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Compact disc interactive player

CDI 220/60/61/65/77

Service
Service
Service

Interactive
Media
Systems

CDI



ServiceManual

SURVEY OF PLAYERS

Version	Description
/60	PAL player without RF-modulator
/61	Multivoltage PAL player with RF-modulator
/65	PAL player with RF-modulator for the UK-system
/77	NTSC player with RF-modulator for the USA-system

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COMPACT disc Interactive

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PHILIPS MEDIA©

These sets are equiped with Compact Disc Mechanism type CDM12.4; service code 4822 691 30354.
This CDM is also used in CDI210/40/41/45.
Service information is included in this manual.

SURVEY OF MAINPANELS

Version	Mainpanel	Version	Mainpanel
/20	4822 214 52065	/40	4822 214 52163
/25	4822 214 52068	/41	4822 214 52164
/37	4822 214 52056	/45	4822 214 52165
/39	4822 214 52066	/57	4822 214 52145

The mainpanels must be repaired via the central repair procedure, if the defective item is on the circuitry of the µP section,digital audio (LEMM+DSP) section, GLUE logic section or digital video section.
If the defective item is in the circuitry of the SERVO section, analog audio section or analog video section, then the panel can be repaired up to component level.
All above mentioned players are equiped with CDM9.

Version	Mainpanel
/60	These mainpanels must be repaired down to component level in a local central repairshop ,see chapter 3.6.
/61	
/65	
/77	

(SF) Varioitus!
Laite sisältaa laserdiodin, joka lähettää näkymätöntä silmille vaarallista lasersäteilyä.

(S) Varning!
Osynlig laserstrålning när denna del är öppnad och spärren ar urkopplad. Betakta ej strålen.

(DK) Advarsel!
Usynlig laserstråling ved abning når sikkerhedsafbrydere er une af funktion. Undgå udsaettelse for stråling.

(GB)
Safety regulations require that the set be restored to its original condition and that parts which are identical with those specified be used.
Safety components are marked by the symbol ⚠.

CLASS 1
LASER PRODUCT
3122 110 03420

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2. PRODUCT INFORMATION
2.1 TECHNICAL SPECIFICATION

System • Système • Sistema • Systeem • System • Sistema • Sistema
CD-Interactive
CD-Interactif

Usable discs • Disques utiliables • Discos utilizables • Discos Utiliable • Te gebruiken discs • Verwendbare discs • Dischi usabili

CD-I	*CD-I*
CD-DA	*CD-Audio*
PHOTO-CD	*Photo-CD*
CD-I READY	*CD-I READY*
CD BRIDGE	*CD BRIDGE*
CD+GRAPHICS	*CD+GRAPHICS*

Power requirement • Alimentation • Alimentacion • Alimentación Voedingsspanning • Netzanschluß • Alimentazione
Europe: 220-230 V/50 Hz UK: 240 V/50 Hz

Power consumption • Consommation • Consume de corriente Opgenomen vermogen • Leistungsaufname • Consumo di corrente • Consomo de Corriente
Europe: 22 W with, 17 W without DVC (22ER9956)
Europe: 22 W avec, 17 W sans DVC (22ER9956)
UK: 23 W with, 18 W without DVC (22ER9956)
UK: 23 W avec; 18 W sans DVC (22ER9956)

Operating temperature • Temperature de fonctionnement Temperatura de operacion • Bedrijfstemperatuur Betriebstemperatur • Temperatura di fonzionamento • Temperatura de funcionamiento
41°F(5°C) to 95°F(35°C)
5°C à 35°C

Relative humidity • Humidité relative • Humedad relative Relatieve vochtigheid • Relative Feuchtigkeit • Umidità relativa • Humedad relativa
5% to 95% (no condensation)
5% à 95% (sans condensation)

Weight • Poids • Peso • Gewicht • Gewicht • Peso • Peso
With DVC: 3,750 kg
Avec DVC: 3,750 kg
Without DVC: 3,500 kg
Sans DVC: 3,500 kg

Dimensions (w x h x d) • Dimensions (l x h x p) Dimensiones (a x a x p) • Afmetingen (b x h x d) Abmessungen (B x H x T) • Dimensioni (l x h x p) • Dimensiones (anch. x alt. x prof.)
420 mm x 90 mm x 286 mm
16.55" x 3.55" x 11.25"

Input • Entrée • Entrada • Ingang • Eingang • Ingresso • Entradas

input (1 ports) 8-pin mini-DIN
(1 entrées) mini DIN 8 broches



REAR

pin *Broche*	signal *Signal*	I/O *E/S*
1	nc	-
2	rxd	I / *E*
3	txd	O / *S*
4	nc	-
5	ground / *Masse*	-
6	cts	I / *E*
7	rts	O / *S*
8	+5V (100 mA max)	

FRONT

pin *Broche*	signal *Signal*	I/O *E/S*
1	rxd1	I / *E*
2	rxd2	I / *E*
3	tx2	O / *S*
4	rts1	O / *S*
5	ground / *Masse*	-
6	nc	-
7	rts2	O / *S*
8	+5V (100 mA max)	

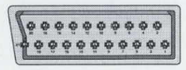
Note: Pointing device speed of 1200 baud is supported.
Remarque: Vitesse de transmission jusqu' à 1200 baud. • Nota: Se admite un dispositivo de puntero de 1200 baudios de velocidad. • Opmerking: Voor de aanwijsapparaten is een snelheid van 1200 baud mogelijk. • Hinweis: Die Geschwindigkeit der Zeigevorrichtung von 1200 baud wird unterstützt • Nota: Tollera la velocità dell'accessorio di comando di 1200 baud. • Nota: Velocidad del dispositivo de apunta admitida: 1200 baudios.

Output • Sortie • Salida • Uitgang • Ausgang • Uscita • Saídas • Salidas

Audio 2 Vrms
2 channel individual RCA pin cinch sockets
2 Veff
2 prises cinch (une par canal)

video (PAL) 1 Vpp (75 Ohm load, sync neg) RCA pin jack
1 Vc-c (charge 75 Ohm, sync. nég.) Prise cinch

AV/Euroconnector
Péritélévision A/V



pin *Broche*	signal *Signal*
1	audio R / *audio R (droite)*
2	nc / *non connecté*
3	audio L / *audio L (gauche)*
4	audio ground / *masse audio*
5	blue ground / *masse bleu*
6	nc / *non connecté*
7	blue / *bleu*
8	function switching (0=Antenna ; 1A=A/V Euroconnector with aspect ratio 16:9; 1B=AV/Euroconnector with aspect ratio 4:3) *commutation fonction (0=Antenna 1=Péritélévision A/V avec ratio 16:9; 1B=Péritélévision A/V avec ratio 4:3)*
9	green ground / *masse vert*
10	nc / *non connecté*
11	green / *vert*
12	nc / *non connecté*
13	red ground / *masse rouge*
14	nc / *non connecté*
15	red / *rouge*
16	fast switching (RGB/CVBS) *commutation rapide (RVB/CVBS)*
17	CVBS ground / *masse CVBS (PAL)*
18	fast switching (ground) *commutation rapide (masse)*
19	CVBS/RGB sync / *CVBS/RVB sync.*
20	nc / *non connecté*
21	shield / *blindage*

(Y/C-PAL)
y-output 1 Vpp (75 Ohms)
c-output 300 mV_{pp} (75 Ohms)
S-video 4-pin miniDIN
Sortie Y 1 V_{c-c} (75 Ohm)
Sortie C 300 mV_{c-c} (75 Ohm)
mini DIN 4 broche S-vidéo

