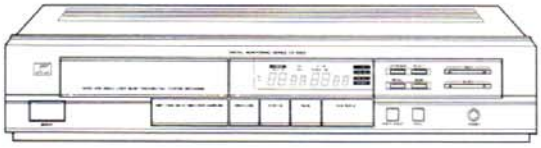
Compact disc player CD65DX/A/AB/N/NB/TB

Service
Service
Service



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For repair of the CDM mechanism in sets with serialnumber AH00, see Service Manual CDM-2-0500.

For sets with serialnumber AH01 and on, see chapter 8.

Service Manual

COMPACT disc DIGITAL AUDIO

CONTENTS

CLASS 1
LASER PRODUCT
3122 110 03420

Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified be used.

Documentation Technique Service Dokumentation Documentazione di Servizio Huolte-Ohje Manual de Servicio Manual de Serviçic
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The following information must be supplied to eliminate delays in processing your order:

1. Complete address
2. Complete part numbers and quanties required
3. Description of parts
4. Model number for which part is required
5. Way of shipment
6. Signature: any order form or telex must be signed otherwise such part order will be considered as null and void.

TECHNICAL ASSISTANCE

Should you require any other technical support, do not hesitate to contact the Technical Department of
MARANTZ INTERNATIONAL
Quality & Service Dept.
80, Rue des Deux Gares,
B-1070 Brussels
Belgium
Phone: 02/525.70.22 or 525.70.23
Telefax: 02/525.6160
Telex: 23550 OR
61511 (PHEMB) routing: BELDMZT

PARTS ORDERING

Parts may be ordered at the following addresses:

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Vertriebsgesellschaft GmbH
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A 1101 Wien
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Telex: 132.332

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MARANTZ AUSTRALIA
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Telex: 24466

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Telex: 31201

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Telex: 611651

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DIVISION OF PHILIPS A/S
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Saxon Way Industrial Estate
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Harmondsworth UB7 OLW
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Telex: 935196

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P.O.Box 21025
Hippocratus Street 188
Athens 11471
Greece
Telex: 216.795

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Sagamihara-shi, Kanagawa
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Telex: 22694

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20126 Milano
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Telex: 201530

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Spain
Telex: 59355

SWEDEN
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Försäljning AB
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S-115 84 Stockholm
Sweden
Telex: 14060

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6 Blok N°6310
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Divisao philips S.A. service
Outurela-carnaxide
2795 LinDA-A-VELHA
Telex: 43906

All of the above locations are fully equipped to take care of your total service needs. Because various countries have differing configuration requirements, it is necessary that you contact the service facility in your particular country. In the event that there is no service location listed for your country, please, contact the nearest facility for the necessary assistance.

In case of difficulties, do not hesitate to contact the Technical Department at abovementioned address.

1. EXPLANATION OF THE LAYOUT OF THE DOCUMENTATION

The documentation consists of chapters.
The number of the chapter is indicated by the first digit of the page number.
The second digit of the page number is the sequence numbering.

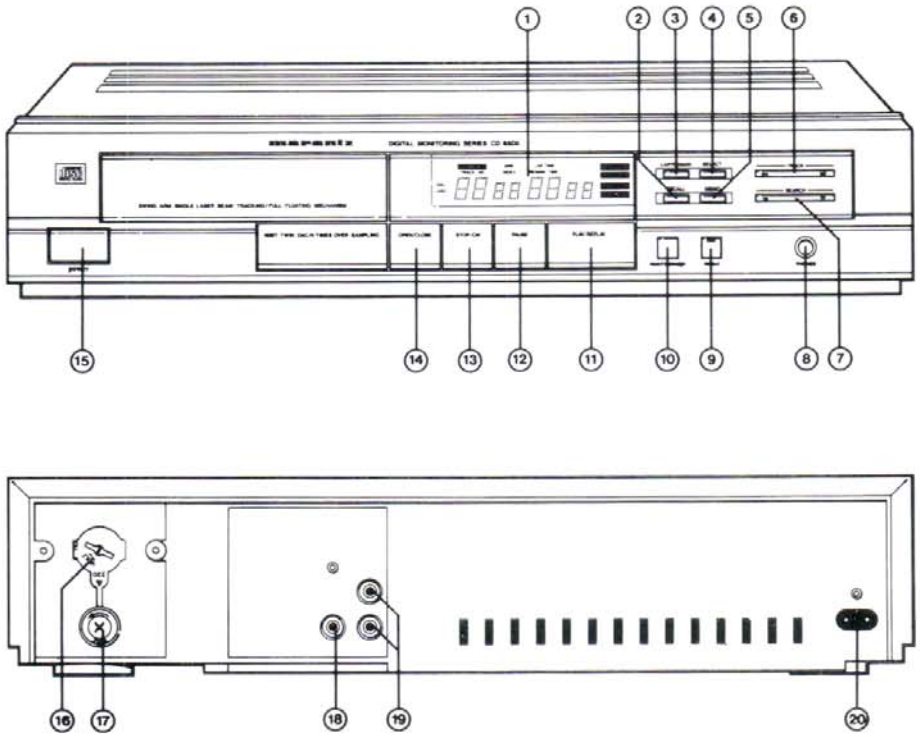
If modifications or supplements require new supplementary or replacement pages, the page number is extended with a third part:

A digit behind the page number indicates that it concerns a supplementary page.
A replacement page is indicated by a letter behind the page number.

Example

3-6	is page 6 of chapter 3
3-6-1	is a supplementary page behind page 3-6
3-6-a	is the replacement page of page 3-6 (so page 3-6 can be removed from the documentation).

TABLE OF CONTENTS PER PAGE



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SUMMARY OF CONTROLS AND CONNECTIONS

Front of player

1 **DISPLAY**

2 **RECALL button**
This button is used to check the contents of a program.

3 **LAP/REMAIN button**
This button is used to switch the time display between the elapsed time (**LAP**) of the current track and the remaining time (**REMAIN**) of the complete disc or program.

4 **SELECT button**
This button is used to enter the select mode, after which you can use the **TRACK/INDEX** button to enter the details when:
- Moving to another index number.
- Starting play from a particular track/index number of time position.
- Programming track/index numbers or time position.

5 **MEMO button**
When this button is pressed the selection shown on the display is stored. This selection can be either a track number, a track and index number or a track and begin time and an end time of a time selection. If the button is pressed during a RECALL function the selection displayed is cancelled from memory.

6 **◀◀ TRACK/INDEX ▶▶ button**
This button has four functions
- To move to another track during play
- To move to another index number during play.
- To start play from a particular track/index number or time position.
- To select track/index numbers or time positions during programming.

Rear of player

All connections to the rear panel should be made with the power to the entire system switched off.
To avoid cross-connection of channels, connect one plug at a time.

7 **◀◀ SEARCH ▶▶ button**
- To search forward to a particular passage during play, press and hold the ▶▶ side of the **SEARCH** button.
- To search backwards to a particular passage during play, press and hold the ◀◀ side of the **SEARCH** button.

9 **REPEAT button**
When this button is pressed, the **REPEAT** indicator lights and either the whole disc or the current program is played back over and over again. Pressing this button again cancels the repeat operation and the **REPEAT** indicator goes off. (Pressing the **STOP/CM** or **OPEN/CLOSE** button also cancels repeat.)

11 **PLAY/REPLAY button**
Pressing this button starts playback. If the tray is open, the tray first closes. When the button is pressed during playback, the laser beam returns to the beginning of the track being played and playback starts again. During play mode, the **PLAY** indicator lights.

12 **PAUSE button**
Pressing this button during playback makes the player enter the pause mode. Playback stops, but the disc continues to rotate.To resume playback from the point where playback stopped, press the **PLAY/REPLAY** button.
During pause mode,the **PAUSE** indicator lights. If **STOP/CM** or **OPEN/CLOSE** is pressed the pause function is cancelled.

13 STOP/CM button
This button is used to stop both the play and rotation of the disc. It is also used to cancel a program.

14 OPEN/CLOSE button
Pressing this button opens the disc tray. Pressing it again closes the disc tray.

15 POWER button
Pressing this button switches on the power and the display. Pressing the **POWER** button again switches off the power and the display.

16 VOLTAGE SELECTOR
Voltage adjustment
Warning: Before connection to the mains, check that the voltage shown by the **VOLTAGE SELECTOR** (situated at the rear of the unit) corresponds to the mains voltage in your household. If not, turn the **VOLTAGE SELECTOR** (16) using a screwdriver or coin, until the voltage shown corresponds to your local mains supply.

17 MAINS FUSE HOLDER
Replacing the mains fuse
Using a screwdriver, remove the **MAINS FUSE HOLDER (17)**
Remove the old fuse and replace with a fuse of the correct rating (315 mA for 110/127V; 160 mA for 220/240V) Refit the **MAINS FUSE HOLDER**

18 DIG OUT socket
The audio signal and the sub code signal of the Compact Disc are output in digital form from this socket. The signal from this socket can be fed to external digital processing equipment if desired.

19 LINE OUT sockets
Insert the two plugs of the connecting lead provided into these sockets and connect the other end of the cable to the CD or AUX sockets of the pre-amplifier or amplifier to be used. Be careful **not** to use the PHONO sockets!
Note that **L** or white corresponds to the left channel and **R** or red to the right channel.

20 MAINS socket

TECHNICAL SPECIFICATION

- System : Compact Disc Digital Audio system
- Mainsvoltages : 110 V, 127 V, 220 V, 240 V ± 10%
- Mains frequencies : 50,60 Hz(no adaption required)
- Power consumption : ≤20 W
- Frequency range : 20 Hz ÷ 20 kHz ±0,1 dB
- Output voltage : max. 2 V_{rms}/≥10 kOhms
- Output impedance : 200 Ohms
- S/N ratio : ≥96 dB
- Channel separation : ≥90 dB
- Channel difference : ≤0,2 dB
- Total harmonic distortion : ≤−90 dB
- Intermodulation distortion : ≤−90 dB
- De-emphasis : 0 or 15/50 µs (switched by the subcode on the disc)
- Dimensions WxDxM : 420 x 300 x 85 mm (tray closed)
- Weight : approx 3 kg

3. SERVICING HINTS

For servicing hints of the CD mechanism see Service Manual C.D.M.-2./0500

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.

In the set chip components have been applied.
For disassembly and assembly of chip components see the figure below.

The disc should always rest properly on the turntable.
To achieve this a disc hold–down has been mounted in a bracket of the tray mechanism.
If the tray mechanism has to be disassembled for servicing, a separate disc hold-down should be used.
For a service disc hold–down see page 3-3

When the tray mechanism and CDM-unit has been disassembled the player can be prepared for measurements by bridging the "tray detection" switch SK2 on the main panel.

SERVICE AIDS

Audio test disc	4822 397 30085
Disc without errors + disc with DO errors, black spots and fingerprints	4822 397 30096
Disc 65 min 1kHz without pause	4822 397 30155
Torx screwdrivers	
Set (straight)	4822 395 50145
Set (square)	4822 395 50132
13th order filter	4822 395 30204

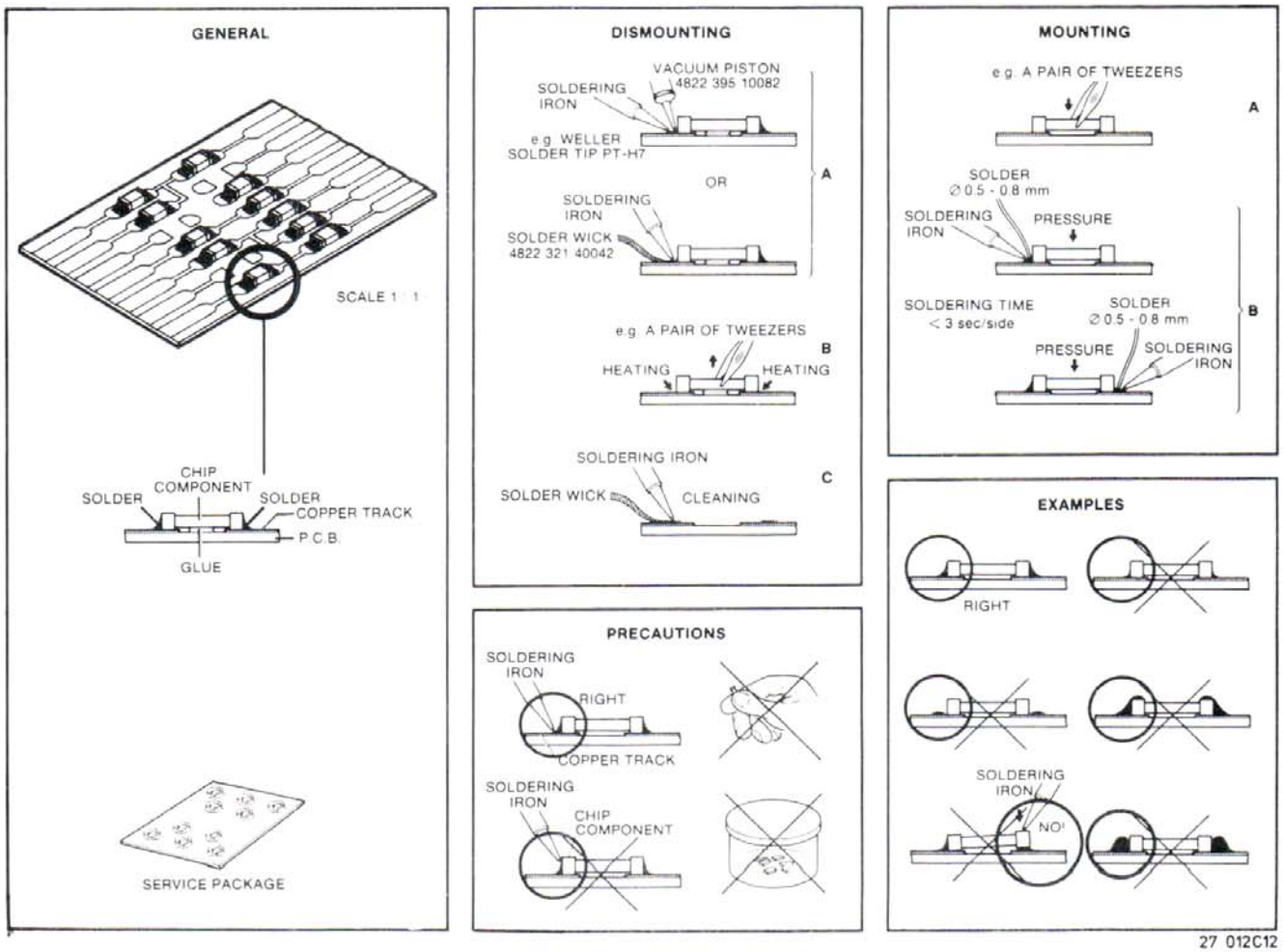


Fig. 2

DISASSEMBLY OF TOP COVER

- Remove the 4 screws out of side walls of top cover.
- Remove screw of the headphone panel.
- Take top cover from set.

REPLACEMENT OF GLASS FUSE

- The glass fuse is situated on the cabinet in the right-hand rear corner of the set. See also page 2-2 under item 17.

REPLACEMENT OF TRANSFORMER FUSE

- Remove top cover.
- Remove the transformer
- Now the transformer fuse is accessible.

SERVICING OF THE FRONT PANEL

Disassembly of the tray-front (pos. 207)

- Drive the tray out by turning the main gear wheel item no. 106
- The fixing point is on the left-hand bottom corner of the tray-front.
- Slide the tray-front to the left after lifting the fixing bracket over the fixing point.
- Now the tray-front can be taken out.

Disassembly of front panel

- Remove top cover.
- Remove the tray-front
- Remove the 3 fixing screws at upper side of front panel.
- Now the front panel can be taken off.
- Ensure during mounting that the 3 bosses of the set frame engage with the appropriate holes of the frontpanel.

Disassembly of control + display panel

- The control and display PCB can be detached by removing the 9 screws at the bottom of the display panel.
- Then the control + display panel can be taken out of the front.

SERVICING OF THE TRAY MECHANISM

Disassembly of the tray mechanisme

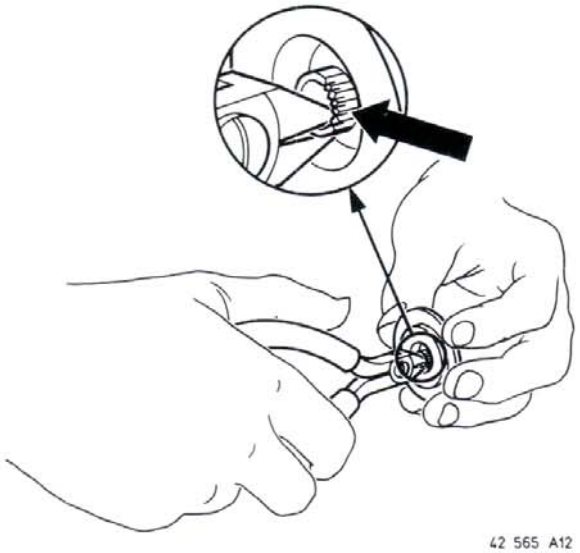
- Remove the top cover.
- Remove the tray-front.
- Remove the front-panel
- Drive the tray (pos. 101) out by turning the main gear-wheel (pos. 106). Allow the tray to travel as far as the stop.
- Swing the cover with hold-down (pos. 113) backwards.
- Turn the main gearwheel until the tray is released.
- The tray can now be taken out of the mechanism.
- Undo the 4 screws with which pos. 506 has been mounted into the set. Two screws are situated in front, one in the centre at the rear and one to be reached from the underside of the set.
- Undo all connector connections of the loading and CDM on the mainpanel.
- Now take the tray mechanism out of the set.

