UN2210, Chip
		PV26-MISCELLANEOUS
J301	YJ07002230	Jack, 16P
J302	YJ07002230	Jack, 16P
X201	FQ01205030	Seramic Vibrator 12.0MHz

REF. DESIG.	PART NO.	DESCRIPTION
		PY16-DISPLAY CIRCUIT BOARD
PY16	WB157K1420	P.W. Board, Display
	ZZ157K8420	P.W. Board Assembly
		PY16-CAPACITORS
CY02	DK58473300	Ceramic 0.047μF, Chip
CY04	DD55330300	Ceramic 33pF ±5%, Chip
CY05	DD55330300	Ceramic 33pF ±5%, Chip
CY07 ~ CY14	DK56222300	Ceramic 2200pF ±10%, Chip
		PY16-RESISTORS
RY01 ~ RY05	NI05154110	150KΩ ±5% 1/10W, Chip
RY06 ~ RY13	NI05103110	10KΩ ±5% 1/10W, Chip
RY15	NI05101110	100Ω ±5% 1/10W, Chip
RY16	NI05332110	3.3KΩ ±5% 1/10W, Chip
RY17	NI05562110	5.6KΩ ±5% 1/10W, Chip
RY18	NI05562110	5.6KΩ ±5% 1/10W, Chip
RY19	NI05103110	10KΩ ±5% 1/10W, Chip
RY20	NI05103110	10KΩ ±5% 1/10W, Chip
RY21	NI05103110	10KΩ ±5% 1/10W, Chip
RY24	NI05472110	4.7KΩ ±5% 1/10W, Chip
RY25	NI05334110	330KΩ ±5% 1/10W, Chip
RY26	NI05103110	10KΩ ±5% 1/10W, Chip
RY27	NI05103110	10KΩ ±5% 1/10W, Chip
		PY16-SEMICONDUCTORS
DY01 ~ DY05	HZ20003020	Diode MA151K, Chip
DY06	HZ20003020	Diode MA151K, Chip
QY01	HC10212030	IC LC6554D
QY02 ~ QY06	BA10001020	Semicon Composit UN2114, Chip
QY10	HX413281S0	Transistor 2SD1328(S), Chip
QY11	HX413281S0	Transistor 2SD1328(S), Chip
QY12	HX327121A0	Transistor 2SC2712(G), Chip
QY13	HX327121A0	Transistor 2SC2712(G), Chip
QY14	HX327121A0	Transistor 2SC2712(G), Chip

REF. DESIG.	PART NO.	DESCRIPTION
		PY16-MISCELLANEOUS
JY02	YJ06006330	Jack, 13P
SY01	SP01010970	Push Switch, Stop
SY02	SP01010970	Push Switch, Pause
SY03	SP01010970	Push Switch, Play
SY05 ~ SY16	SP01010970	Push Switch, Play
VY01	HQ30801410	Display Unit
WY01	YB00180330	Connective Cord, 13P
WY03	YB00130360	Connective Cord, 5P
XY01	FQ03004010	Seramic Vibrator 3.00MHz
ZY01	HW10001550	Photo Unit
		PY26-LAMP CIRCUIT BOARD
PY26	WB157K1440	P.W. Board, Lamp
	ZZ157K8440	P.W. Board Assembly
DY51	HD20003000	Diode RL103E, etc.
DY52	HD20003000	Diode RL103E, etc.

(W01-99)	Assembly and Wiring
(T01-99)	Adjustment
(X01-00)	Correction

NOTE ON SAFETY:

Symbol ⚠ Fire or electrical shock hazard. Only original parts should be used to replace any part marked with symbol ⚠. Any other component substitution (other than original type), may increase risk of fire or electrical shock hazard.

[MEMO]