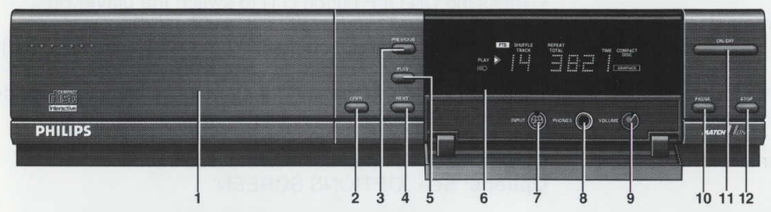


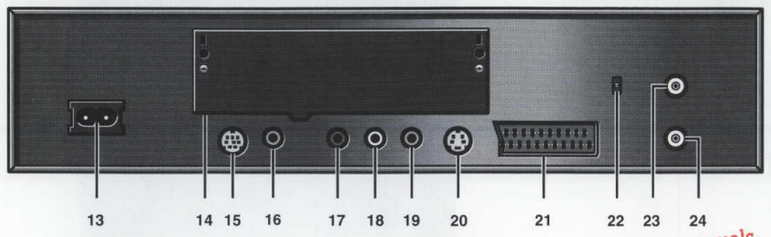
pin *Broche*	signal *Signal*
1	ground y / *Masse Y*
2	ground c / *Masse C*
3	y / *Y*
4	c / *C*

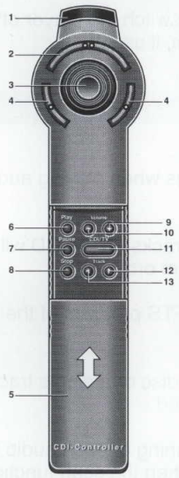
Designs and specifications are subject to change without notice. • La conception et les spécifications de ce produit sont sujet à modifications sans avis préalable. • Los diseños y las especificaciones están sujetos a cambios sin previo aviso. • Concepten en specificaties kunnen gewijzigd worden zonder voorafgaande verwittigingen. • Änderungen von Ausführung und technische Daten vorbehalten. • I disegni e le specifiche tecniche sono soggette a modifiche senza preavviso. • As especificações descitas estão sujeitas a altreação sem aviso prévio. • El diseño y las especificaciones estás sujetos a cambios sin previo aviso.

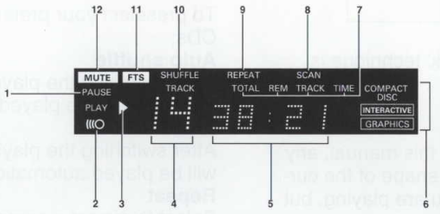
2.2 CONNECTION AND CONTROLS

CDI 220









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POWER CONNECTION

- Connect the female end of the AC (alternating current) cord supplied into the AC socket (13).
- Insert the male end of the cord into an AC outlet.
- **CAUTION: NEVER MAKE OR CHANGE CONNECTIONS WITH THE POWER SWITCHED ON.**

CAUTION
- **ONLY A QUALIFIED SERVICE PERSON SHOULD REMOVE THE COVER OR ATTEMPT TO SERVICE THIS DEVICE.**
- **USE OF CONTROLS OR ADJUSTMENTS OTHER THAN THOSE SPECIFIED HEREIN MAY RESULT IN HAZARDOUS RADIATION EXPOSURE OR OTHER UNSAFE OPERATION.**
- **THE PLAYER AUTOMATICALLY ADJUSTS TO THE LOCAL MAINS VOLTAGE.**
- **WHEN THE PLAYER IS IN THE "OFF" POSITION, IT IS STILL CONSUMING SOME POWER. IF YOU WISH TO DISCONNECT YOUR PLAYER COMPLETELY FROM THE MAINS, THE MAINS-PLUG HAS TO BE DISCONNECTED.**

PLACEMENT

- Place the player on a firm, flat surface.
- Keep away from heat sources and direct sunlight.
- In a cabinet, allow 1 inch (2-3 cm) of free space all around the unit for adequate ventilation.

DESCRIPTION OF CONTROLS AND CONNECTIONS

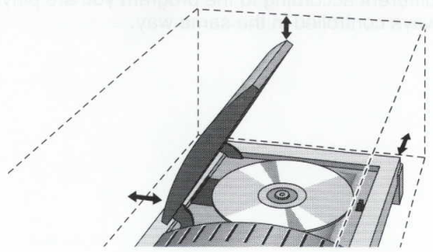
FRONT
1 Disc loading tray.
2 Open/close button.
3 Previous track selection button
4 Next track selection button.
5 Play button.
6 Soft tone multifunction display with infra-red remote control receiver.
7 Input port for CD-I pointing devices.
8 Headphone jack.
9 Headphone volume control.
10 Pause button.
11 AC power on/off button.
12 Stop button.

REAR
13 Mains AC (alternating current) input socket.
14 Extension socket.
15 Input port for CD-I serial connections.
16 Digital out.
17 Audio output R.
18 Audio output L.
19 Video output (CVBS).
20 Y/C (S-Video) out*.
21 A/V Euroconnector*.
22 Channel selector*.
23 OUT TO TV*.
24 IN FROM ANTENNA*.

DISPLAY PANEL
1 CD pause active.
2 Remote control active (flashing indicator).
3 Disc playing (stepping indicator).
4 Track number (CD-Audio).
5 Elapsed or remaining time (CD-Audio).
6 Type of disc indicator.
7 Time indicators.
8 CD scan active.
9 CD repeat active.
10 CD shuffle active.
11 CD FTS active.
12 Mute indicator.

REMOTE CONTROL
1 Infra red remote control.
2 Action button.
3 Thumbpad.
4 Action buttons (for left or right handed operation).
5 Sliding Cover.
6 Play button.
7 Pause button (CD-Audio).
8 Stop button (CD-Audio).
9 Volume control up button.
10 Volume control down button.
11 CD-I/TV button.
12 Next track (CD-Audio).
13 Previous track (CD-Audio).

*Available on some player versions only.



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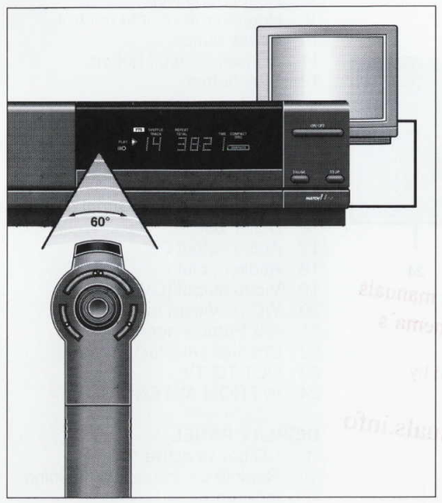
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2.3 BEFORE USING YOUR CD-I PLAYER

REMOTE CONTROL INTERACTIVE OPERATION

For normal interactive operation, use the remote control to select functions displayed on the TV screen.

- Point the remote control at your CD-I player.
- Move the cursor in the direction you want by pressing in that direction on the "Thumbpad".
  The harder you press the faster the cursor arrow moves.
- Click on one of the action buttons.



The function selected by this 'point-and-click' technique is highlighted to confirm the selection.

NOTE

To 'point-and-click' on any screen shown in this manual, any one of the action buttons can be used. The shape of the cursor is different according to the program you are playing, but it is always controlled in the same way.

WIRED POINTING DEVICE OPERATION

Place the pointing device in front of the display screen, with the back (the cable end) pointed towards the screen.
Now, as you roll the mouse, the trackerball or the roller controller, the cursor moves in the corresponding direction on the screen.
When the cursor is positioned on the required function click on one of the action buttons.

The function selected by this 'point-and-click' technique is highlighted to confirm the selection.