Disassembly of the CDM-unit

- Remove the top cover.
- Remove the tray-front
- Remove the front-panel
- Remove the tray mechanism.
- Take the cover with hold-down (pos. 113) out of the tray-mechanism.
- Undo the 2 screws on pos. 502.
- Take the CDM out of the mechanism.
- For servicing the CDM-unit see Manual CDM2/0500.

Service disc hold-down

Compose a service Disc hold-down in the following way.
- Cut in the most inner ring of a disc holddown pos 118 (4822 462 50383) with small and sharp nippers See fig. below.
- Enlarge the diameter of the innermost ring slightly with the hind part of a pencil or ballpoint, so that it jams onto the turntable with sufficient force.
- If the jamming force decreases after certaintime of use, the diameter has to be enlarged with a pencil or ballpoint again.



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4. ELECTRICAL MEASUREMENTS AND ADJUSTMENTS

HINTS

Test disc

It is important to treat the test discs with great care. The disorders on the discs (black spots, fingerprints, etc.) are exclusive and unambiguously positioned. Damage may cause additional drop-outs, etc. rendering the intentional errors no longer exclusive. In that case it will no longer be possible to check e.g. the good working of the track detectors.

Measurements on op-amps

In the electronic circuit op-amps have been used frequently. Some of the applications are amplifiers, filters, inverters 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 the non-inverting inputs. In such cases only the output signal will be measurable.

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

Stimulation with "0" and "1"

During troubleshooting sometimes certain points should be connected to ground or 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 related points are outputs of op-amps. These outputs are short-circuit-resistant, i.e. they can be brought to "0" or ground without problems.
The output of an op-amp, however, should never be connected directly to the power supply voltage.

Measurements on microprocessors

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

Measurements with an oscilloscope

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

Selection of 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 related circuit has no supply voltage.
  The injected levels or signals should never be greater than the supply voltage of the related circuit.

GENERAL CHECKPOINTS

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 first be checked.

a. Ensure that disc and objective are clean (remove dust, fingerprints, etc.) and work with undamaged discs.
b. Check if all supply voltages are present and if they have the correct values.
c. Check the good working of the CD mechanism by means of the servicing programme.

Indication of test points

In the drawings of the diagrams and the panels the test points have been indicated by a number (e.g. ◇12◇) to which the measuring method refers. In the measuring method below, the symbol (◇) has been omitted for the testpoints indicated.

Initiation of the servicing programme of the µP

- **Servicing position "0"**

  Simultaneously depress the SEARCH ▶▶, TRACK ▶▶ and LAP/REMAIN keys. Keep these three keys depressed while the mains voltage is switched on.
  This is the STAND-BY mode, "0" appears on the display.

  In this position it is possible to move the arm by means of the SEARCH ▶▶ and SEARCH ◀◀ keys with a minimum of torque to the inside and outside respectively.
  This makes it possible to control the free motion of the arm across the length of the disc.

- **Servicing position "1"**

  From servicing position "0" the player can be brought in servicing position 1" by depressing the TRACK ▶▶ 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× to and fro. Then the player reassumes servicing position "0".

- **Servicing position "2"**

  To be reached by depressing the TRACK/INDEX ▶▶ 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 TRACK ▶▶ key after servicing position "2" has been reached.

  The radial control is switched on. $\overline{\text{MUSB}}$ 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 ▶▶ key to the outside and to the inside, by means of the SEARCH ◀◀.

  Now the motion is controlled by the μP and the arm moves by steps of 64 tracks as long as the key is depressed.

  If servicing position 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).

Specification measurement

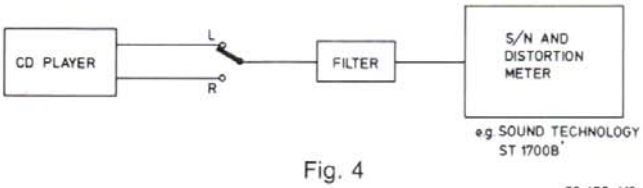

Fig. 4

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To measure the specification use can be made of audio test disc 4822 397 30085.
Use 13th order filter 4822 395 30204 to measure (see Fig.4):

- Total harmonic distortion (THD)
- Intermodulation distortion
- Signal-to-noise ratio (S/N)

Continuous burning of the laser

- Bridge capacitor 2583 on the main panel.
- Connect $\overline{\text{Si}}$ (= pin 20 of 6525) to ground.
- Switch on the supply voltage.
- Now the laser will burn continuously.

Note: **Danger**

Invisible laser radiation.
Avoid direct exposure to beam.
Do not stare into the objective.

Check of the laser supply.

The laser and, the laser supply in IC6525 plus the monitor diode form a feedback system.
A defect in the laser supply can result in the destruction of the laser.
If, in that case, the laser (=complete CDM2 unit) 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.

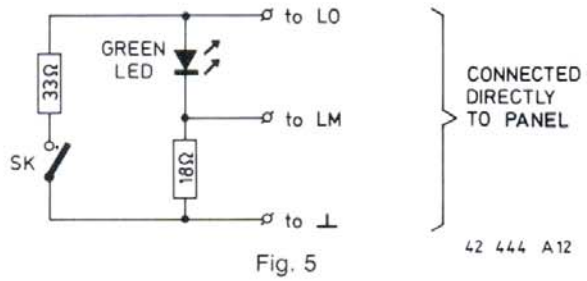

Fig. 5

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

- Take the above flex print out of connector 31 on the PCB.
- Connect the circuit via the extension cable to the connector.
- Select the play mode by grounding $\overline{\text{Si}}$ (pin 20 of IC6525).
  Note: $\overline{\text{Si}}$ = 0, start initialisation low, is the play mode.
- Measure the voltage LO (Laser Out) at test point 9.

  SK open: 1,8V ≤ LO ≤ 2,3V
  170 mV ≤ LM ≤ 220 mV
  The green LED emits little light.

  SK closed: 1,8V ≤ LO ≤ 2,3V
  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 $\overline{\text{Si}}$ = 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 CDM2 unit the laser output potentiometer (3528) should be placed in mechanical mid-position to avoid damage to the laser.

Adjusting the laser current

Coarse adjustment

- Place potentiometer 3528 approximately in mid-position.
- Put test disc 5 on the turntable.
- Bring the player in service position 1.
- The focussing motor can now start focussing 16x and when it has found the focal point a "1" will appear on the display.
- If this does not happen, turn potentiometer 3528 clockwise or anti-clockwise a little.
- Hereafter the fine adjustment of the lasercurrent has to be carried out.

Fine adjustment

- Play track 1 of the test disc 5.
- Adjust potentiometer 3528 for a voltage across 3508 , testpoint 1 and 2 of 50 mV ± 5 mV.

Adjustment of the focus off-set

Coarse adjustment

A.
- Place potentiometer 3517 approximately in mid-position
- Put test disc 5 on the turntable
- Bring the player in service position 1.
- The focussing motor can now start focussing 16x and when it has found the focal point a "1" will appear on the display.
- If this does not happen, turn potentiometer 3517 clockwise or anticlockwise.
- Here after the fine adjustment of the focus offset has to be carried out.

B.
- Place with potentiometer 3517 the focussing motor in optical horizontal position.
- Here after the fine adjustment of the focus offset has to be carried out.

Fine adjustment

- Bring the player in service position 2.
- Adjust potentiometer 3517 for a voltage across 2545 (testpoint 27) of 400 mV ± 40mV

Note: Notice that the CDM is in a horizontal position

I. DETAILED MEASURING METHOD

- **µP IC6551**

Servicing program

For initiation of the service programm see: "General check points".
Initiation of the servicing program.

- **Reset (pin 17; testpoint 14)**

When the supply voltage is switched on, a positive pulse should be present.

- **X-TAL out (pin 16; test point 13)**

  The frequency of this signal should be 6 MHz.

- **I²C (pin 3; testpoint 29**
- **I²D (pin 2; testpoint 31**
  There should be activity at testpoint 29 and 31 in position STAND-BY.

- **$\overline{\text{MSTP}}$ (pin 20; test point 78)**

When, after RD "high", the $\overline{\text{MSTP}}$ is "high" for a short moment (> 0.2 sec), the turntable motor control will be switched on.
The turntable motor is controlled by the MC-signal (test point 12.
To check MC, see: "Decoder A IC". To check the turntable motor control, see CDM-2 Service Manual: "Checking of the motor control".

- **B0 (pin 11; test point 36)**
  B1 (pin 10; test point 34)
  B2 (pin 9; test point 33)
  B3 (pin 8; test point 32)

With the B0 ÷ B3 signals
- The radial control is switched on.
- The level on the DAC output is controlled.
- In the SEARCH mode, there should be activity on all 4 test points.
- In the following positions the signals B0 ÷ B3 are stable:

signal	STOP	PLAY	Service pos. 0,1,2	Service pos. 3
B0	"low"	"high"	"low"	"high"
B1	"high"	"high"	"high"	"high"
B2	"high"	"high"	"high"	"high"
B3	"low"	"low"	"low"	"low"

- **$\overline{\text{TL}}$ (pin 12; test point 16)**

- The $\overline{\text{TL}}$ signal (Track Lost) is used to tell the µP that track loss threatens. The µP then can give correction signals with B0 ÷ B3.
- In the "SEARCH" mode, or when the player is bumped against, there are pulses on test point 16.

- **REdig (pin 13; test point 37)**

The REdig signal (= Radial Error Digital = radial deviation) is used to determine the place of the arm relative to the track and to check/correct in case of track jumping or bumping against the player.

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

- **$\overline{\text{DODS}}$ (pin 22; test point 19)**

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

Position of player	POWER ON	Servicing pos. 3	PLAY	SEARCH
$\overline{\text{DODS}}$ signal	"low"	"high"	"high"	

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- **$\overline{\text{MUTE}}$ signal (pin 11; test point 67)**

  When Filter-B IC is applied, the $\overline{\text{MUTE}}$ input will not be used.

II. CONTROL µP IC6566

- **Reset (pin 2; test point 100)**

  When the supply voltage is switched on a positive voltage should be present.

- **X-tal (pin 5; test point 101)**

  The frequency of this signal should be 4 MHz.

- **Data (pin 25; test point 102)**

- **Clock (pin 26; test point 103)**

  There should be activity at test point 102 and 103 in position play (display information).

- **I^2C (pin 22; test point 29)**

- **I^2O (pin 23, 17; test point 31)**

  There should be activity at test point 29 and 31 in position play.

- **$\overline{\text{POR}}$ (pin 28; test point 104)**

  When the supply voltage is switched on a negative puts should be present.

III. PHOTODIODE SIGNAL PROCESSOR IC6525

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

  High Ohmic measurement

Position of player	SC (pin 25)
POWER ON	−4 V
PLAY	+5 V
Servicing pos. 1	+5 V

- **$\overline{\text{Si}}$ (pin 20; test point 21)**
  LO (pin 17; test point 9, 9^A, 9^B)

- With the $\overline{\text{Si}}$ signal (= Start Initialization) the laser supply, among other things, is switched on.
  When the $\overline{\text{Si}}$ 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
$\overline{\text{Si}}$ signal	"high"	"low"	"low"
LO signal	"low"	"high"	"high"

- **LM (pin 16; test point 11) to check LM**
  See general checkpoints 'check of the laser supply'
- **To check the laser supply,** see General checkpoints "Check of the Laser Supply".
- **To check the focus offset,** see General checkpoints "Adjustment of the Focus Offet".

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

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

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

- When the player is brought into servicing position 1 without disc, the objective will search 16x for the focal point.
  At test point 26 the FE signal varies 16x between +2 V and −1,5 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 −6 V (= +5A and −6B) via a 200 kΩ resistance to test point 25.

Signal injected test point 25 IC7104A	+5 V	−6 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 IC6525 has been completed.

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

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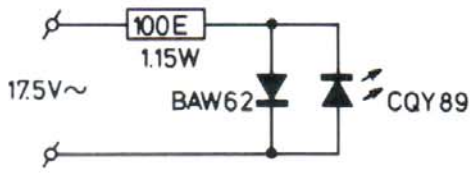
- The signals D1+D4 are the error signals from the photodetector circuits.
- When in servicing position 1 the disc is moved, the focusing unit should keep in track.
  When the disc is moving, there should be a changing signal on test points 4, 6, 7 and 8.
- Check of the photodetector.
  Connected the circuit below to an atternating voltage of 17,5 V.



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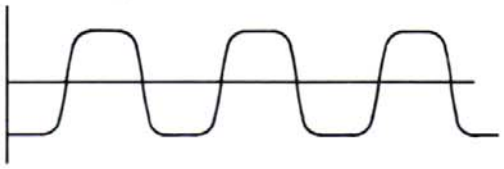
100 E-1.5 W - 4822 116 51096
BAW 62 - 4822 130 30613
CQY 89 - 4822 130 31332

Switch on the supply voltage and bring the player in the stand-by mode or in serciving 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 panel.
(The amplitude depends on the distance between the IR diode and the objective).



38 314 A12

Position of the oscilloscope: 100 ms/div.

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

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

- **HF-out (pin 27; test point 17)**

- 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 position 2 and during the reading of the lead-in track, the HF signal is present but is not stable.

37 017 B8

Position of the oscilloscope: 0,5 µs/div.
Amplitude about 1,5 V_{pp}

- **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 IC6525.
- 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).

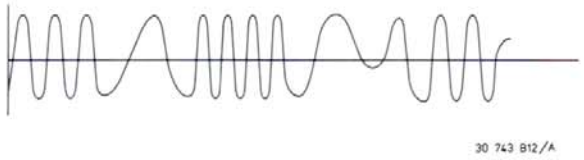
- Put test disc 5A 84822 397 30096) on the turntable.
- Switch on the power-supply switch and press the PLAY key.
- Play track number 10 or 15 and check the HFD signal at test point 23.
  When drop-out pulses are present on the DET signal (pin 26), the HFD pulses should also be present at test point 23.
  (Position of oscilloscope: 2 ms/div.).

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

- **RE1 (pin 11; test point 18)**
  RE2 (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.



30 743 B12/A

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

IV. RADIAL ERROR PROCESSOR IC6529

- **Check the signals between the µP and the Radial Error Processor**

- **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 µP.

- **RE-lag (pin 8; test point 41)**

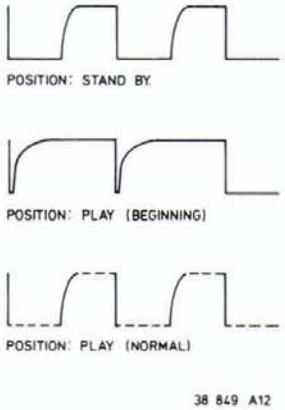
  Capacitor 2559 in the RE-lag circuit has a memory function.
  It memorizes the degree of inclination of the disc.
  When a jump is made to a certain track on the disc, the memory should be cleared.
  This is done by the µP ($\overline{RPU}$ signal) via transistors 6533, 6534.

  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 6533, 6534.

V. DECODER-A IC

- **Check the MC signal (pin 17; test point 12)**

- In stand-by mode, the MC signal (Motor Control) corresponds to the figure below.
- Place a disc on the turntable.
- In position PLAY or SERVICE POSITION 3 the MC signal corresponds to the figure below.



38 849 A12

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

- **VC (connector point 15-1; test point 46)**

- Place a disc on the turntable.
- The voltage at connector point 15-1 during playback will be:
  $V_C = 0 > V_C > -1.7$ V
  To check the turntable motor control, see C.D.M.-2 Service Manual: "Checking of the motor control".

- **Check the HFD-signal on test point 66, pin 26**

- Insert a disc.
- In the PLAY mode and in SERVICING POSITION 3 the HFD-signal is "high"; however, minor pulses may be present and in case of disorders on the disc.
- In SERVICING POSITION 2 and during playback of track no. 15 of test disc 5A HFD pulses are visible.

Position of the oscilloscope 5 ms/div.

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- **Check the CEFM signal (pin 27; test point 68)**

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

- **Check the Xin signal (pin 19; test point 69)**

- 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.

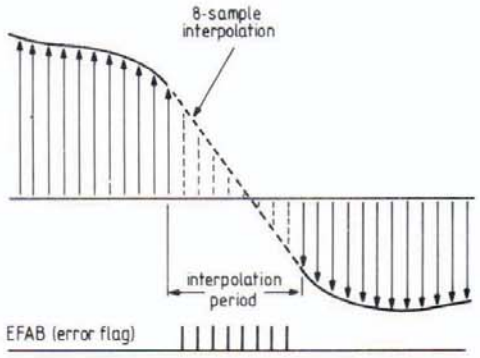
- **Check the timing signals meant for Filter-B IC**

- 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 71; pin 39).
- Check signals:
  WSAB at test point 71 (pin 39)
  (Word Select from Decoder-A to Filter-B)
  CLAB at test point 72 (pin 38)
  (Clock from Decoder-A to Filter-B)
  and their interrelation.
- There must be activity a test point 73 (pin 37), DAAB signal (DATA from Decoder-A to Filter-B).

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

- Place test disc 5A on the turntable.
- Select one of the following positions:
  SERVICE POSITION 3 or position PLAY.
- During playback of track no. 17, a EFAB pulse should appear at test point 61 for a short moment.
  The EFAB pulses also appear when the disc is gently slowed down and during fast search (Fast Forward or Fast Reverse).

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

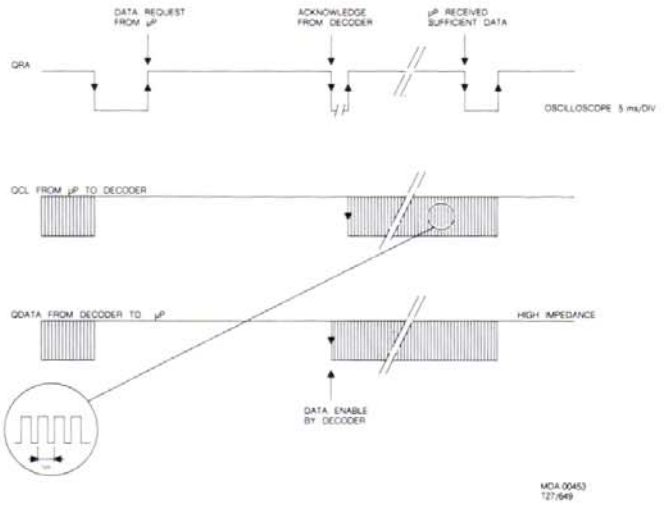


38 845 A12

- **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; pin30.
- Check signals: QRA at test point 75 (pin 30)
  QCL a 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 the 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 µP.
As soon as the µP has taken in enough information via QDA, QRA will go low again. That is why the QRA times vary each time.



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

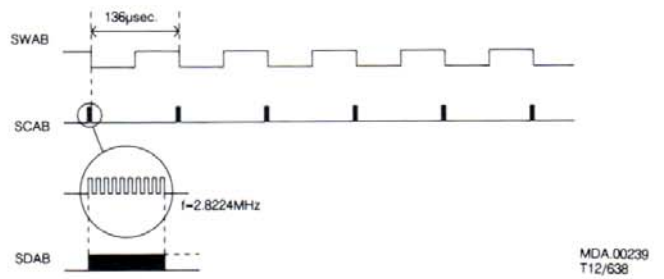
- Motor start pulse when test point 78 is "high" for $\geqslant$ 0.2 sec.
- Motor stop pulse when test point 78 is "low" for $\geqslant$ 0.2 sec.

Note:
After the motor start pulse, SWAB information (Subcoding Word clock) will become visible at this point. The period time of that signal 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)
  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 is "high" between two bursts of 10 clock pulses in case of pause indication and "low" in case of music indication.



- **Check the $\overline{\text{CRI}}$ signal (pin 28)**

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

- **Check the 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 DEEM signal should be "low".
- During playback of track no. 15 (recorded with PRE-EMPHASIS), the DEEM signal should be "high".

VI. FILTER-B IC

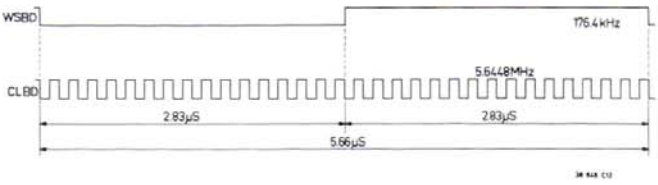
- **Check the signals between Decoder-A IC and Filter-B IC**

- See sub. "V Decoder-A IC":
  * Check the X-tal signal
  * 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**

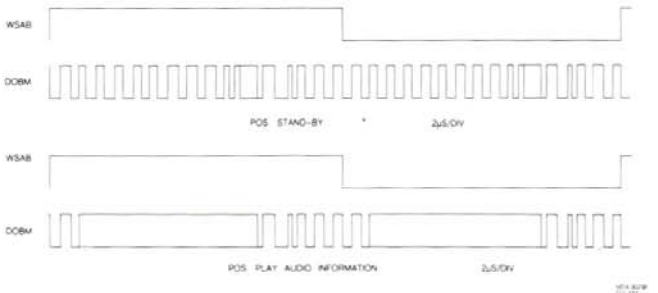
- Place a disc on the turntable.
- Select one of the following positions:
  SERVICE POSITION 3 or position PLAY.
- Trigger the oscilloscope with the WSBD signal (Word Select from Filter B to DAC) test point 85 (pin 18).

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 6572.



- **Check the DOBM signal (Digital Output)**
- Place a disc on the turntable
- Select the stand-by mode (only mains switch depresssed)
- Trigger the oscilloscope with the WSAB signal (testponit 71)

Check the DOBM signal (testpoint 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)**

- **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 from one track to another.
  Fast SEARCH when the Search button is kept depressed for some time.

VII. DAC IC (Dual Digital Analog Converter)

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

- See sub. "VI 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.

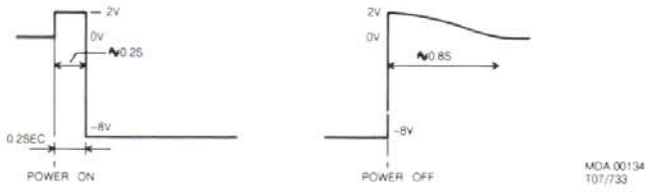
VIII DEEM CIRCUIT

- **Check DEEM circuit**

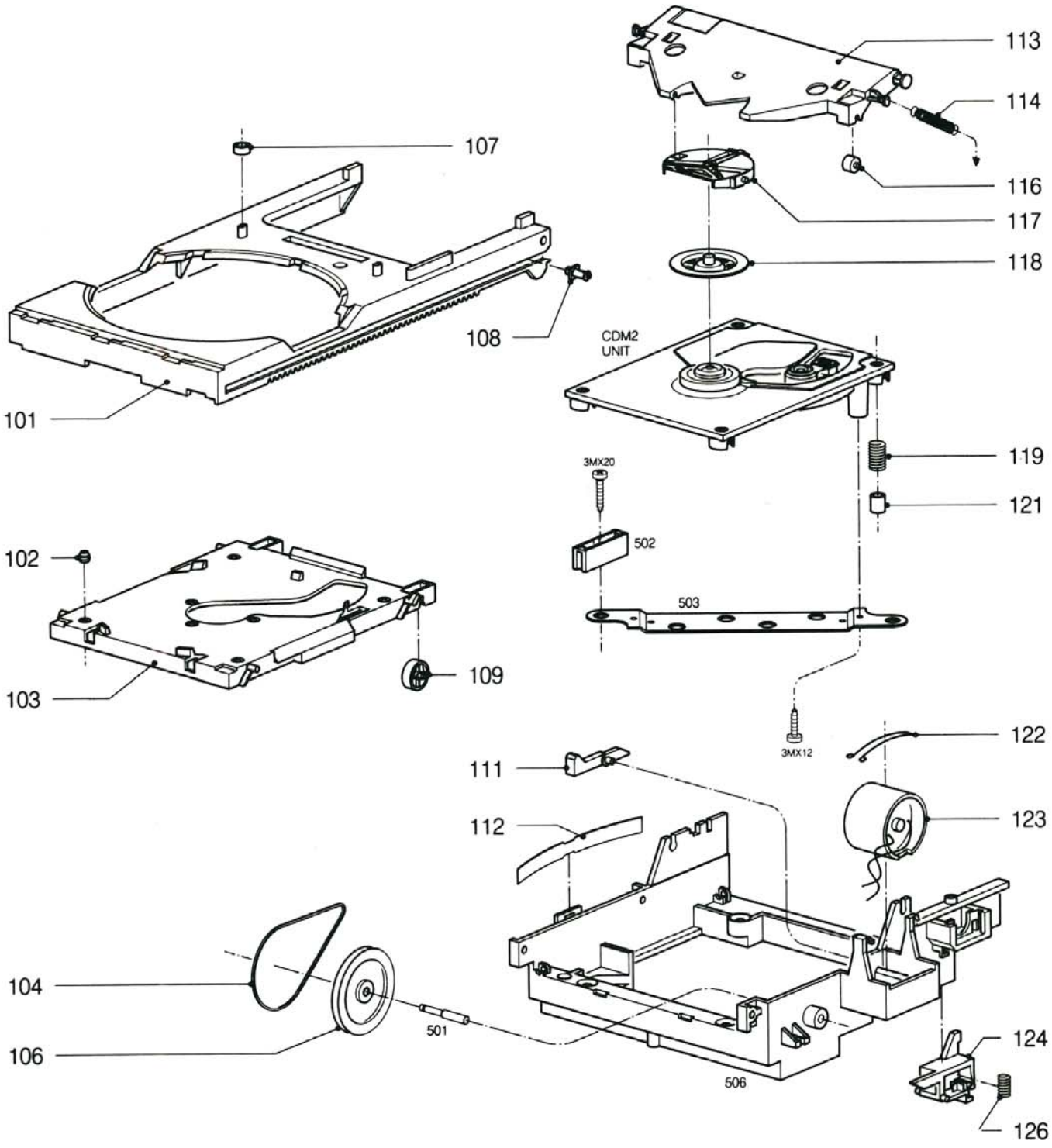
- Place test disc 5 on the turntable.
- During playback of track no. 14 (recorded without PRE-EMPHASIS) the DEEM signal at test point 84 should be "low".
- During playback of track no. 15 (recorded with PRE-EMPHASIS), the DEEM signal at test point 84 should be "high".
- During playback of track no. 14 the analogue signal should be present at the source of 6583 (test point 91) and 6582 (test point 92).
- During playback of track no. 15 the analog signal at the source of 6583 (test point 91) and 6582 (test point 92) should be 0 V.

IX KILL CIRCUIT

- During switching on and off the mains voltage the signal on the collector of 6580 (to be measured on a jumper, test point 93) should be as indicated in the figure below.



EXPLODED VIEW TRAY MECHANISM



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EXPLODED VIEW TRAY MECHANISM

Parts list
tray mechanism

101	4822 444 50582
102	4822 325 60317
103	4822 466 92111
104	4822 358 10115
106	4822 522 32359
107	4822 532 51756
108	4822 402 61081
109	4822 528 90638
111	4822 402 61107
112	4822 492 63659
113	4822 444 60467
114	4822 492 32762
116	4822 528 90639
117	4822 532 11547
118	4822 462 50383
119	4822 492 51902
121	4822 325 60318
122	4822 492 63746
123	4822 361 20998
124	4822 402 50244
126	4822 492 51935

For sets from AH01.. on: CDM unit 4822 691 20464
see also chapter 8

For sets from AH02.. on:

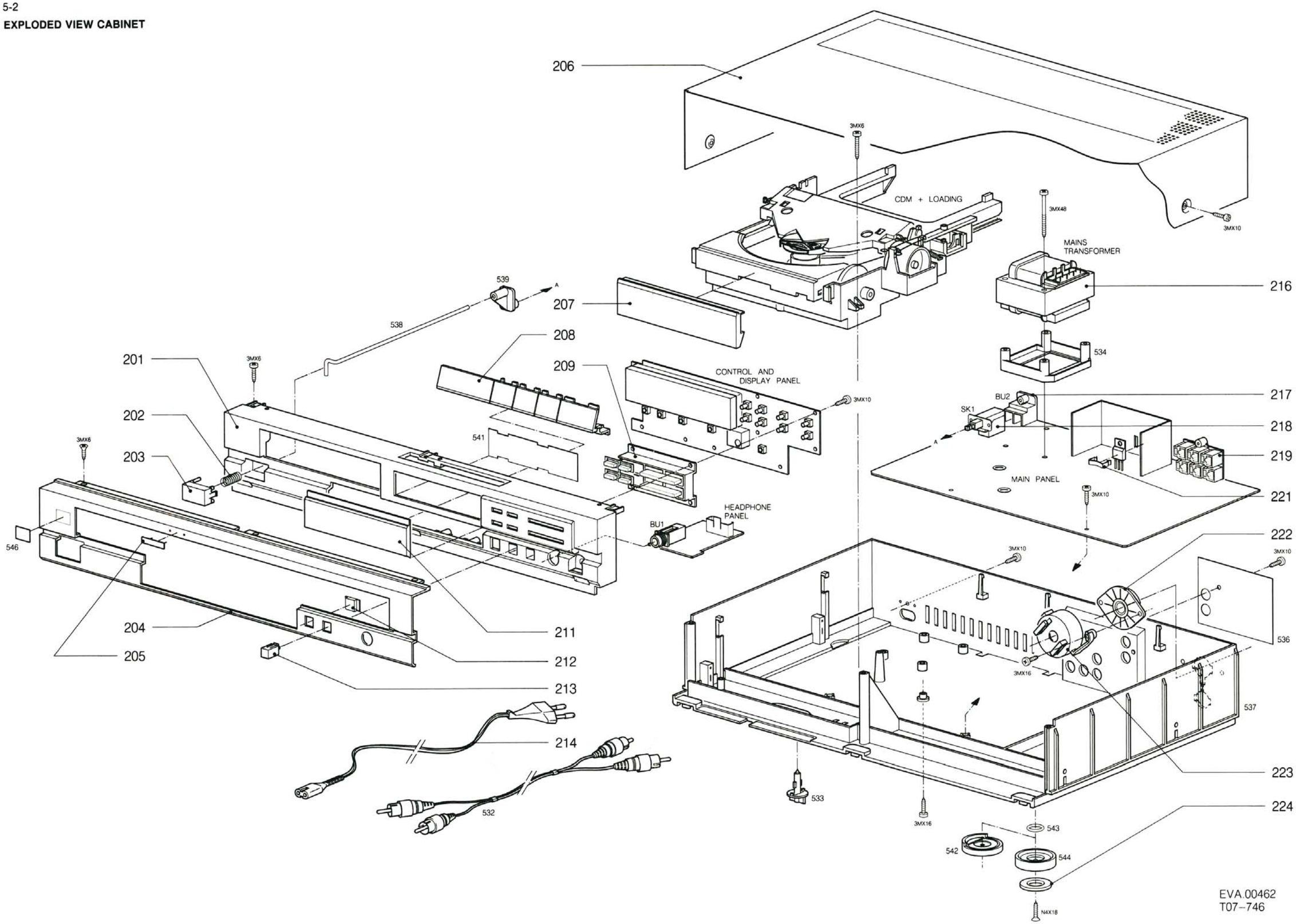
103	4822 466 92236

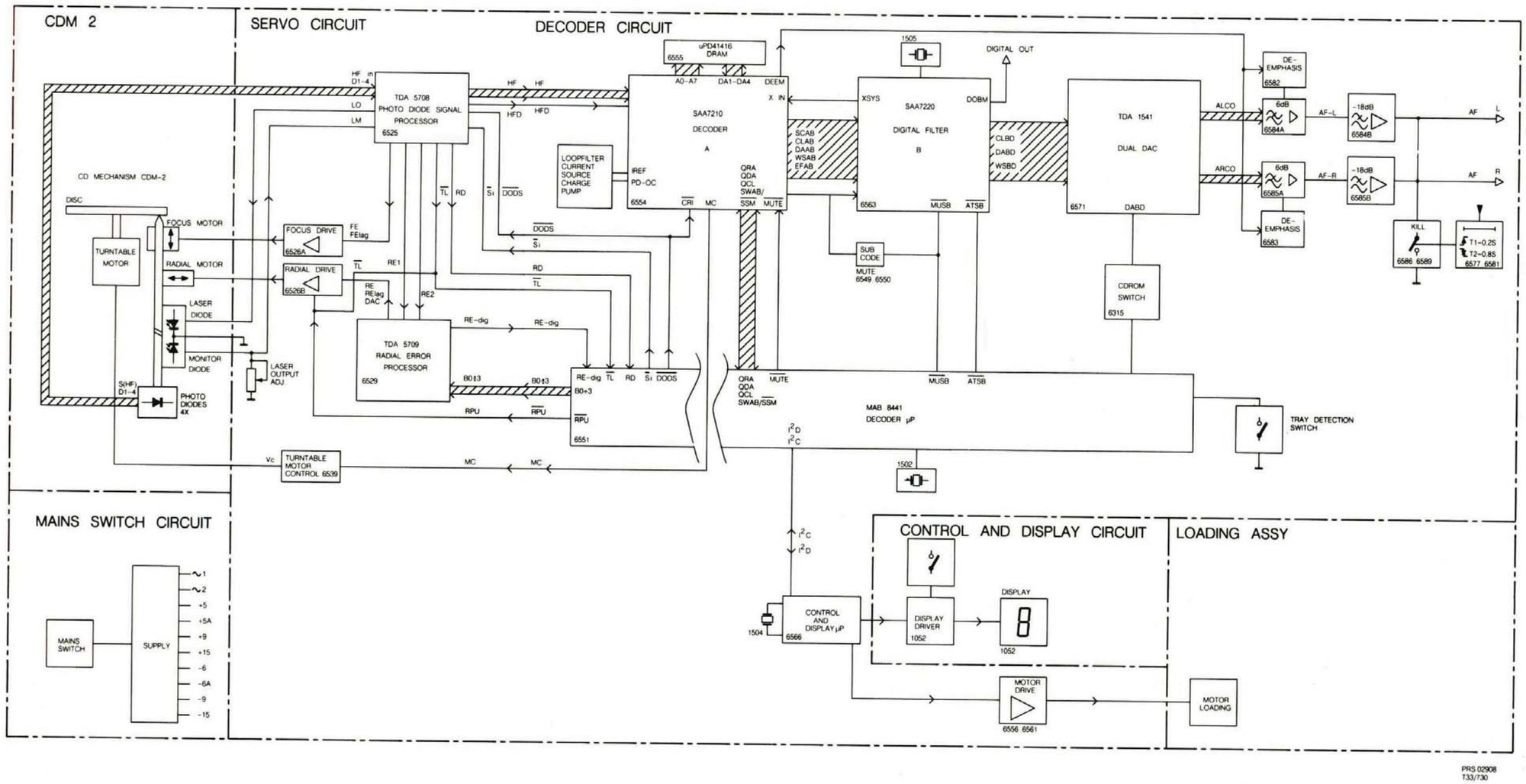
Adaptorring for CD-single
4822 466 92227