NOTE

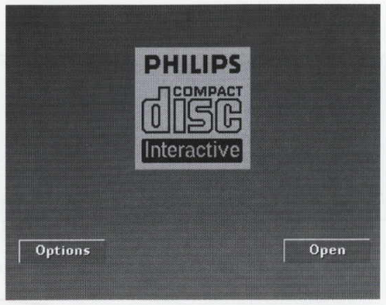
To 'point-and-click' on any screen shown in this manual, any one of the action buttons can be used. The shape of the cursor is different according to the program you are playing, but it is always controlled in the same way.

SETTINGS

- Press the ON/OFF button (11) to switch the player on.
- Switch on the TV (and HiFi system if used).
- Select the CD-I input on the TV (and HiFi system if used).

On the TV, the player start-up screen will appear.
This screen has the following system function icons to guide and assist you:

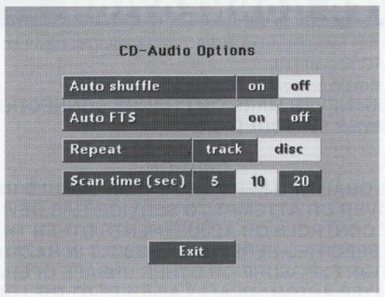
Open/Close: To open or close the disc tray.
Options: See: 'OPTIONS SCREEN'.



- Press the ON/OFF button (11) to switch the player off.
- Switch off the TV (and HiFi system, if used).

OPTIONS SCREEN

1. CD Audio
To preselect your preferred settings when playing audio CDs:
Auto shuffle
After switching the player on, the tracks on the CD will automatically be played in a random order.
Auto FTS
After switching the player on, the FTS program of the CD will be played automatically
Repeat
Select to repeat a complete audio disc or a single track when the repeat function is activated.
Scan time
Select the time you want the beginning of each audio track to play for (5, 10 or 20 seconds) when the scan function is activated.



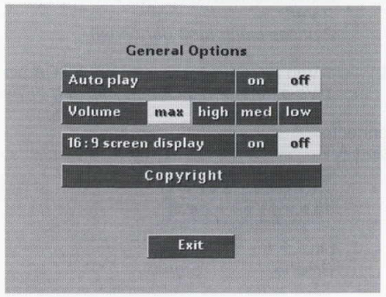
- When finished, point-and-click on 'Exit'.

2. General
To change the player general settings:
Auto play
After switching the player on, playback will start automatically when a disc is loaded.
Volume
Selecting the player default volume setting.

2.4 SETTING UP

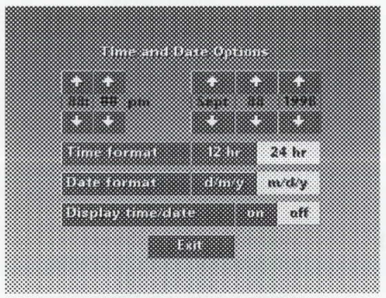
OPTIONS SCREEN CONTINUATION

16 : 9 screen display
Selecting 16 : 9 screen display, when you have your player connected to a TV with a 16 : 9 screen.



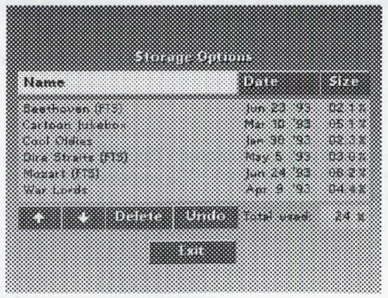
- When finished, point-and-click on 'Exit'.

3. Time and Date
To change the player time/date settings:
Time/Date set
If the time or date shown on the screen is wrong, select the appropriate ▲ and ▼ arrows to set hours, minutes, day, month and year in turn, as required.
Time format
Select 24 hour or 12 hour clock.
Date format
Select d/m/y to present the date in day-month-year sequence. Select m/d/y to present the date in month-day year sequence.
Display time/date
Select whether time and date will displayed on the TV screen or not.



- When finished, point-and-click on 'Exit'.

4. Storage
To refer to the intermediate results of CD-I titles and of programs created for your audio and Photo CDs.
The 'Storage' screen shows the information held in memory: titles, dates and percentage of memory used.
Clicking on 'Name', 'Date', or 'Size' sorts the information accordingly.
- Use the scroll arrows to move up and down the list.
- To delete an item, click on its title and then click on 'Delete'. If you change your mind after deleting, click on 'Undo'.

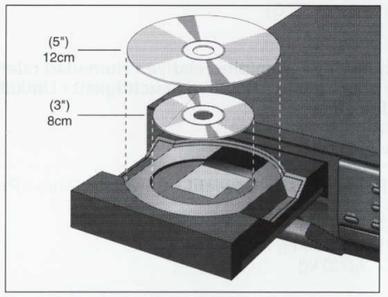


- When finished, point-and-click on 'Exit'.

LOADING AND UNLOADING

Loading:
- Point and click on 'Open' (you may also press the OPEN /CLOSE button (2) on the player) to open the disc tray (1).
- Take the disc from its holder and place it on the tray with the label up.
- Point and click on 'Close' (you may also press the OPEN/CLOSE button (2) on the player, or gently push the front of the tray) to close the tray.

The TV screen changes according to the type of disc.



CAUTION
NEVER PUT MORE THAN ONE DISC AT A TIME INTO THE CD-I PLAYER

Unloading:
- Point and click on 'Open' (you may also press the OPEN /CLOSE button (2) to open the disc loading tray. The player start-up screen reappears on the TV.
- Take the disc from the tray and replace it in its holder.
- Point and click on 'Close' (you may also press the OPEN/CLOSE button (2) on the player, or gently press the front of the tray) to close the tray with or without a new disc.

NOTE

You may unload the disc at any time by pressing the OPEN/CLOSE button (2).
Unloading a CD-I disc while the CD-I program is running, will terminate the CD-I program abruptly. 'Bookmarks' or intermediate results, if used by the CD-I program, might not be updated to the latest situation.

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2.5 DISC PLAY

PLAYING A CD-I DISC

NOTE

This procedure is equal for CD BRIDGE discs, CD-I READY discs and PHOTO CDs. And for Digital Video discs and Video CD's when a Digital Video Cartridge has been installed.

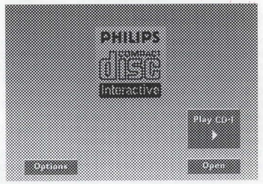
CAUTION

– **NEVER LEAVE A STILL PICTURE ON THE SCREEN FOR ANY LENGTH OF TIME. THIS CAN CAUSE BURNING-IN OF THE PICTURE TUBE. IN SUCH A CASE SWITCH OFF THE PLAYER OR REMOVE THE DISC.**

Playing a CD-I disc depends on the value of Autoplay (see settings). The factory setting is default "OFF".

1. When autoplay is "OFF":
   After loading the disc, the CD-I start-up screen appears on the TV.
   To start the CD-I program, select the 'Play' icon on the screen and click on it.

2. When autoplay is "ON":
   After loading the disc, the CD-I program will start up automatically.
   The opening screen of the CD-I program now appears on the TV. From this point, all interaction is between you and the program. To stop at any time, select the STOP or EXIT function provided by the CD-I program.



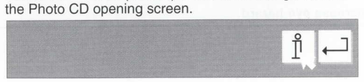
PLAYING A PHOTO CD

After loading the disc, the CD-I start-up screen appears on the TV.

- To start the Photo CD program, select the 'PLAY CD-I' icon on the screen; you may also press the PLAY button (5) on the player or remote control (6).
  The opening screen of the Photo CD program now appears on the TV.
  At the bottom of this screen a menu bar with icons is shown.



- Select the ☑ icon.
  The 'Options' screen will now appear.
- To select a language click on the box, the flag or the name of a country.
  The previous setting will be replaced automatically.
- Select the ↩ icon (Return) of this screen to go back to the Photo CD opening screen.