Parts list
cabinet

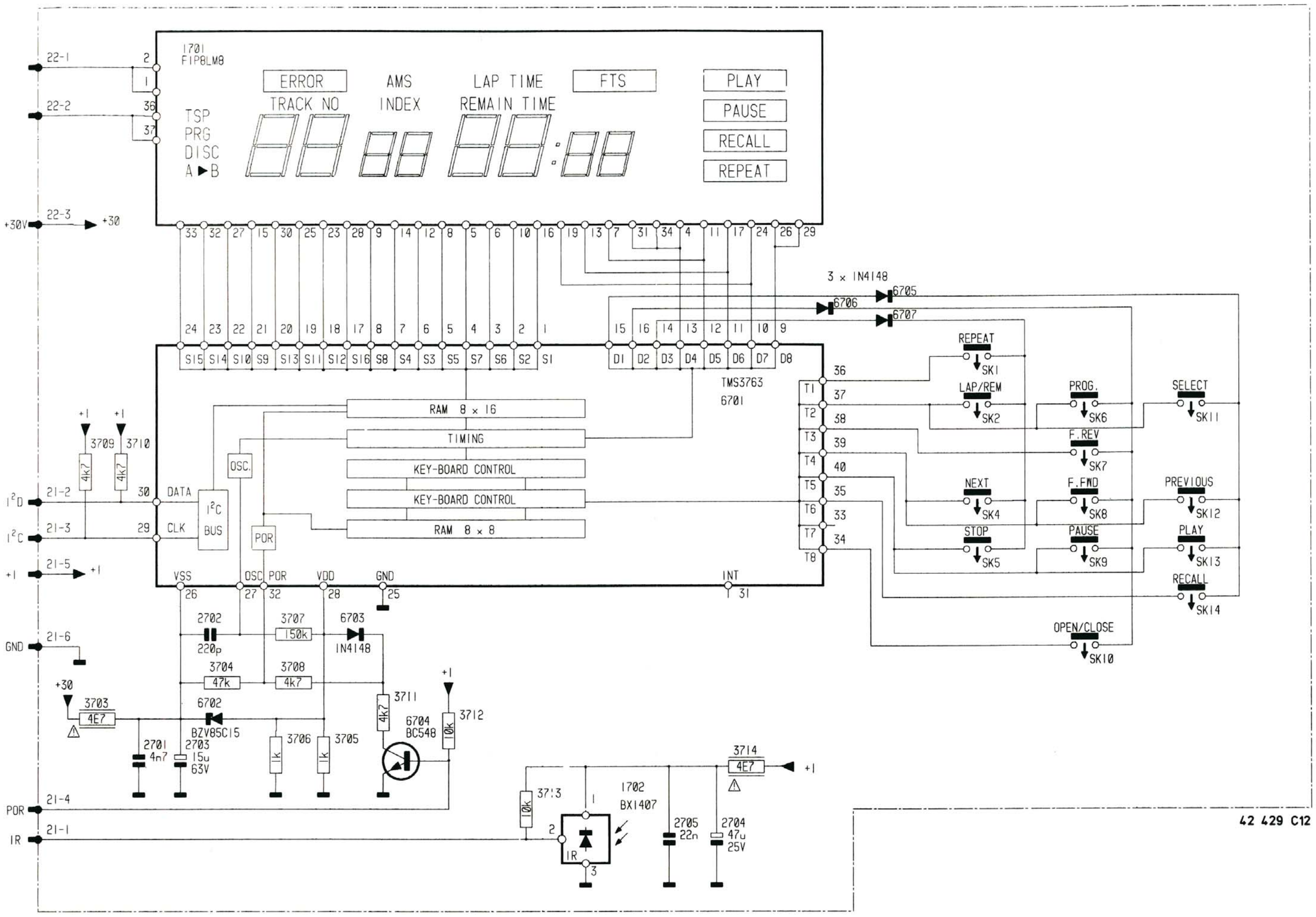
201	4822 444 40221
201	4822 444 40243 /N/A
202	4822 492 51723
203	4822 410 26145
203	4822 410 26418 /N/A
204	4822 454 30398
204	4822 454 12114 /N/A
206	4822 444 60533
206	4822 444 60564 /N/A
207	4822 444 60521
208	4822 410 26189
208	4822 410 30485 /N/A
209	4822 410 26163
209	4822 410 30484 /N/A
211	4822 381 10939
212	4822 381 10931
213	4822 410 26146
213	4822 410 30486 /N/A
214	4822 321 10523 /AB/A
214	4822 321 10457 /NB/N
214	4822 321 10522 /TB
216	4822 146 30615
217	4822 276 11309
218	4822 265 20291
219	4822 267 40741
221	4822 492 63076
222	5322 272 10215
223	4822 462 41124
224	4822 462 41162
538	4822 535 92408
533	4822 417 20158
BU1	4822 267 40661
BU1	4822 267 30688 /N/A
Dir. for use	4822 736 13733

EXPLODED VIEW CABINET



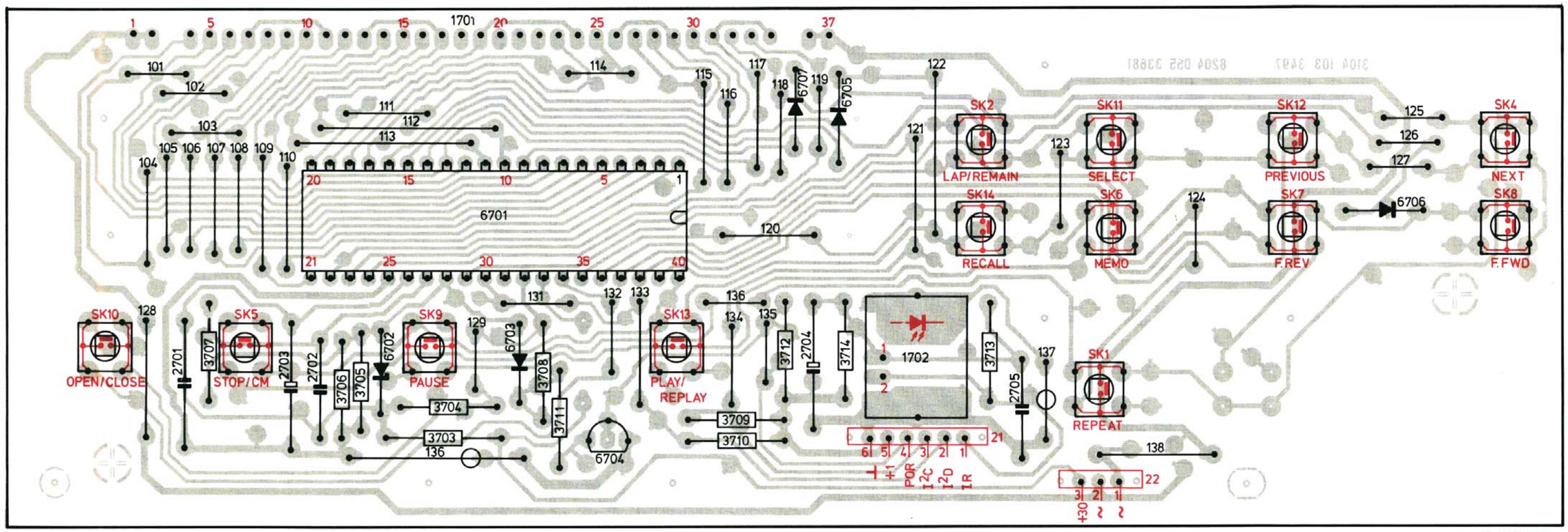


B0-B3	-	Control bits for radial circuit
DAC	-	Current output for track jumping (Digital to Analogue Converted)
$\overline{DODS}$	-	Drop out detector supression
D1+4	-	Photodiode currents
FE	-	Focus error signal
FE lag	-	Focus error signal for LAG network
HF	-	HF output for DEMOD
HFD	-	HF detector output for DEMOD
HF-in	-	HF current input
LM	-	Laser monitor diode input
LO	-	Laser amplifier current output
MC	-	Motor control signal
RE	-	Radial error signal (amplified RE_2-RE_1 currents)
RE1	-	Radial error signal 1 (summation of amplified currents D_3 and D_4
RE2	-	Radial error signal 2 (summation of amplified currents D_1 and D_2
RE dig	-	Radial error digital
RE lag	-	Radial error signal for LAG network
RD	-	Ready signal, starting up procedure finished
$\overline{RPU}$	-	Radial puls after track jumping
$\overline{Si}$	-	On/off control for laser supply and focus circuit
$\overline{TL}$	-	Track loss signal
Vc	-	Control voltage for turntable motor
$\overline{ATSB}$	-	Attenuation of Audio level in Search position (Cueing)
CD ROM Switch	-	Digital Data information on disc signal
CEFM	-	Clock Eight-to-Fourteen Modulator
CLAB	-	Clock signal Decoder-A to Filter-B
CLBD	-	Clock signal Filter-B to DAC
$\overline{CRI}$	-	Counter Reset Inhibit
DAAB	-	Data signal Decoder-A to Filter-B
DABD	-	Data signal Filter-B to DAC
$\overline{DEEM}$	-	Deemphasis
DOBM	-	Digital out signal
EFAB	-	Error flag Decoder-A to Filter-B
IREF	-	Reference Current
$\overline{MSTP}$	-	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 Filter-B
SCLK-I^2C	-	Serial Clock signal Decoder-Control µP (Inter IC Connection)
SDAB	-	Subcode data Decoder-A to Filter-B
SDAT-I^2D	-	Serial Data Signal Decoder-Control µP (Inter IC Connection)
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



42 429 C12

CS 13 570



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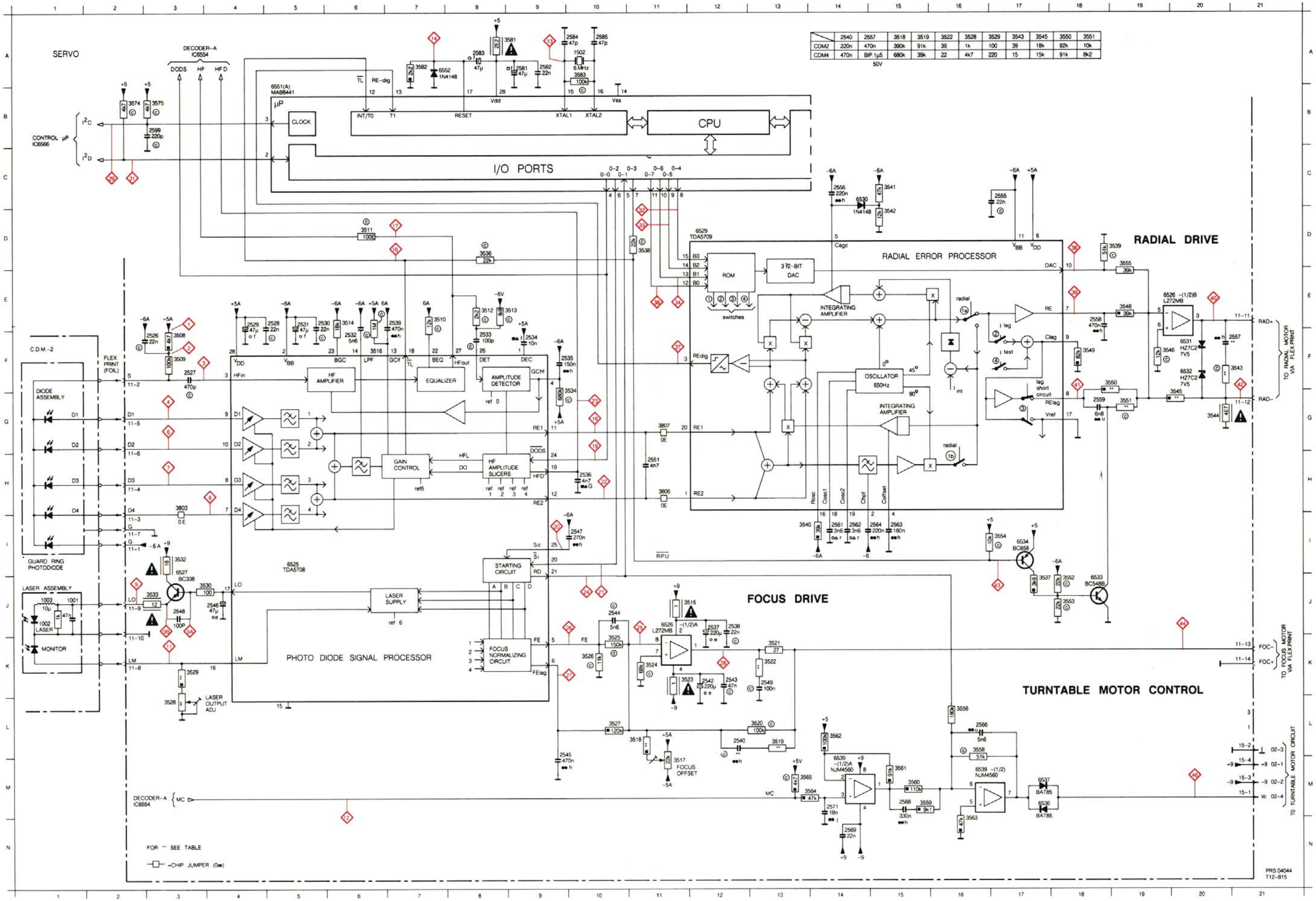

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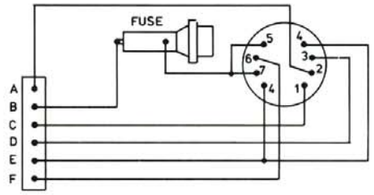
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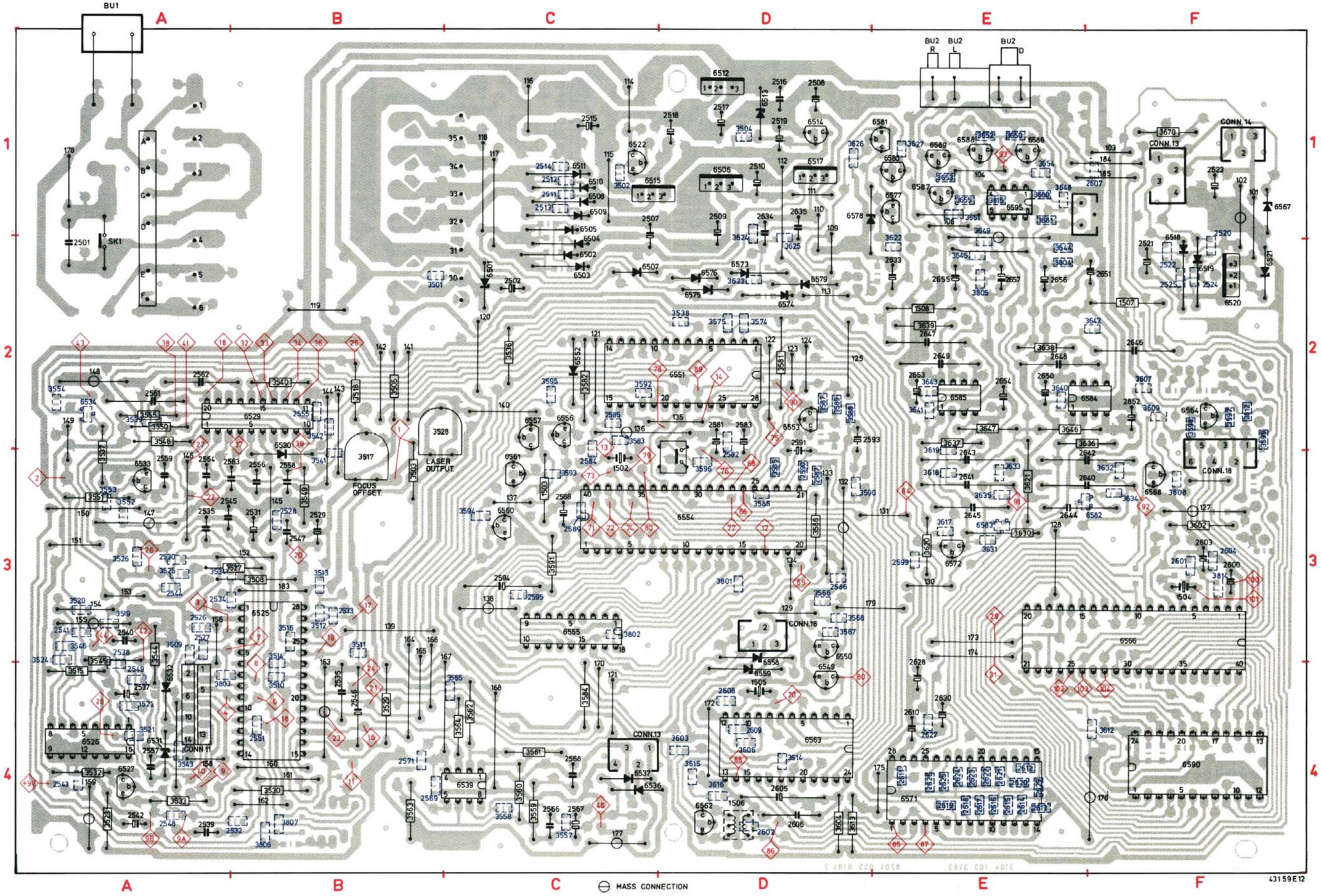
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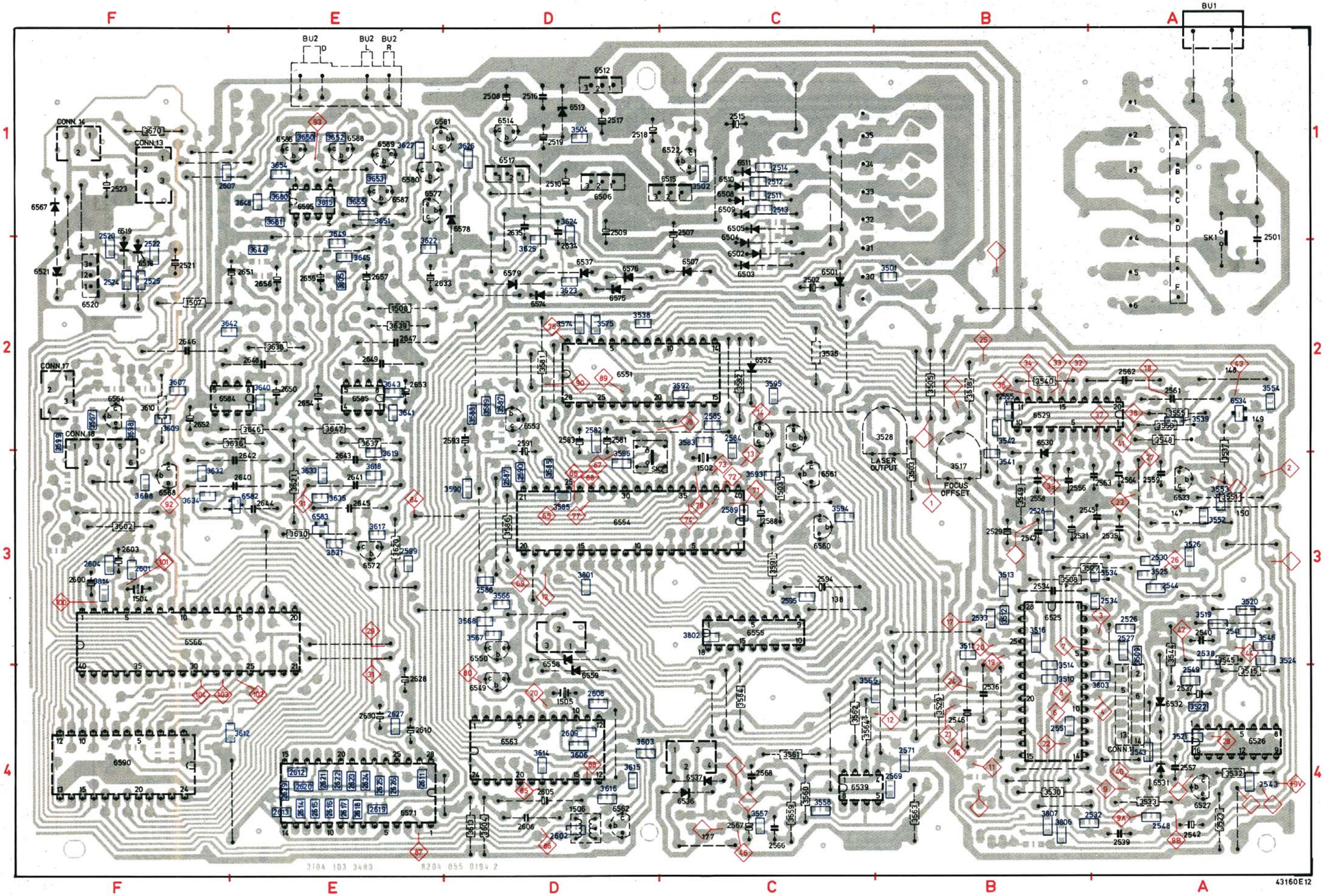

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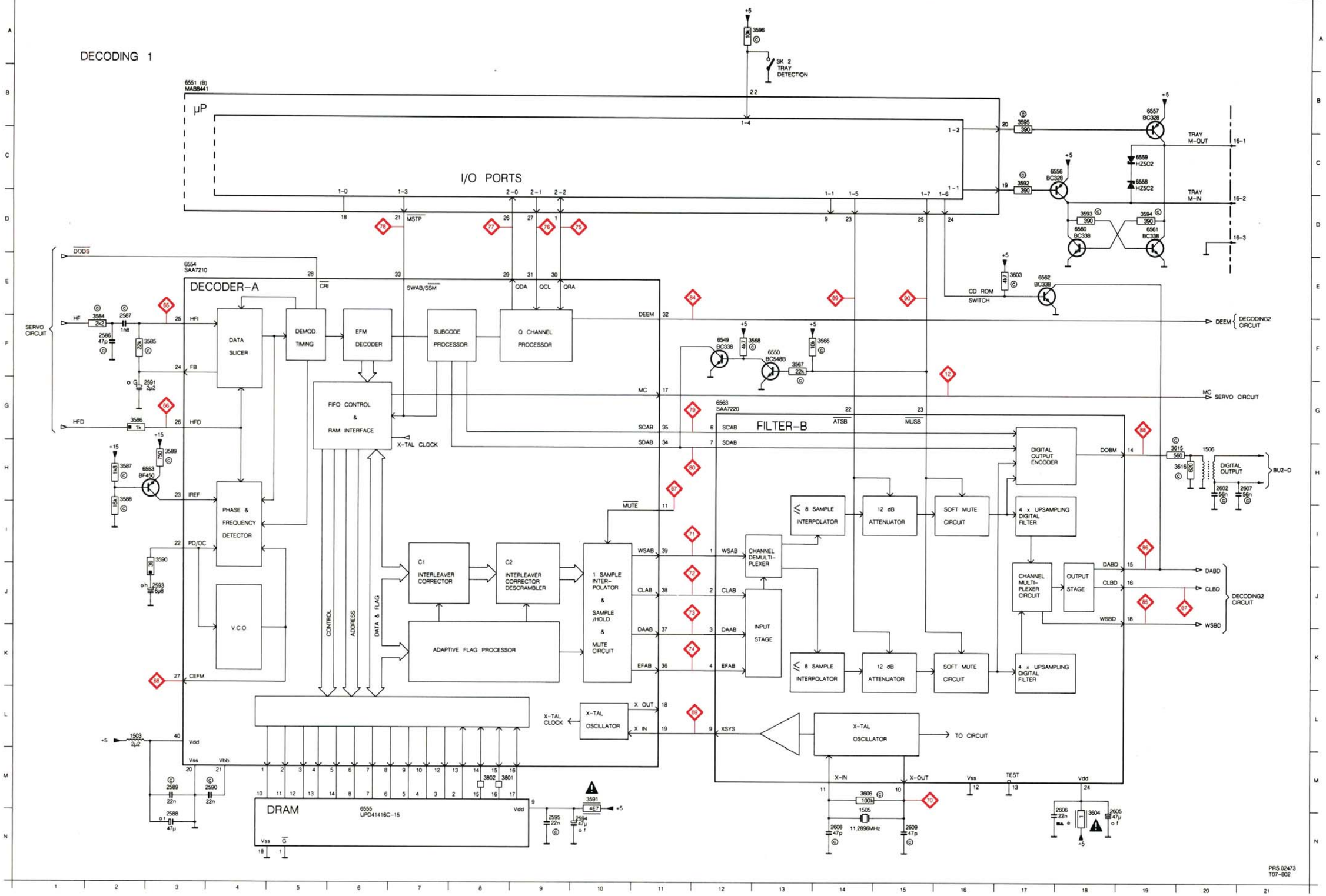

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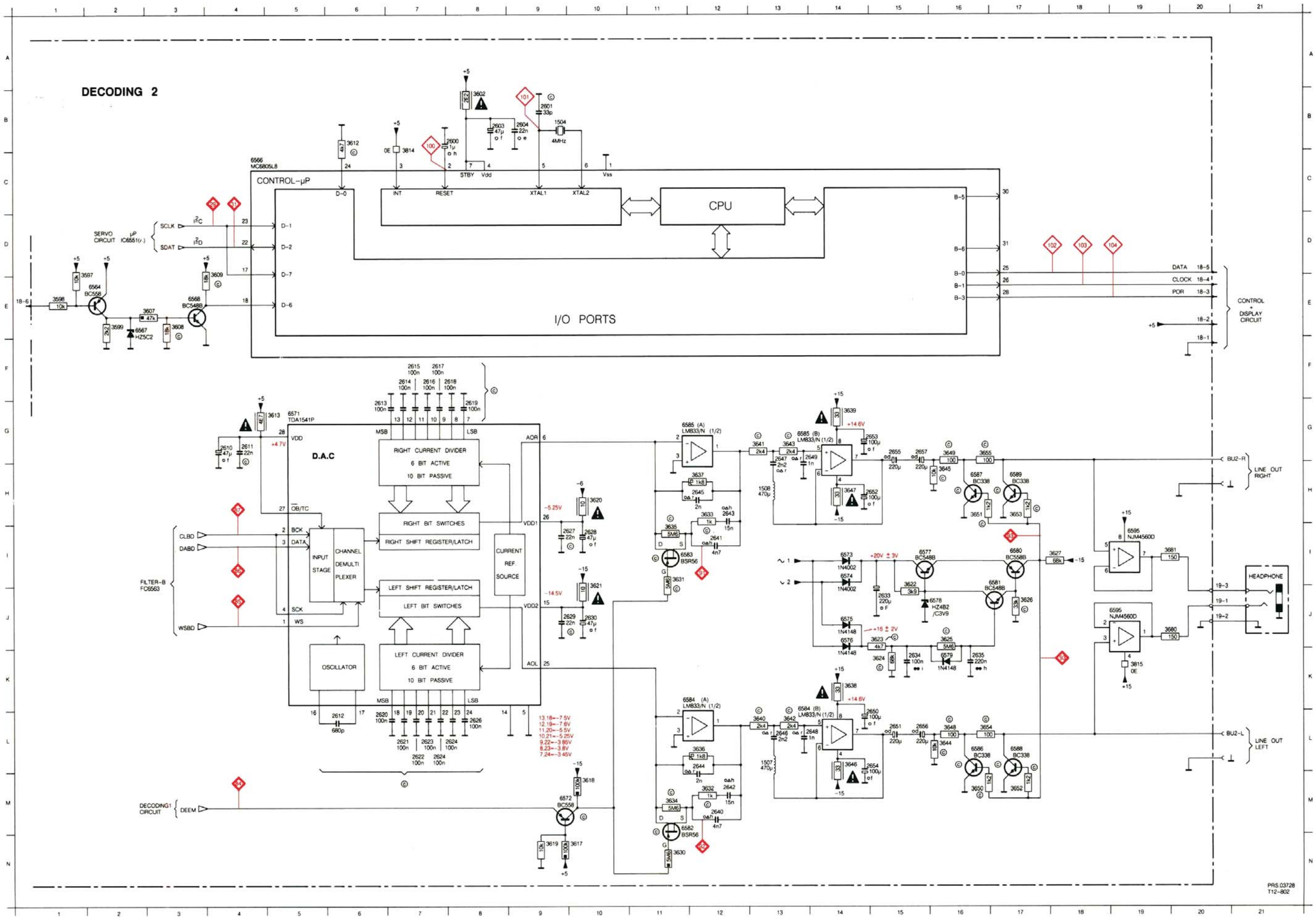

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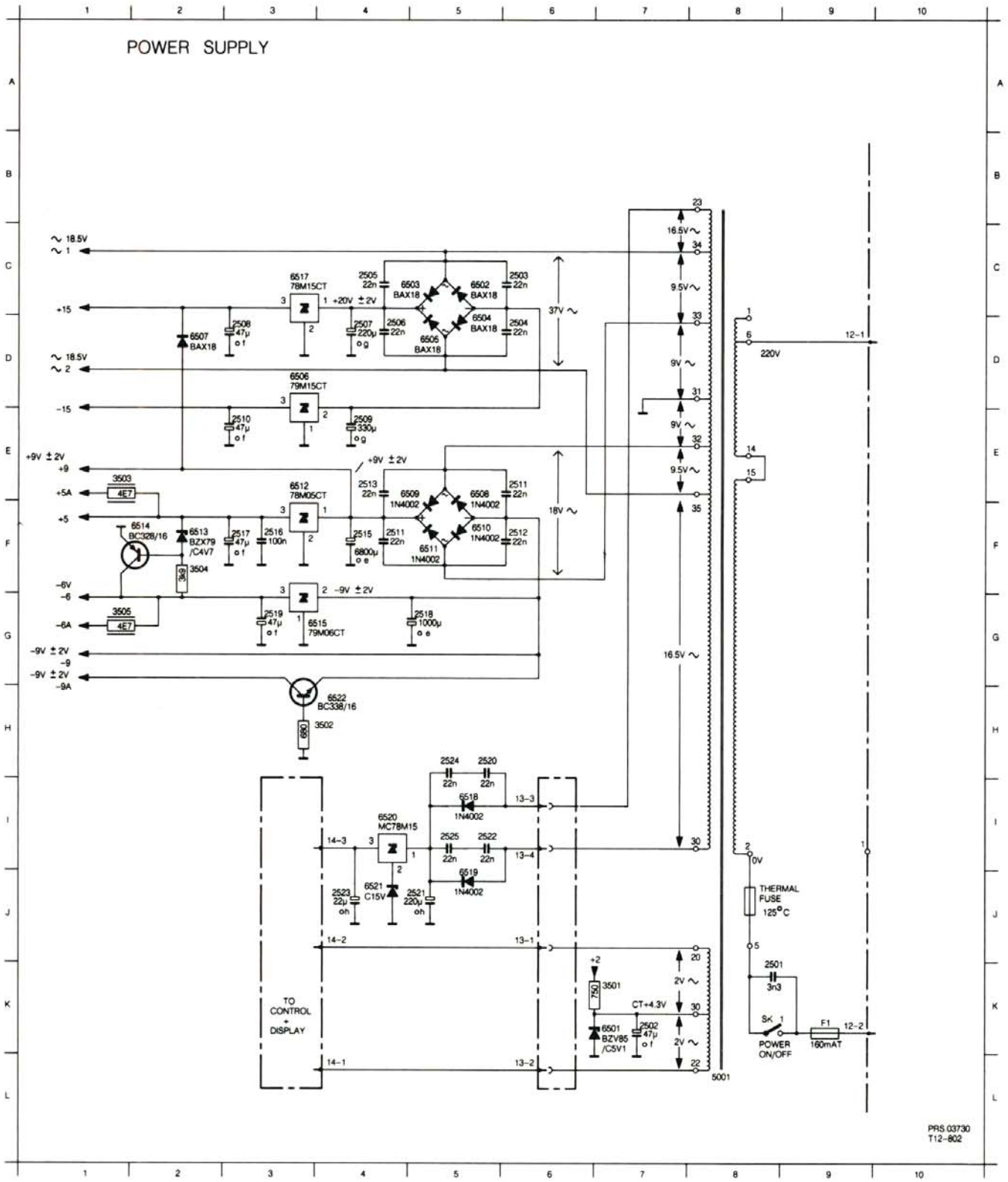
2504	D 6	2509	E 4	2513	E 4	2519	G 3	2524	H 5	3504	F 2	6503	C 4	6508	E 5	6513	F 2	6519	J 5	SK 1	K 8
2505	C 4	2510	E 3	2515	F 4	2520	H 5	2525	I 5	3505	G 1	6504	D 5	6509	E 4	6514	F 2	6520	I 4