- Select the ℹ icon (Information) and the INFORMATION screen, explaining the control buttons of the menu bar in the selected language, appears.
- From this point, all interaction is between you and the program.

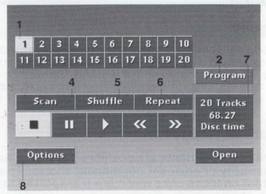
CAUTION

NEVER LEAVE A STILL PICTURE ON THE SCREEN FOR ANY LENGTH OF TIME. THIS CAN CAUSE BURNING-IN OF THE PICTURE TUBE. IN SUCH A CASE SWITCH OFF THE PLAYER OR REMOVE THE DISC.

PLAYING A CD-AUDIO DISC 1. Using the audio screen

NOTE: This procedure can also be used for audio sections on 5 inch (12 cm) laser discs.

After loading the disc, the CD-Audio screen appears on the TV.



1. **Play track bar:**
   Shows the total number of tracks (up to 30). You can 'point-and-click' to select any track. For discs with more than 30 tracks, the right » and left « scroll arrows are used to move through the track list.

2. **PROGRAM:** Allows you to program a list of special tracks called a Favorite Track Selection. When you select PROGRAM, the FTS track bar and the FTS icon will appear.

3. **FTS:** Allows you to play Favorite Track Selections. This icon only appears if a Favorite Track Selection has been created for the disc that is loaded in the player.

4. **SCAN:** Allows you to listen to the beginning of every track listed in the play track bar. You can set the scan time to 5, 10 or 20 seconds in the 'Options' screen.

5. **SHUFFLE:** Allows you to play the tracks in the play track bar in a random order.

6. **REPEAT:** Allows you to repeat either a track or the entire disc. You can change the repeat mode in the 'Options' screen.

7. **TRACK/TIME** window:
   – After loading, and in STOP mode, this shows the total number of tracks and the total playing time. When you click at this window (7), the track time of the selected track is displayed.

   – In PLAY and PAUSE modes, the window shows the track number and either the elapsed or the remaining track playing time. To change between elapsed and remaining time, 'point-and-click' at the time shown in the window.

8. All the disc play control functions are shown on the screen, and can be selected as desired by 'point-and-clik' with yuor remote control.

DISC PLAY

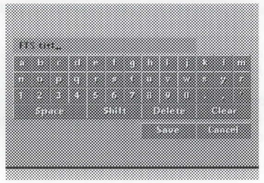
The operation of the functions is briefly explained in the following table.

NOTE

If auto SHUFFLE or auto FTS has been selected on the 'CD Audio' screen, this function will be activated automatically.

PLAYING A CD-AUDIO DISC 2. Creating FTS titles

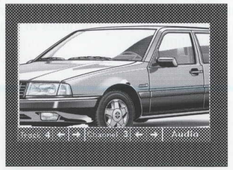
- After creating a Favorite Track Selection for a disc, you can compose a title of up to 30 characters (depending on the character width) for the selection using the keyboard screen.
  The title then appears on the CD-Audio screen whenever the disc is loaded.
- At the CD-Audio screen, 'point-and-click' on the program button, then 'point-and-click' on the "Save FTS" button.
  The CD-Audio screen will change to the keyboard screen.
- Select each character of the title in turn, using shift to change between upper and lower case characters and space to separate words.



Delete erases the last selected character.
Clear erases the complete (or partially complete) title.
Cancel returns to the CD-Audio screen without saving the title.
OK saves the title and returns to the CD-Audio screen.

PLAYING A CD-AUDIO DISC 3. CD graphics

When an audio CD with graphics is played, the CD Graphics screen will appear automatically.



- To let the picture channel bar appear/disappear click on the action button anywhere outside the channel bar.
- You can select another track number by clicking on 'Track' or either arrow next to it.
  Depending on the disc, other channel numbers might give you other information, such as the lyrics in a different language.
- Refer to the instructions that come with the disc for their functions.
- To play audio only, click on the 'audio' icon.

CAUTION

NEVER LEAVE A STILL PICTURE ON THE SCREEN FOR ANY LENGTH OF TIME. THIS CAN CAUSE BURNING-IN OF THE PICTURE TUBE. IN SUCH A CASE SWITCH OFF THE PLAYER OR REMOVE THE DISC.

OPERATION	SELECT
Start play	▶ **play** play starts at the beginning of track 1, or any other preselected track number. If a track is already playing, it is re-started.
Select a track	**track** number if the disc contains more than 30 tracks, use the left « and right » scroll arrows to move through the track numbers as required.
Pause	⏸ **pause** use to interrupt play.
Exit pause	**pause** or **play** play restarts at exactly the same point as pause was selected.
Forward search	**forward** searches forward through disc.
Reverse search	**reverse** searches backwards through disc.
Stop play	**stop** stops playing. If play is restarted, it begins at the first track.
Scan the disc	**scan** plays the beginning of each track on the disc.
Exit scan	**scan** normal play starts from this point.
Shuffle play	**shuffle** shuffle sequence appears in track bar.
Exit shuffle	**shuffle** normal play starts from this point.
Repeat	**repeat** repeats the entire disc (or FTS program), or the track being played, as selected on the "Options" screen.
Play FTS	**FTS** only available when an FTS program has already been created for the disc in the player.
Exit FTS	**FTS** normal play starts from this point.
Program FTS	**program** • point to tracks as required on the play track bar, and in each case click on any action button to record the track in the FTS track bar. • To cancel an unwanted track, point to it in the FTS track bar and click on any action button. • To cancel the entire FTS program, point to the first track in the FTS track bar and click on any action button repeatedly until all the tracks disappear.
Store FTS	**Save FTS** the keyboard screen replaces the CD-Audio screen. See 'CREATING FTS TITLES'.

2.6 ACCESSORIES • ACCESSOIRES

SUPPLIED ACCESSORIES • ACCESSOIRES FOURNIS

These accessories are provided to help you use or set-up your CD-I Player.


AC Cord


Three Batteries


Euroconnector *


Antenna Cable * (RF coaxial cable)


"Thumbpad" Remote Control Handset


Digital out Cable


Y/C (S-Video) * Cable

** available on some player versions only*

The products and services described herein are not necessarily available in all countries.

OPTIONAL ACCESSORIES • ACCESSOIRES EN OPTION

Maximize your pleasure with state-of-the-art accessories designed specifically for your CD-I Player.

The optional accessories shown here may be purchased from your supplier.


CD-I Mouse 22ER9011

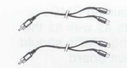

Roller Controller 22ER9012


CD-I Trackball 22ER9013


Touchpad 22ER9017


Audio L-R Cable


Video (CVBS) Cable


Audio Stereo Splitter 22ER9209


Splitter 22ER9208


Digital Video Cartridge 22ER9956

Due to continuous product improvements this document is subject to change without notice.

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3.1 SAFETY INSTRUCTIONS

- Safety regulations demand that the set be restored to its original condition and that components identical with the original types be used.
  Safety components are marked by the symbol ⚠.
- **ESD**

  All IC's and many other semi-conductors are susceptible to electrostatic discharges (ESD).
  Careless handling during repair can reduce life drastically.
  When repairing, make sure that you are connected with the same potential as the mass of the set via a wrist wrap with resistance.
  Keep components and tools also at this potential.
  For detailed information see "Handling ESD-sensitive components".
- A set to be repaired should always be connected to the mains via a suitable isolating transformer.
- never replace any modules or any other parts while the set is switched on.
- Use plastic instead of metal alignment tools. This in order to prelude short-circuit or to prevent a specific circuit form being rendered unstable.