ELECTRICAL PARTS

SAA7220	4822 209 11157
MC6805L8	4822 209 72584
MAB8441P/T120	4822 209 11544
NPD41416C-20	4822 209 50582
TDA1541	4822 209 70295
SAA7210P/04	4822 209 71001
TY40408	4822 209 71579
L272BH	4822 209 72026
LM833	4822 209 72031
MC7815CT	4822 209 80808
MC7906CT	4822 209 82056
TDA5708	4822 209 83202
TDA5709	4822 209 83203
NJM4560D	4822 209 83274
MC79M15CT	4822 209 86361
TCA0372DP2	4822 209 72587

BC548B	4822 130 40937
BC328-16(6514)	4922 130 41023
BSR56	4822 130 42633
BC328	4822 130 44104
BC338	4822 130 44121
BC558B	4822 130 44197
BF450	4822 130 44237
BC548B	4822 130 40937

IN4148	4822 130 30621
BZV85C5VI	4822 130 31456
HZ4B2	4822 130 32843
HZ7C2	4822 130 32862
HZ5B1	4822 130 32986
HZ5C2	4822 130 33293
BAX18	4822 130 34121
HZ15-3	4822 130 80138
IN4002	5322 130 30684
BAT85	4822 130 31983

1504 Crystal 4000 kHz	4822 242 70831
1502 Crystal 6000 kHz	4822 242 71508
1505 Crystal 11.289 Mhz	4822 242 71644

1503 Coil 2,2 µH	4822 157 50963
1506 Transformer	4822 148 80281
1507	
1508 Coil 470 µH	4822 157 51193

2568 330 N 63V	4822 121 43048
2534 10 N 25V	4822 122 10177
2501 3 N 3 400V	4822 122 40327
2557 1 µ 5 bip 50V	4822 124 21918
2651 100 µ bip 16V	4822 124 22339
2567 2 µ 2 bip 50V	4822 124 22341

3517 Trim 22K	4822 100 11193
3528 Trim 1K	4822 100 20151
TRIM 4 k 7 (CDM4)	4822 101 10685
Safety res. 1E	4822 111 30483
Safety res. 2E2	4822 111 30492
Safety res. 4E7	4822 111 30499
Safety res. 10E	4822 111 30508
Safety res. 12E	4822 111 30511
Safety res. 18E	4822 111 30515
Safety res. 33E	4822 111 30522

MISCELLANEOUS

Mains switch	4822 276 11309

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1 pF	5%	4822 122 32479
1,2 pF	5%	4822 122 33013
1,5 pF	5%	4822 122 31792
1,8 pF	5%	4822 122 32087
2,2 pF	5%	4822 122 32425
3,3 pF	5%	4822 122 32079
3,9 pF	5%	4822 122 32081
4,7 pF	5%	4822 122 32082
5,6 pF	5%	4822 122 32506
6,8 pF	5%	4822 122 32507
8,2 pF	5%	4822 122 32083
10 pF	5%	4822 122 31971
12 pF	5%	4822 122 32139
15 pF	5%	4822 122 32504
18 pF	5%	4822 122 31769
22 pF	10%	4822 122 31837
27 pF	5%	4822 122 31966
33 pF	5%	4822 122 31756
39 pF	5%	4822 122 31972
47 pF	5%	4822 122 31772
56 pF	5%	4822 122 31774
68 pF	5%	4822 122 31961
82 pF	10%	4822 122 31839
100 pF	5%	4822 122 31765
120 pF	5%	4822 122 31766
150 pF	5%	4822 122 31767
180 pF	2%	4822 122 31794
220 pF	5%	4822 122 31965
270 pF	5%	4822 122 32142
330 pF	10%	4822 122 31642
390 pF	5%	4822 122 31771
470 pF	5%	4822 122 31727
560 pF	5%	4822 122 31773
680 pF	5%	4822 122 31775
820 pF	5%	4822 122 31974
1 nF	10%	5322 122 31647
1,2 nF	5%	4822 122 31807
1,5 nF	10%	4822 122 31781
1,8 nF	10%	4822 122 32153
2,2 nF	10%	4822 122 31644
2,7 nF	10%	4822 122 31783
3,3 nF	10%	4822 122 31969
3,9 nF	10%	4822 122 32566
4,7 nF	10%	4822 122 31784
5,6 nF	10%	4822 122 31916
6,8 nF	10%	4822 122 31976
10 nF	10%	4822 122 31728
12 nF	10%	5322 122 31648
15 nF	10%	4822 122 31782
18 nF	10%	4822 122 31759
22 nF	10%	4822 122 31797
27 nF	10%	4822 122 32541
33 nF	10%	4822 122 31981
47 nF	10%	4822 122 32542
56 nF	10%	4822 122 32183
100 nF	10%	4822 122 31947
180 nF	10%	4822 122 32915
220 nF	20%	4822 122 32715

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0 E	jumper	4822 111 90163
1 E	5%	4822 111 90184
1,1 E	5%	4822 111 90377
1,2 E	5%	4822 111 90378
1,3 E	5%	4822 111 90379
1,5 E	5%	4822 111 90381
1,6 E	5%	4822 111 90382
1,8 E	5%	4822 111 90383
2 E	5%	4822 111 90384
2,2 E	5%	5322 111 90104
2,4 E	5%	4822 111 90385
2,7 E	5%	4822 111 90386
3 E	5%	4822 111 90387
3,3 E	5%	4822 111 90388
3,6 E	5%	4822 111 90389
3,9 E	5%	4822 111 90391
4,3 E	5%	4822 111 90392

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4,7 E	5%	5322 111 90376
5,1 E	5%	4822 111 90393
5,6 E	5%	4822 111 90394
6,2 E	5%	4822 111 90395
6,8 E	5%	4822 111 90254
7,5 E	5%	4822 111 90396
8,2 E	5%	4822 111 90397
9,1 E	5%	4822 111 90398
10 E	2%	5322 111 90095
11 E	2%	4822 111 90338
12 E	2%	4822 111 90341
13 E	2%	4822 111 90343
15 E	2%	4822 111 90344
16 E	2%	4822 111 90347
18 E	2%	5322 111 90139
20 E	2%	4822 111 90352
22 E	2%	4822 111 90186
24 E	2%	4822 111 90355
27 E	2%	5322 111 90105
30 E	2%	4822 111 90356
33 E	2%	4822 111 90357
36 E	2%	4822 111 90359
39 E	2%	4822 111 90361
43 E	2%	5322 116 90125
47 E	2%	4822 111 90217
51 E	2%	4822 111 90365
56 E	2%	4822 111 90239
62 E	2%	4822 111 90367
68 E	2%	4822 111 90203
75 E	2%	4822 111 90371
82 E	2%	4822 111 90124
91 E	2%	4822 111 90375
100 E	2%	5322 111 90091
110 E	2%	4822 111 90335
120 E	2%	4822 111 90339
130 E	2%	4822 111 90164
150 E	2%	5322 111 90098
160 E	2%	4822 111 90345
180 E	2%	5322 111 90242
200 E	2%	4822 111 90348
220 E	2%	4822 111 90178
240 E	2%	4822 111 90353
270 E	2%	4822 111 90154
300 E	2%	4822 111 90156
330 E	2%	5322 111 90106
360 E	1%	4822 111 90288
360 E	2%	4822 111 90358
390 E	2%	5322 111 90138
430 E	2%	4822 111 90362
470 E	2%	5322 111 90109
510 E	2%	4822 111 90245
560 E	2%	5322 111 90113
620 E	2%	4822 111 90366
680 E	2%	4822 111 90162
750 E	2%	5322 111 90306
820 E	2%	4822 111 90171
910 E	2%	4822 111 90372
1 k	2%	5322 111 90092
1,1 k	2%	4822 111 90336
1,2 k	2%	5322 111 90096
1,3 k	2%	4822 111 90244
1,5 k	2%	4822 111 90151
1,6 k	2%	5322 111 90265
1,8 k	2%	5322 111 90101
2 k	2%	4822 111 90165
2,2 k	2%	4822 111 90248
2,4 k	2%	4822 111 90289
2,7 k	2%	4822 111 90569
3 k	2%	4822 111 90198
3,3 k	2%	4822 111 90157
3,6 k	2%	5322 111 90107
3,9 k	2%	4822 111 90571
4,3 k	2%	4822 111 90167
4,7 k	2%	5322 111 90111
5,1 k	2%	5322 111 90268
5,6 k	2%	4822 111 90572
6,2 k	2%	4822 111 90545

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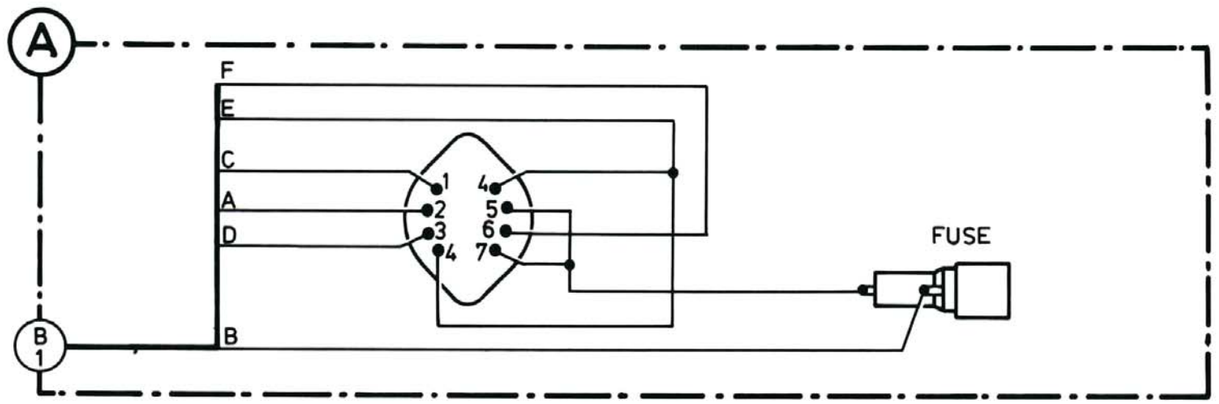
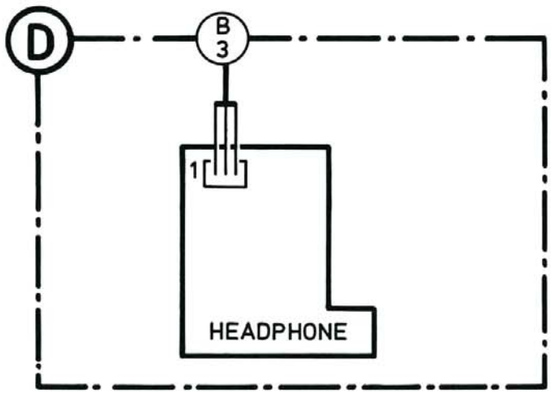
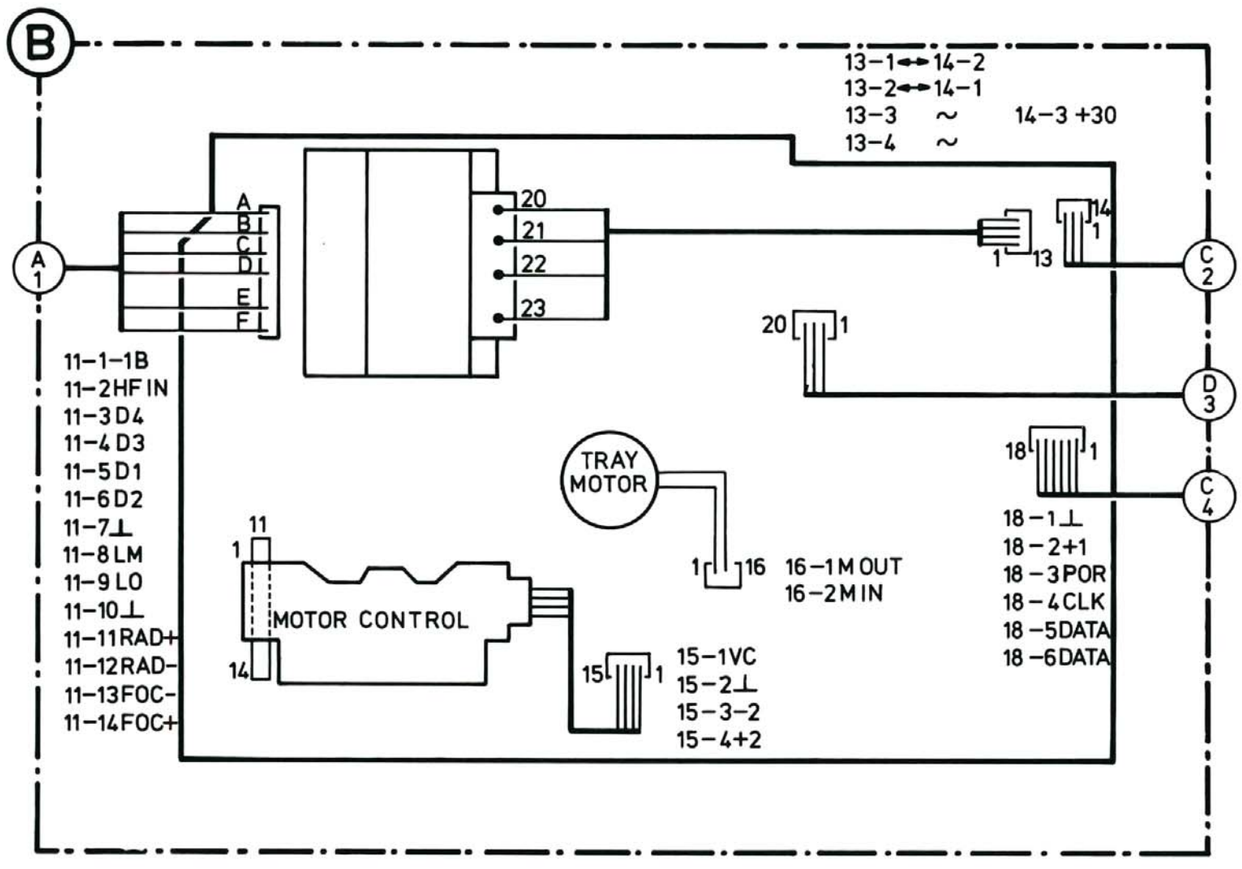
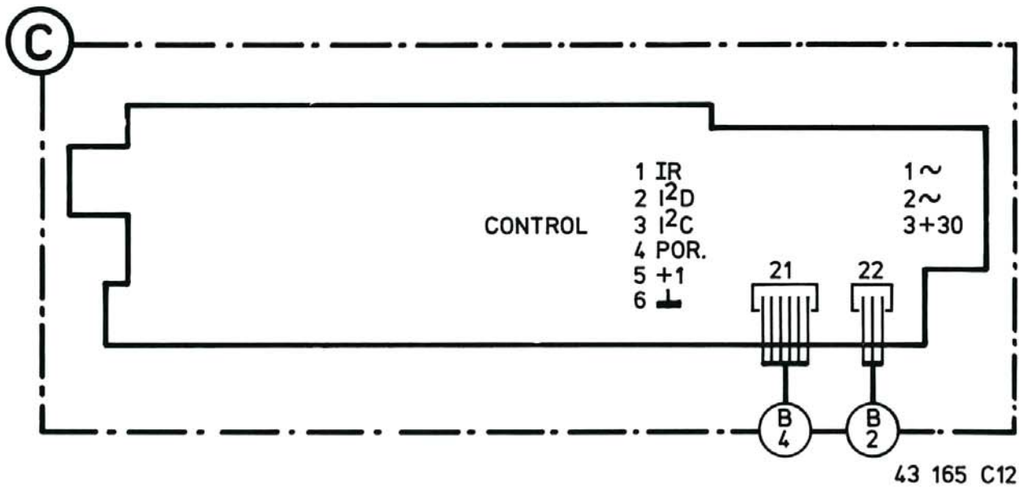
6,8 k	2%	4822 111 90544
7,5 k	2%	4822 111 90276
8,2 k	2%	5322 111 90118
9,1 k	2%	4822 111 90373
10 k	2%	4822 111 90249
11 k	2%	4822 111 90337
12 k	2%	4822 111 90253
13 k	2%	4822 111 90509
15 k	2%	4822 111 90196
16 k	2%	4822 111 90346
18 k	2%	4822 111 90238
20 k	2%	4822 111 90349
22 k	2%	4822 111 90251
24 k	2%	4822 111 90512
27 k	2%	4822 111 90542
30 k	2%	4822 111 90216
33 k	2%	5322 111 90267
36 k	2%	4822 111 90514
39 k	2%	5322 111 90108
43 k	2%	4822 111 90363
47 k	2%	4822 111 90543
51 k	2%	5322 111 90274
56 k	2%	4822 111 90573
62 k	2%	5322 111 90275
68 k	2%	4822 111 90202
75 k	2%	4822 111 90574
82 k	2%	4822 111 90575
91 k	2%	5322 111 90277
100 k	2%	4822 111 90214
110 k	2%	5322 111 90269
120 k	2%	4822 111 90568
130 k	2%	4822 111 90511
150 k	2%	5322 111 90099
160 k	2%	5322 111 90264
180 k	2%	4822 111 90565
200 k	2%	4822 111 90351
220 k	2%	4822 111 90197
240 k	2%	4822 111 90215
270 k	2%	4822 111 90302
300 k	2%	5322 111 90266
330 k	2%	4822 111 90513
360 k	2%	4822 111 90515
390 k	2%	4822 111 90182
430 k	2%	4822 111 90168
470 k	2%	4822 111 90161
510 k	2%	4822 111 90364
560 k	2%	4822 111 90169
620 k	2%	4822 111 90213
680 k	2%	4822 111 90368
750 k	2%	4822 111 90369
820 k	2%	4822 111 90205
910 k	2%	4822 111 90374
1 M	2%	4822 111 90252
1,1 M	5%	4822 111 90408
1,2 M	5%	4822 111 90409
1,3 M	5%	4822 111 90411
1,5 M	5%	4822 111 90412
1,6 M	5%	4822 111 90413
1,8 M	5%	4822 111 90414
2 M	5%	4822 111 90415
2,2 M	5%	4822 111 90185
2,4 M	5%	4822 111 90416
2,7 M	5%	4822 111 90417
3 M	5%	4822 111 90418
3,3 M	5%	4822 111 90191
3,6 M	5%	4822 111 90419
3,9 M	5%	4822 111 90421
4,3 M	5%	4822 111 90422
4,7 M	5%	4822 111 90423
5,1 M	5%	4822 111 90424
5,6 M	5%	4822 111 90425
6,2 M	5%	4822 111 90426
6,8 M	5%	4822 111 90235
7,5 M	5%	4822 111 90427
8,2 M	5%	4822 111 90237
9,1 M	5%	4822 111 90428
10M	5%	5322 111 91141

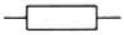
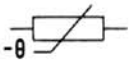
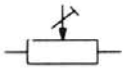
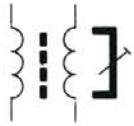

A
F
E
C
A
D
B
1
2
3
4
5
6
7
FUSE
B
1

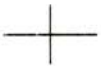
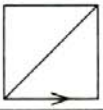
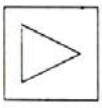

D
B
3
1
HEADPHONE

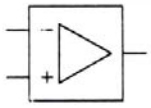
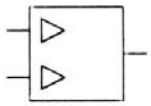
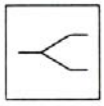
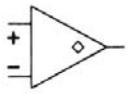
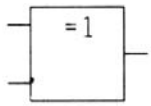
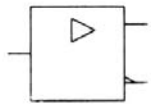
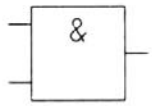
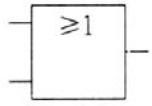
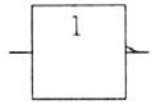

B
13–1 ↔ 14–2
13–2 ↔ 14–1
13–3 ~
13–4 ~
14–3 +30
A
1
A
B
C
D
E
F
11–1–1B
11–2HF IN
11–3D4
11–4D3
11–5D1
11–6D2
11–7⊥
11–8LM
11–9LO
11–10⊥
11–11RAD+
11–12RAD–
11–13FOC–
11–14FOC+
20
21
22
23
1
13
14
1
C
2
20
1
D
3
TRAY
MOTOR
1
16
16–1M OUT
16–2M IN
18
1
C
4
18–1⊥
18–2+1
18–3POR
18–4CLK
18–5DATA
18–6DATA
11
1
MOTOR CONTROL
14
15
1
15–1VC
15–2⊥
15–3–2
15–4+2

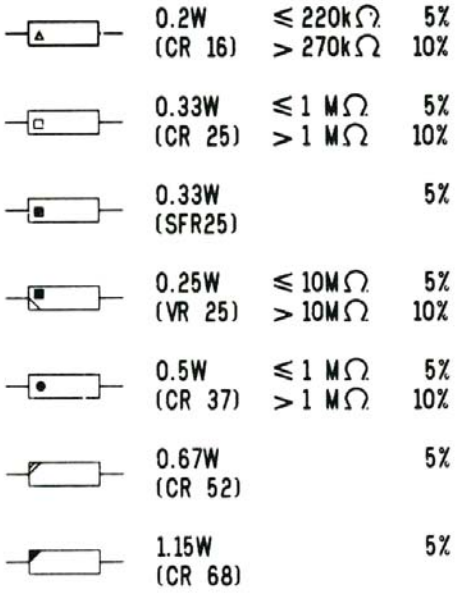

C
CONTROL
1 IR
2 I²D
3 I²C
4 POR.
5 +1
6 ⊥
1 ~
2 ~
3+30
21
22
B
4
B
2

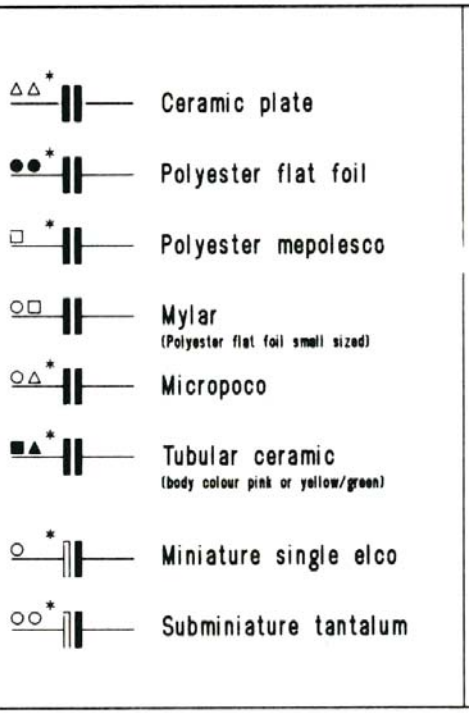
43 165 C12

SYMBOL	DESCRIPTION
	Capacitor, general
	Electrolytic capacitor (+ and - may be omitted)
	Bipolar electrolytic capacitor (+ may be omitted)
	Resistor, general
	N.T.C. resistor
	P.T.C. resistor
	Voltage divider with preset adjustment
	Chip jumper
	Pin contact
	Bus contact
	Coil, self-induction
	Transformer with electrically poor conducting core and adjustable pre-magnetization
	Diode
	Zener diode
	Stabistor
	Double variable capacity diode (in one envelope)
	Photo conductive diode
	L.E.D.

SYMBOL	DESCRIPTION
	Transistor (N.P.N.)
	Transistor (P.N.P.)
	Direct current (DC)
	Alternating current (AC)
	Earth (functional)
	Frame or chassis connection
	Direction in which AC voltages are passed on (optional present)
	Interrupted line
	Not-connected crossing lines
	Connected lines
	Cable tree with lead-outs
	Changer, general (arrow is optional)
	Voltage Controlled Oscillator
	Band-pass filter
	Phase changing network
	Delay element
	Amplifier, general

SYMBOL	DESCRIPTION
	Operational amplifier
	Differential amplifier
	Splitter
	Operational amplifier with open output
	Exclusive OR gate
	True/complement amplifier with high input
	Flip Flop
	AND gate
	OR gate
	Inverter with high input





MDA.00084

CHANGES

Description		Reason
Introductions with A88-216 from marking AH01 and AH02		
– Front page		Version /A added
– Table of contents	**1-1-a**	Contents adapted
– Exploded view Tray mechanism	**5-1-a**	Adaptation for 8 cm CD-single
– Diagram of the servo	**6-4-a**	Table added because of the introduction of e CDM-4
– Electrical parts	**6-9-a**	Components added
– Technical data	**8-1**	Laser current adjustment for the CDM-4
– Servicing Hints	**8-2**	A separate manual for the CDM-4 will not be published.
– Servicing Hints	**8-3**	Therefore these pages are added to the existing manual.
– Measurements and adjustments	**8-4**	
– Measurements and adjustments, laser adjustment	**8-5**	
– Exploded view CDM-4	**8-6**	
– Motor circuit	**8-7**	

2. TECHNICAL DATA

General

- Application: Compact Disc "Home Player"
- Single–stage radial and balanced actuator for track following
- Track following error detection method : Push–Pull
- Focus error detection method : Double Foucault
- Dimensions: 130 x 100 x 44 mm
- Weight : abt. 270 grams

Radial actuator

- Swing angle: 72°
- Diameter readout range: from 47.4 mm ± 0.6 mm to 117.5 mm ± 0.5 mm
- Squareness relative to turntable: 90° ± 0.4°
- Bearing friction: 0.75 mNm max.
- Total ohmic resistance of the coils: 20 Ω ± 2 Ω
- Maximum allowable voltage: 14V/DC continuous
- K factor: 0.019 Nm/A (± 20%)

Focus actuator

- Vertical amplitude: 1.9 mm ± 0.2 mm
- DC voltage across the focus motor in focus: between –0.8V and +0.7V.
- Sensitivity: 21 mm/A
- Ohmic resistance: 23.5 Ω ± 2.5Ω
- Maximum allowable voltage: 8V/DC continuous

Laser diode LTO 22MC

- Wave length: 780 nm ± 10 nm
- Light energy: 3 mW
- Voltage across the diode at 3mW: typical = 1.75 V, max. = 2.2 V

Turntable motor

- Hall motor

3. 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.

ESD

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.

For measurements and adjustments it is possible to position the working mechanism outside the set.
For this purpose, an extension cable can be made from the following parts.

- Service flat cable (14-pole) 4822 322 40066
- Service connector (14-pole) 4822 290 60602

These two items should be used to assemble an extension cable between the connector and the flex cable of the CDM-4 unit.
The two connections to the motor should be lengthened with loose wires.

Remark: The service cable should be assembled as follows; (see Fig. 1)

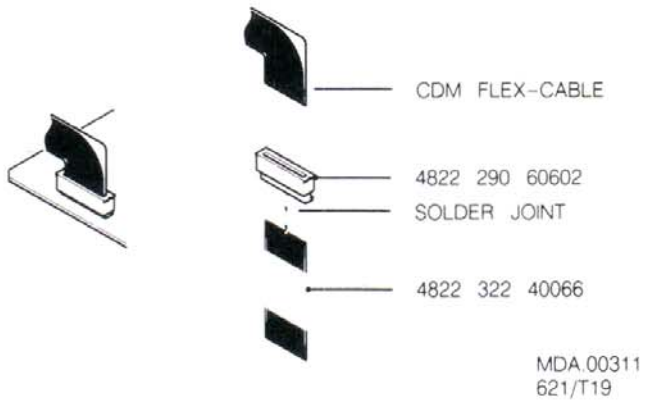


Fig. 1.

Service aids

Audio test disc (test disc 3)	4822 397 30085
Disc without errors (test disc 5)	
Disc with DO errors,	
black spots and fingerprints (test disc 5A)	4822 397 30096
Disc hold-down	see page 8-3
Torx screwdrivers	
Set (straight)	4822 395 50145
Set (square)	4822 395 50132
Glass disc	4822 395 90204

Demounting the Rafoc unit

- Take the CD-mechanism out of the set.
- Remove the flexible PCB from the connector on the PCB by lifting the upper part of the connector and taking the flexible PCB out. (see Fig. 2)

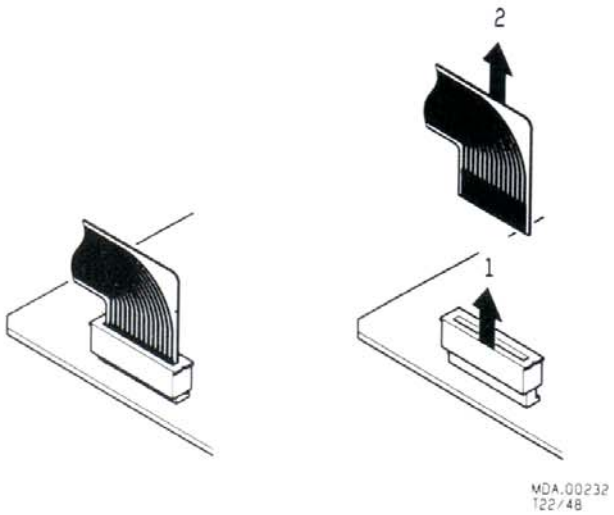


Fig. 2

- The RAFOC unit can be removed after the two fixing screws M3 x 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. 56, 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 necassary to glue the flexible PCB with a fast-drying glue to prevent the RAFOC unit from rubbing against the flexible PCB.
  The glueing should be done very carefully.
- When the laser and/or the monitor diodes are defective, it will be necessary to replace the complete CDM unit.
- 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.
  For servicing positions see the service manual of the set.
- After mounting, the angle setting should be adjusted.

Replacing the flexible PCB item 54

- Demount the RAFOC unit.
- Desolder the connections A (see Fig. 3) of the flexible PCB.

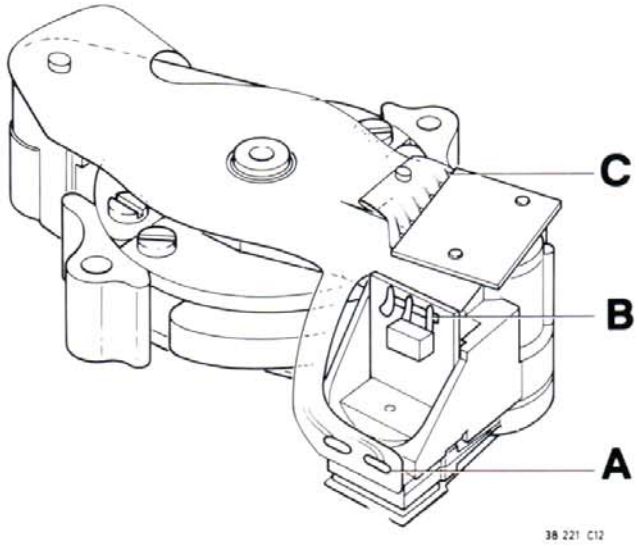


Fig. 3

- 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 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.

Mounting the flexible PCB (item 54).

- Solder the 4 connections of the radial coils.
- Apply the connections A and B (see Fig. 3).
- 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).
- Then the 6 connections C can be heated so that they become soldered to the photodiode PCB.

Replacing electrical components

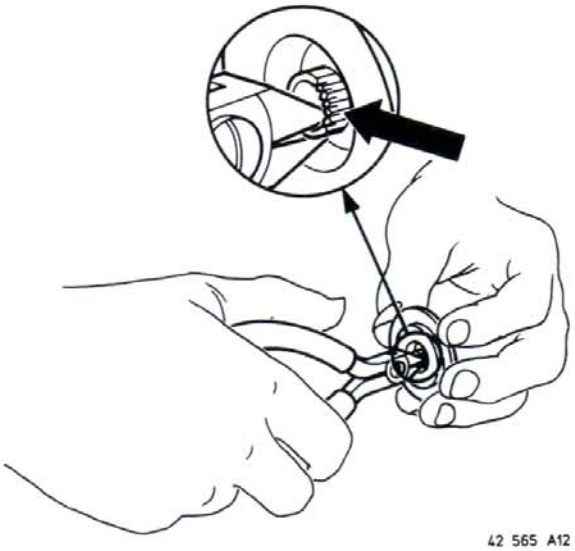
- If one of the following components is defective: photodiodes, laser diode, focus motor, radial actuator turntable motor, the entire CDM unit should be replaced.

A service disc-holddown

The disc should always bed down well on the turntable. If the mechanism has to be dismounted for repair, a service disc-holddown should be used.
The CD mechanism then can function normally as in the set.

Compose a service Disc hold-down in the following way

- Cut in the most inner ring of a disc hold-down (4822 462 50383) with small and sharp nippers. See fig. below.
- Enlarge the diameter of the innermost ring slightly with the hind part of a pencil of ballpoint, so that it jams onto the turntable with sufficient force.
- If the jamming force decreases after a certain time of use, the diameter has to be enlarged with a pencil or ballpoint again.



Replacing chip components

Leadless components have been applied in the set.
For the insertion and removal of leadless components see the figure on page 3-1.

4. MEASUREMENTS AND ADJUSTMENTS

Checking the angle setting

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

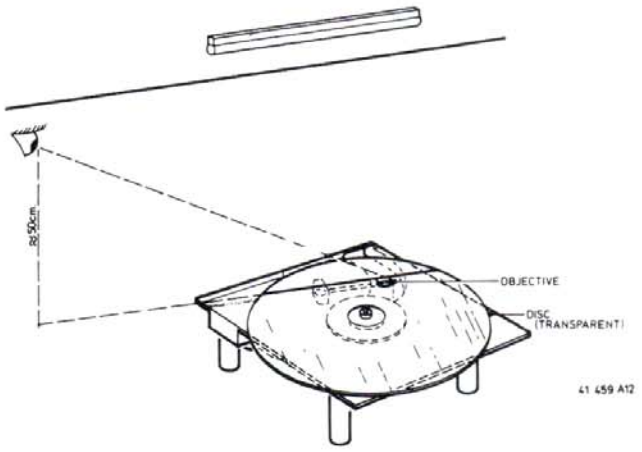


Fig. 4

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.
Locate the CDM in such a way that the line reflected by the glass disc runs across the centre of the objective.
The line reflected by the objective should fall just within the surface of the objective. If this is the case, the two lines are not more than 4 mm apart and squareness is correct.