3.2 SERVICING OF SMDs (Surface Mounted Devices)

3.2.1 General cautions on handling and storage

a. Oxidation on the SMDs terminals results in poor soldering. Do not handle SMDs with bare hand.
b. Avoid for storage places that are sensitive to oxidation such as places with sulfur or chlorine gas, direct sunlight, high temperatures or a high degree of humidity.
   As a result the capacitance or resistance value of the SMDs may be affected.
c. Rough handling of circuit boards containing SMDs may cause damage to the components as well as the circuit boards. Circuit boards containing SMDs should never be bent or flexed. Different circuit board materials expand and contract at different rates when heated or cooled and the components and/or solder connections may be damaged due to the stress.
   Never rub or scrape chip components as this may cause the value of the component to change. Similary, do not slide the circuit board across any surface.

3.2.2 Removal of SMDs

a. Heat the solder (for 2-3 seconds) at each terminal of the chip. Small components can, by means of litz wire and a limited horizontal force, be removed with the soldering iron. They can also be removed with a solder sucker (see Fig. 1a) or
b. While holding the SMD with a pair of tweezers take it off gently using th soldering iron's heat applied to each terminal (see Fig. 1b).
c. Remove the excess solder on the solder lands by means of litz wire or a solder sucker (see Fig. 1c).

3.2.2.1 Caution on removal:

a. When handling the soldering iron, use suitable pressure and be careful.
b. When removing the chip, do not use undue force with the pair of tweezers.
c. The soldering iron to be used (approx. 30 W), must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).
d The chip, once removed, must **never** be used again.

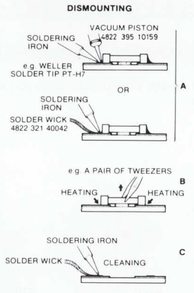


Fig. 1

3.2.3 Attachment of SMDs

a. Locate the SMD on the solder lands by means of tweezers and solder the component at one side. Ensure that the component is positioned well on the solder lands (see Fig. 2a).
b. Next complete te soldering of the terminals of the component (see Fig. 2b).

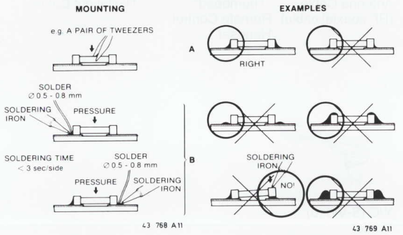


Fig. 2

Fig. 3

3.2.3.1 Caution on attachment:

a. When soldering the SMD terminals, do not touch them directly with the soldering iron. The soldering must be as quick as possible; care must be taken to avoid damage to the terminals and the body itself.
b. Keep the SMD's body in contact with the printed board when soldering.
c. The soldering iron to be used (approx. 30 W) must preferably be provided with a thermal control (soldering temperature about 225 to 250°C).
d. Soldering should not be done outside the solder land.
e. Soldering flux (of rosin) may be used but should not be acidic.
f. After soldering, let the SMD cool down gradually at room temperature.
g. The quantity of solder must be proportional with the size of the solder land. If the quantity is too great, the SMD might crack or the solder lands might be torn loose from the printed board (see Fig. 3).

3.3 HANDLING ESD-SENSITIVE COMPONENTS

3.3.1 Personal safety

The testing, handling and replacing of ESD-sensitve components requires special attention for personal safety. A person dealing with ESD-sensitive components should, normally speaking, be connected via a resistance to the same potential as the chassis of the set to protect him against direct contact with the supply voltage.
This resistance is often applied in the connection lead of wrist wraps. If necessary, make use of an isolating transformer.

3.3.2 Storage and transport

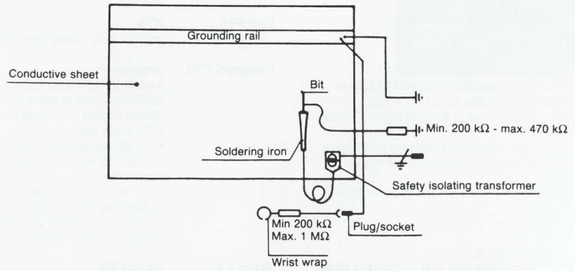
Transport and store the circuits and PCBs in their original packages.
As an alternative to the original package one may use a conductive material or special IC package which short-circuits all the pins of the component with one another.
Always discharge the package before opening it.

3.3.3 Testing or handling

Work on a conductive surface when testing loose circuits and components or when transferring components and circuits from one package to another.
Use a conductive wrist wrap with lead to make an electrical connection between the conductive surface and yourself via a resistance in the connection lead of the wrist wrap.
Connect equipment and tools also with this conductive surface.
Do not connect any signals to inputs as long as the power supply of the set to be tested is off.
All the inputs that are not used should be connected either to ground or to the supply voltage. When testing, do not use any freon sprays for under-cooling of sensitive components.

3.3.4 Mounting ESD-sensitive components

Mount ESD-sensitive components only after all other components have been mounted.
Make sure that the components themselves, the metal parts of the PCB, mounting equipment and mounting operator are at the same potential level as the chassis of the set.
If it is impossible to ground the PCB, the mounting operator should pick the PCB up before bringing it into contact with the components to be replaced.



Special attention should be paid in regions having a dry atmosphere and when the floor is covered with a nylon carpet or such.

3.3.5 Soldering

Soldering iron tips, also those of low-voltage soldering stations, should be kept at the same potential as the components and the PCB.
It is better to use solder-removing braid than solder suckers.

3.3.6 Electrostatic charges

One should stick to the precautionary measures also after the ESD-sensitive components have been mounted on the PCB. Until the sub-PCBs have been incorporated into a complete system on which the correct supply voltages are connected, the PCB is nothing more than an extension of the conductors of the components on this PCB. To prevent electrostatic discharges from passing to the components via the terminals, we recommend that you apply conductive clips or conductive tape on the terminals of the PCB.

3.3.7 Transients (switch-on phenomena)

To prevent permanent damages as a result of switch-on phenomena, no ESD-sensitive components, or PCBs populated with these components, should be inserted in or removed from test-sockets or systems with the supply voltage on.
Prevent switching peeks on the mains as a consequence of switching electric equipment, relay and DC lines on and off.

3.3.8 Working environment

The work bench for the service technician should look like the one shown in the figure.

3.3.9 Replacement of the Flat Pack IC's

For replacing a component see Fig. 6 Dismounting and Mounting. Also a number of precautions and examples is given.
When replacing a flat pack, rosin flux applied to the device leads will ensure a good soldered joint.
Since rosin flux, when not properly heated by the soldering process, is sticky, it will attract dust which will result in component degeneration over a period of time.
The removal of excess flux with a cleaner will not solve this problem because the flux is then even spread over a greater area by the cleaner. Drying of the flux can be accomplished by blowing the area with a common hair dryer for 1 or 2 minutes at a distance of approx. 10 centimeters.

SAFETY GUIDELINES FOR THE PROFESSIONAL SERVICE TECHNICIAN

Important

Proper service and repair is important to the safe, reliable operation of all Philips equipment. The service procedures recommended by Philips and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

It is important to note that this manual contains various CAUTIONS and NOTICES which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these CAUTIONS and NOTICES ARE NOT EXHAUSTIVE. Philips could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, Philips has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by Philips must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.

Safety Checks

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to your customer. Be sure to check all of the following:

Fire and Shock Hazard

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those units which are transported to and from the service shop.
2. Never release a repaired unit unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed according to the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including the ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length, and dress.
5. No lead or component should touch a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with a ⚠ by the Ref. No. in the parts list and enclosed within a broken line* (where several critical components are grouped in one area) along with the safety symbol ⚠ on the schematic diagrams and/or exploded views.