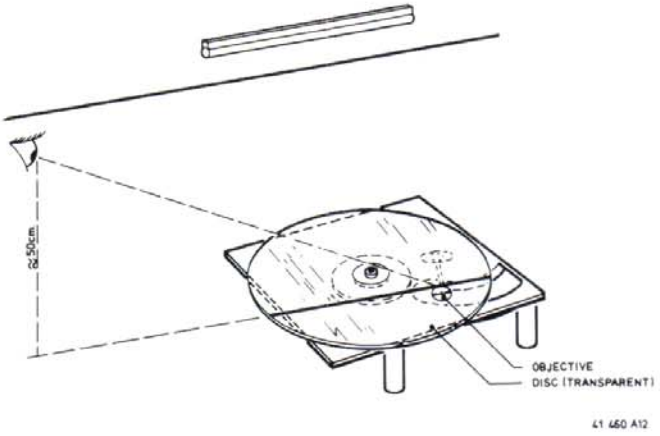


Fig. 5

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 settig one or both of the two locking knocks for the bearing plate on pos. 59 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:

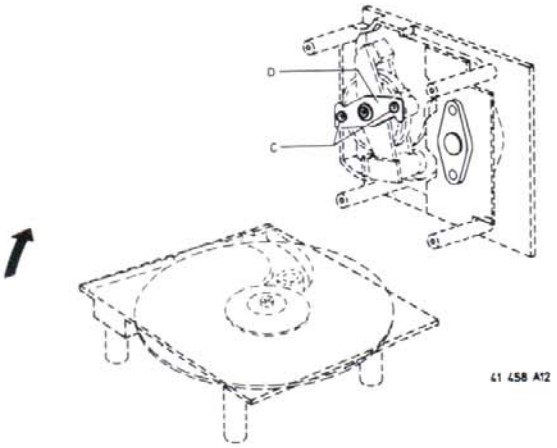


Fig. 6

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.

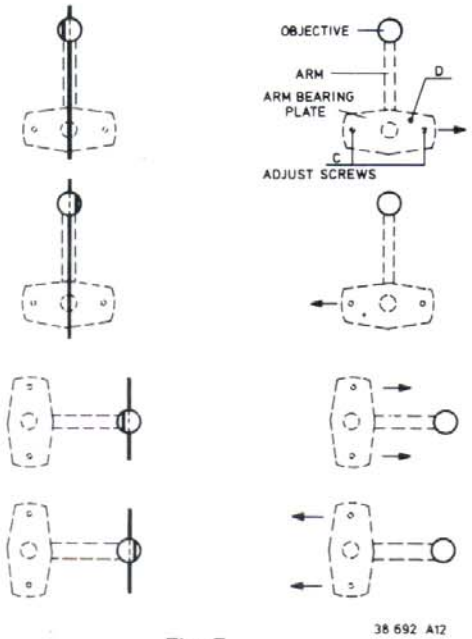
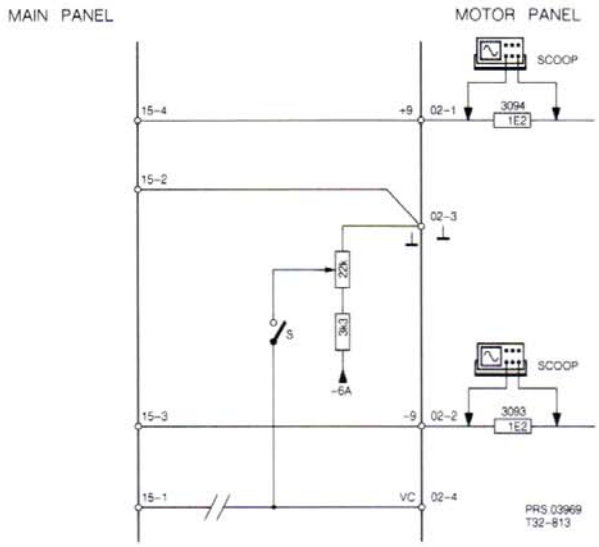


Fig. 7

Laser adjustment for CDM4

- Measure the resistance of R3529 + R3528 with an ohmmeter and adjust potentiometer R3528 so that R3528 + R3529 have a combined value of 1 kΩ.
- Put test disc 5 on the turntable.
- Switch on the set and select the PLAY mode.
- Check if HF is present. If not, stop the measurement immediately and analyse the fault.
- If HF is present, play track 1 of test disc 5 and adjust the sum HF across R3508 (test points 1 and 2) to 50 mV with a DC voltmeter.

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



1. Interrupt the Vc connection by unsoldering the connector point 02-4 on the motor panel

2. Connect a trimming potentiometer of 22k Ohm + a resistor of 3k3 Ohm to the motor print between 02–3(⊥) and -6A supply on the main panel.

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

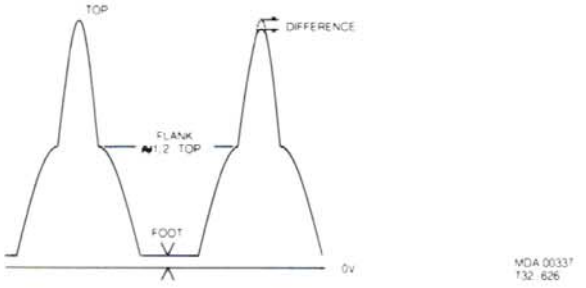
4. Measure with an oscilloscope first across 3094 and hereafter across 3093.
   Do not measure across both resistors at the same time, since the currents are measured through the +2 lead and –2 lead.

5. Put the trimming potentiometer in the maximum position (the slider is then connected to the resistor of 3k3 Ohm).

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. V_c = –1.7 +/– 0.5 V.
   B. Measure across 3094, value 1 = maximum 56.4 mV.
   C. Measure across 3093, value 2 = maximum 58.8 mV.
   D. 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:

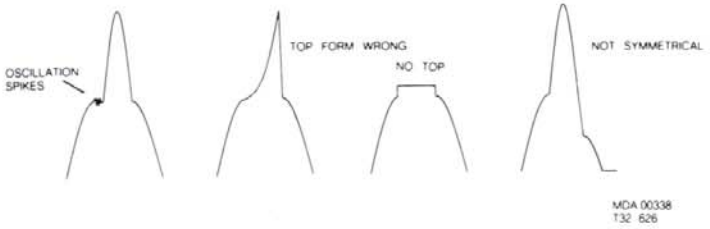


Top is not specified by value, see 7 (value 1 and value 2).

Top difference	<24 mV
Flank difference	<36 mV
Foot	is not specified

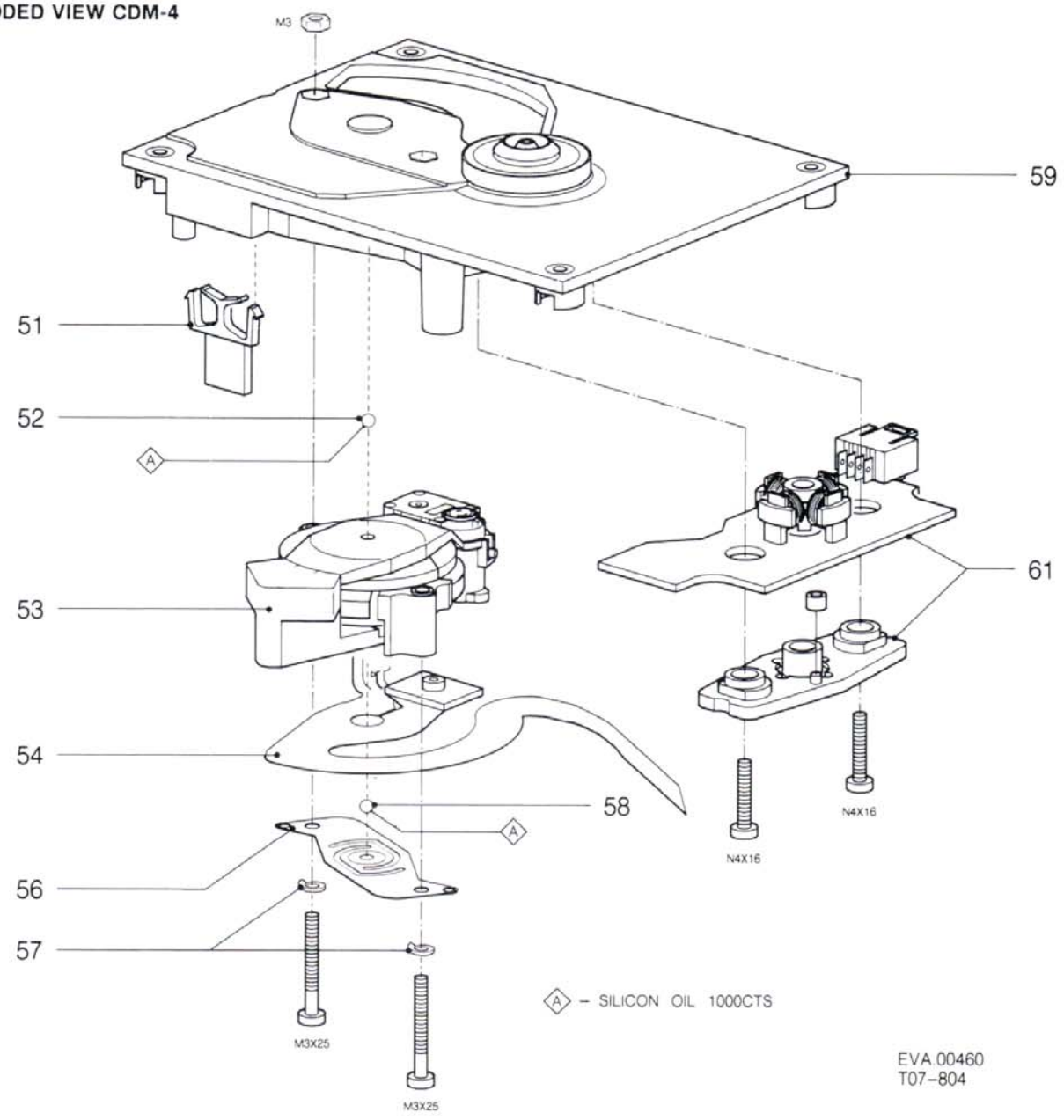
Remark:
Flank difference is at one asymmetrical pulse.
Foot is DC offset.

9. Examples of the wave form faults:



10. Adjust the voltage on 02–4(Vc) with the potentiometer back to –0,9 V. The motor must still turn. Although the top height is much lower now the wave form has to be symmetrical and rounded.

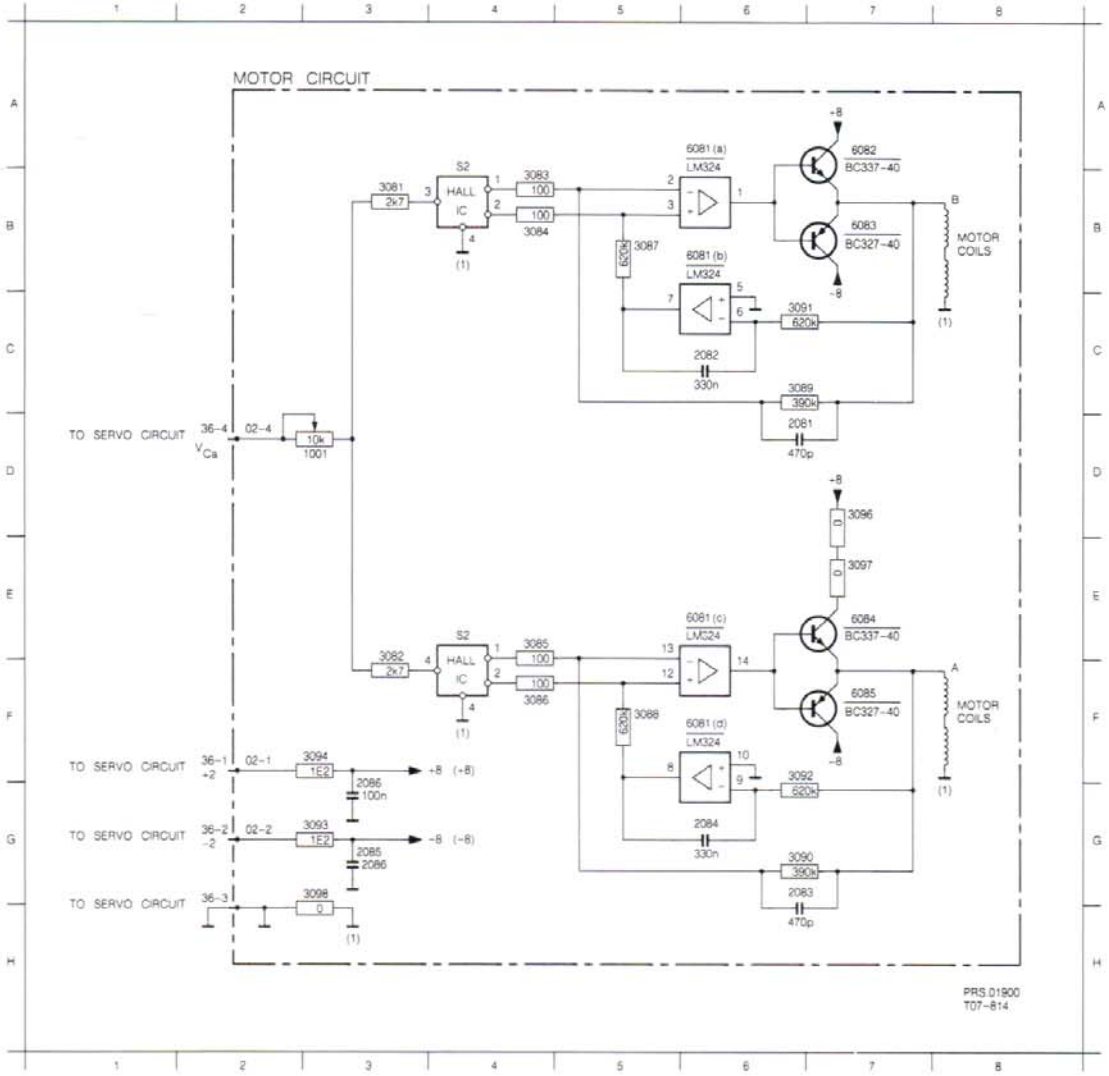
EXPLODED VIEW CDM-4



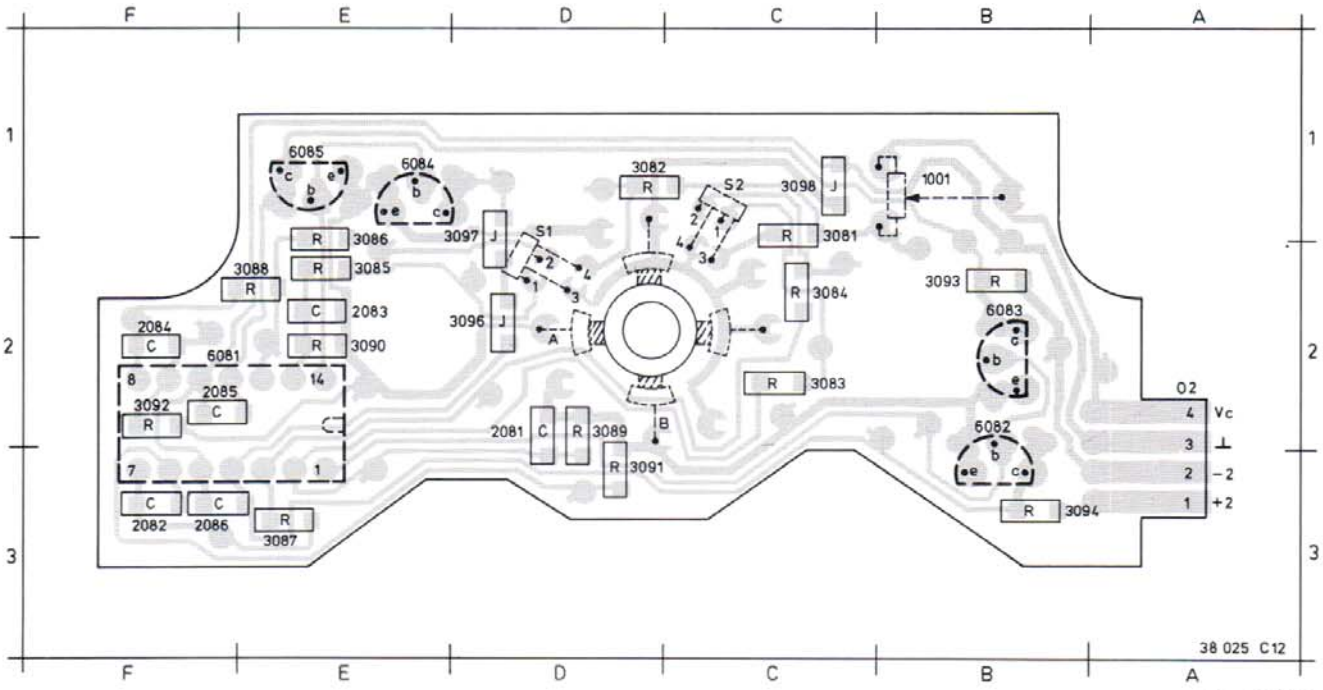
Mechanism parts

Complete unit	4822 691 20464 (pos. 51÷61)
51	4822 492 63761
52,58	4822 520 40177
54	4822 323 50124
56	4822 520 10555
57	4822 530 80188
A	4822 390 80145

MOTOR CIRCUIT



MOTOR PANEL



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