   Replacement parts without the same safety characteristics may create shock, fire, or other hazards.
7. When servicing any unit, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many electronic products use a polarized ac line cord (one wide pin on the plug). Defeating this safety feature may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.

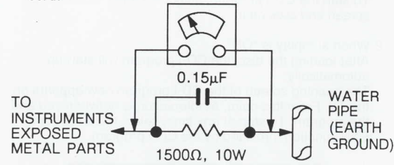
Fire and Shock Hazard (Continued)

9. After reassembly of the unit, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc. to be sure the unit is safe to operate without danger of electrical shock.

* Broken line:

Leakage Current Cold Check

1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas, and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.



Leakage Current Hot Check

1. Do not use an isolation transformer for this test. Plug the completely reassembled unit directly into the ac outlet.
2. Connect a 1.5k, 10W resistor paralleled by a 0.15uF. capacitor between each exposed metallic cabinet part and a good earth ground such as a water pipe, as shown above.
3. Use an ac voltmeter with at least 5000 ohms/volt sensitivity to measure the potential across the resistor.
4. The potential at any point should not exceed 0.75 volts. A leakage current tester may be used to make this test; leakage current must not exceed 0.5 milliamps. If a measurement is outside of the specified limits, there is a possibility of shock hazard. The receiver should be repaired and rechecked before returning it to the customer.
5. Repeat the above procedure with the ac plug reversed. (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

Parts Replacement

1. Many electrical and mechanical parts in Philips equipment have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the Philips recommended replacement part shown in this service manual may create shock, fire, or other hazards. Under no circumstances should the original design be modified or altered without written permission from Philips. Philips assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.
2. All ICs and many other semiconductor parts are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce the life of the part drastically.

LASER NOTE:

DANGER - Invisible laser radiation when open. AVOID DIRECT EXPOSURE TO BEAM.
CAUTION - Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
CAUTION - The use of optical instruments with this product will increase eye hazard.

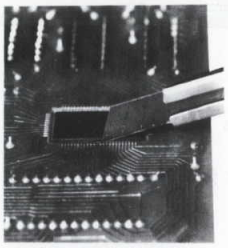
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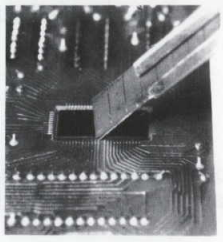
TOOLS TO BE USED



DISMOUNTING



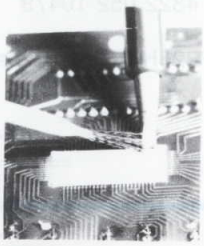
CUTTING
THE LEADS



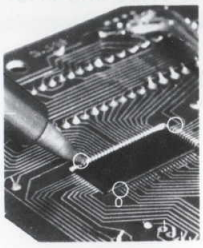
WRONG
TRACKS WILL
BE DAMAGED

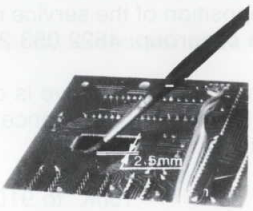


CLEANING
THE TRACKS



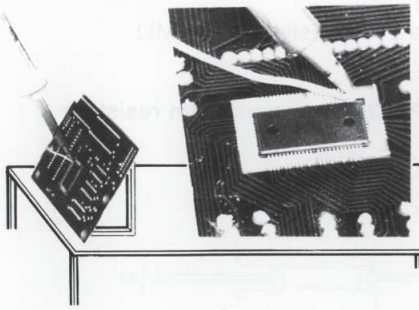
MOUNTING





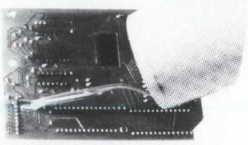
APPLYING FLUX

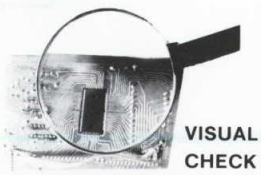
FIXING IC
AT THE CORNERS



SOLDERING:
SPEED
1 CM IN 5 SEC.

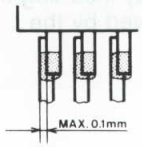
DRYING

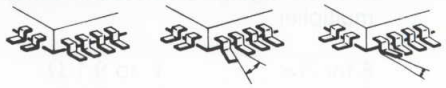




VISUAL
CHECK

ALIGNING THE LEADS





RIGHT WRONG WRONG

SOLDERING



RIGHT WRONG WRONG

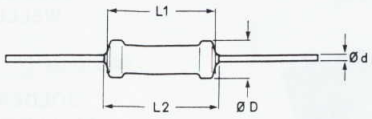
PCS 71 253

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3.4 CODENUMBERS FOR STANDARDIZED RESISTORS

Unless otherwise specified, all defective resistors in the circuits of the set can be replaced by standardizes types, mentioned in this chapter.

VR25, VR37 high-ohmic/high -voltage resistors



type	Dmax	L1 max	L2 max	d
VR25	2,5	6,5	7,5	0,6

type	Dmax	L1 max	L2 max	d
VR37	3.7	9.0	10.0	0.7

Range VR25 : 100 KΩ to 22 MΩ
Range VR37 : 100 KΩ to 33 MΩ

Composition of the service number for the VR25 and VR37
Main subgroup: 4822 053 20... and 4822 053 21...

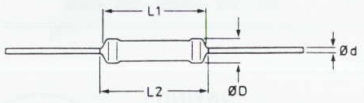
The codenumber above is completed by inserting the first two figures (resistance code) followed by the multiplier.

4 for R = 100K to 910 KΩ
5 for R = 1M to 9.1 MΩ
6 for R = or > 10M

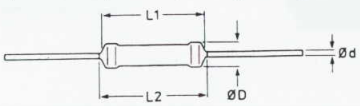
Example's:
The serv.nbr. for a VR25 resistor of 100 KΩ is 4822 053 20104
The serv.nbr. for a VR37 resistor of 33 MΩ is 4822 053 21336

PR01, PR02 and PR03 power metal film resistors

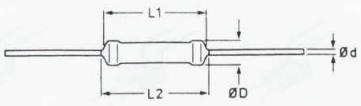
ϕDmax	L1	L2max	ϕd
2.5	6.5	8.0	0.6



ϕDmax	L1max	L2max	ϕd
3.9	10	11	0.8



ϕDmax	L1max	L2max	ϕd
5.2	16.7	17.9	0.8



Rated dissipation at T(amb) = 70 degrees :
PR01 = 1 Watt, PR02 = 2 Watt, PR03 = 3Watt

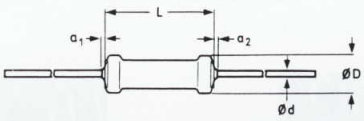
Composition of the service number for the PR01, PR02 and PR03
Main subgroup: 4822 053 10... ; 4822 053 11... and 4822 053 12...

The codenumber above is completed by inserting the first two figures (resistance code)followed by the multiplier.

8 for R= 1 to 9,1 Ω
9 for R= 10 to 91 Ω
1 for R= 100 to 910 Ω
2 for R= 1 to 9,1 KΩ
3 for R= 10 to 91 KΩ
4 for R= 100 to 910 KΩ
5 for R= or > 1 MΩ

Example:
The serv.nbr. of a PR01 resistor of 47 Ω is: 4822 053 10479
The serv.nbr. of a PR03 resistor of 1 MΩ is: 4822 053 12105

NFR25 fusible resistors ⚠



Dmax	Lmax	d	a1 + a2
2.5	6.5	0.6	≤ 1

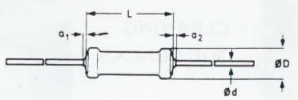
Composition of the service number for the NFR25
Main subgroup: 4822 052 10...

The codenumber above is completed by inserting the first two figures (resistance code)followed by the multiplier.

8 for R= 1 to 9,1 Ω
9 for R= 10 to 91 Ω
1 for R= 100 to 910 Ω
2 for R= 1 to 9,1 KΩ
3 for R= 10 to 91 KΩ

Example:
The service number of a resistor of 47 Ω is: 4822 052 10479

NFR25H fusible resistors ⚠



Dmax.	Lmax.	d	a1 + a2
2,5	6,5	0,6	≤ 1

Composition of the service number for the NFR25H
Main subgroup: 4822 052 11...

The codenumber above is completed by inserting the first two figures (resistance code)followed by the multiplier.

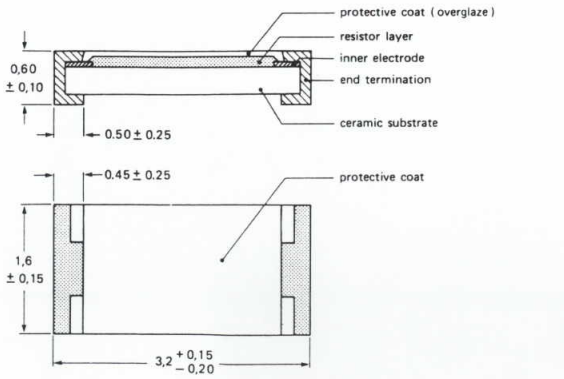
8 for R= 1 to 9,1 Ω
9 for R= 10 to 91 Ω
1 for R= 100 to 910 Ω
2 for R= 1 to 9,1 KΩ
3 for R= 10 to 91 KΩ

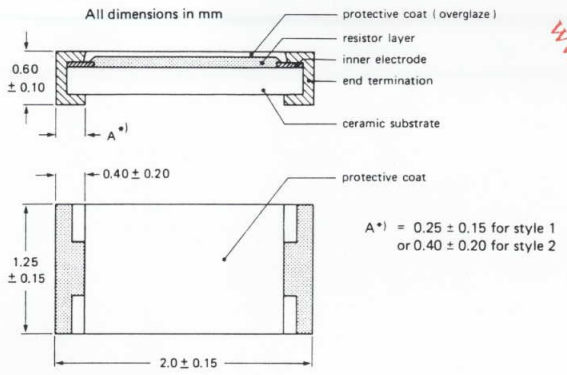
Example:
The service number of a resistor of 47 Ω is: 4822 052 11479

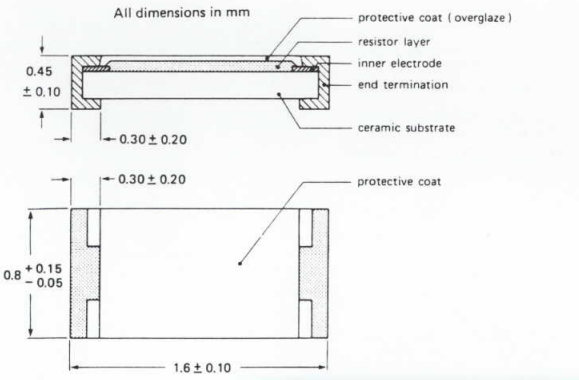
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RC-01, RC-11 AND RC-21 chip resistors







Absolute max. dissipation :
RC-01 : 0,25 W, RC-11 : 0,10 W, RC-21 :0,062 W.

Range: RC-01 0 Ω TO 10 MΩ
RC-11 0 Ω TO 10 MΩ
RC-21 0 Ω TO 6,8 MΩ

Composition of the service number for the RC-01,RC-11 and RC-21
Main subgroup: 4822 051 10... , 4822 051 20... and 4822 051 30...
The codenumber above is completed by inserting the first two figures (resistance code) followed by the multiplier.

8 for R=	0	to 9.1 Ω
9 for R=	10	to 91 Ω
1 for R=	100	to 910 Ω
2 for R=	1	to 9.1 KΩ
3 for R=	10	to 91 KΩ
4 for R=	100	to 910 KΩ
5 for R=	1	to 9.1 MΩ
6 for R= or >	10 MΩ	

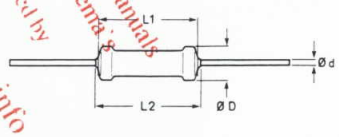
Example's:
The serv.nbr. for a RC-01 resistor of

0 Ω is 4822 051 10008
The serv.nbr. for a RC-11 resistor of
0 Ω is 4822 051 20008
The serv.nbr. for a RC-21 resistor of
0 Ω is 4822 051 30008

The serv.nbr. for a RC-01 resistor of
10 Ω is 4822 051 10109
The serv.nbr. for a RC-11 resistor of
10 Ω is 4822 051 20109
The serv.nbr. for a RC-21 resistor of
10 Ω is 4822 051 30109

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MRS16T metal film resistors with low-inductance



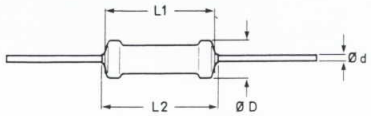
D	L	L2 max.	d
1,7 +0,2 −0,1	3,5 +0,2 −0,15	3,7	0,5 −0,04

Composition of the service number for the MRS16T
Main subgroup: 4822 050 1....
The codenumber above is completed by inserting the first three figures (resistance code)followed by the multiplier.

8 for R=	4,99	to 9,76 Ω
9 for R=	10	to 97,6 Ω
1 for R=	100	to 976 Ω
2 for R=	1	to 9,76 KΩ
3 for R=	10	to 97,6 KΩ
4 for R=	100	to 976 KΩ
5 for R= or >	1 MΩ	

Example:
The service number of a resistor of 487 Ω is:
4822 050 14871

MRS25 metal film resistors (0,5%)



D	L1	L2 max	d
2,5	6,5	7,0	0,6 ± 0,03

Composition of the service number for the MRS25
Main subgroup: 4822 050 2....

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The codenumber above is completed by inserting the first three figures (resistance code)followed by the multiplier.

8 for R=	1	to 9,76 Ω
9 for R=	10	to 97,6 Ω
1 for R=	100	to 976 Ω
2 for R=	1	to 9,76 KΩ
3 for R=	10	to 97,6 KΩ
4 for R=	100	to 976 KΩ
5 for R=	1	to 9,76 MΩ
6 for R= or > 10 MΩ		

Example:
The service number of a resistor of 976 Ω is:
4822 050 29761

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3.5 CENTRAL REPAIR PROCEDURE OF THE MAINBOARD

If the defective item is in the circuitry of the µP section, CIAP section or digital video section, then the complete main board must be replaced and sent back to a local central repairshop.
Relevant sections are displayed when using the diagnostic programme (chapter 5) and are marked by silkscreening in the layout of the board.
Dealers must contact the national Service Centers for this procedure. See further on in this chapter 3.6 for instructions and addresses.

If the defective item is in the circuitry of the SERVO section, analog audio or analog video section then the main panel can be repaired by the authorized dealer down to component level.
For partslist see chapter 8 .

Remark :
The defect on the board can be isolated and found by means of built-in diagnostics :
(See chapter **5 SERVICE SOFTWARE**)

1. Low Level test (in short LLtest)
2. Service Shell

3.6 REPAIR PROCEDURE OF THE MAINBOARD IN YOUR COUNTRY

3.6.1 Repair procedure for NORTH AMERICA Customers

- Return defective Main boards to the following address :

PHILIPS SERVICE COMPANY
907 SNAPP FERRY ROAD
GREENEVILLE, TN 37743

- Re-use original packaging to return the part to Philips.
- Use standard NARDA form to receive Warranty credit, Dud credit or Defective shelf stock credit. Form must be filled out completely.
  Describe the defect condition in detail.
- ALL RETURN ITEMS ARE SUBJECT TO INSPECTION FOR MISUSE OR ABUSE. PHILIPS RESERVES THE RIGHT TO REFUSE CREDIT ON SUCH ITEMS
- Damaged or cracked boards will be refused for credit.

3.6.2 Procedura di Riparazione ITALIA

Nel caso in cui il prodotto non funzioni correttamente o sia difettoso si prega di contattare il Centro Assistenza Tecnica Autorizzato di zona (consultare l'elenco telefonico provincia alla voce Philips Service).
Si raccomanda di leggere attentamente le istruzioni d'uso prima di interpellare il Centro Assistenza Autorizzato. Per ulteriori informazioni si consiglia di interpellare :

SERVIZIO CONSUMATORI PHILIPS
PIAZZA IV NOVEMBRE 3
20124 MILANO

FAX: 02 - 67 52 26 60
TEL.: 167 - 82 00 26 (Linea verde)

3.6.3 Reparatur Prozedur OSTERREICH

Bitte richten Sie alle weiteren Fragen an den PHILIPS SERVICE ZENTRALE:

Osterreichische Philips Industrie GmbH
Service Zentrale
Gutheil - Schodergasse 12
A-1100 WIEN

TEL.: (0222) 60 101-0
FAX: (0222) 60 101-5596

3.6.4 Reparatur Prozedur SCHWEIZ Procedura di Riparazione SVIZZERA Procédure de réparation SUISSE

Bitte richten Sie alle weiteren Fragen an Ihr "Philips info Center":
Per qualunque domanda in questione rivogetevi p.f. al vostro "Centro Philips d'Informazione":
Pour toustes autres questions, veuillez vous adresser à "Philips Info Center":

PHILIPS INFO CENTER
c/o SERLOG SERVICE + LOGISTIK AG
FEGISTRASSE 5
CH-8957 SPREITENBACH

TEL.NR. 056/70 72 70
FAX.NR. 056/70 75 75

3.6.5 Proceso de Reparación ESPAÑA

Para el proceso centralizado de reparaciónes de CD-i puede ud. Tomar contacto con el Sr. J.J. Morillas o Sr. Lluch. Dirección :

EUROSERVICE (SERVICE SPAIN)
BRUCH 147 - 149
08037 BARCELONA

TEL.NR. 34 3 2070100
FAX.NR. 34 3 4574894

3.6.6 Reparaturabwicklung DEUTSCHLAND

Das fehlerhafte Mainboard muss in ESD-sicherer Verpackung mit detaillierter Fehlerbeschreibung an die hierunter genannte Adresse gesandt werden.
Die Rücksendung des defekten Mainboards erfolgt an folgende Adresse:

PHILIPS CE GmbH
CONSUMER ELECTRONICS
SERVICE ORDERDESK
z.Hd. Frau Billert
ALEXANDERSTR. 1
20099 HAMBURG

3.6.7 Procédure de réparation FRANCE

- Commander le circuit principal
- ré-utiliser l'emballage initial pour retourner la pièce à SERVICE SA
- Retourner les principales pièces défectueuses à l'adresse suivante :

SERVICE SA
Service Retours / Pièces Détachées
Rue des Vieilles Vignes - BP 02
77311 - CROISSY BEAUBOURG

- Joindre le ticket de prélèvement de la pièce livrée
- Si la réparation est sous garanti, joignez une demande de remboursement

Remarque : Si le circuit défectueux n'est pas retourné dans les 8 jours qui suivent la livraison de la piéce de remplacement, une facture complémentaire sera établie.

3.6.8 Other countries

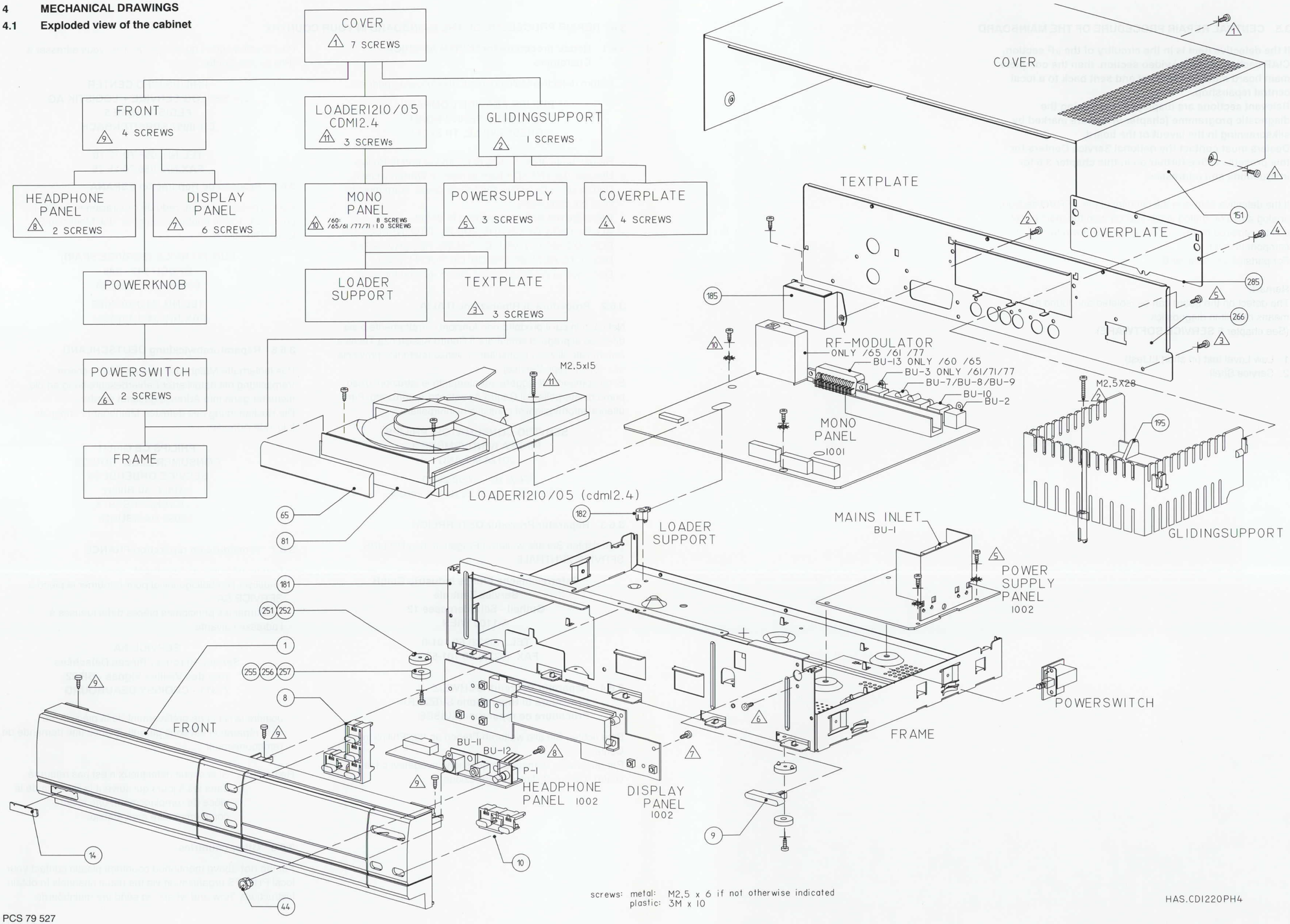
For the **not** above mentioned countries please contact your local PHILIPS organization via the usual channels to obtain instructions "how and where" to send the mainboards.

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4 MECHANICAL DRAWINGS

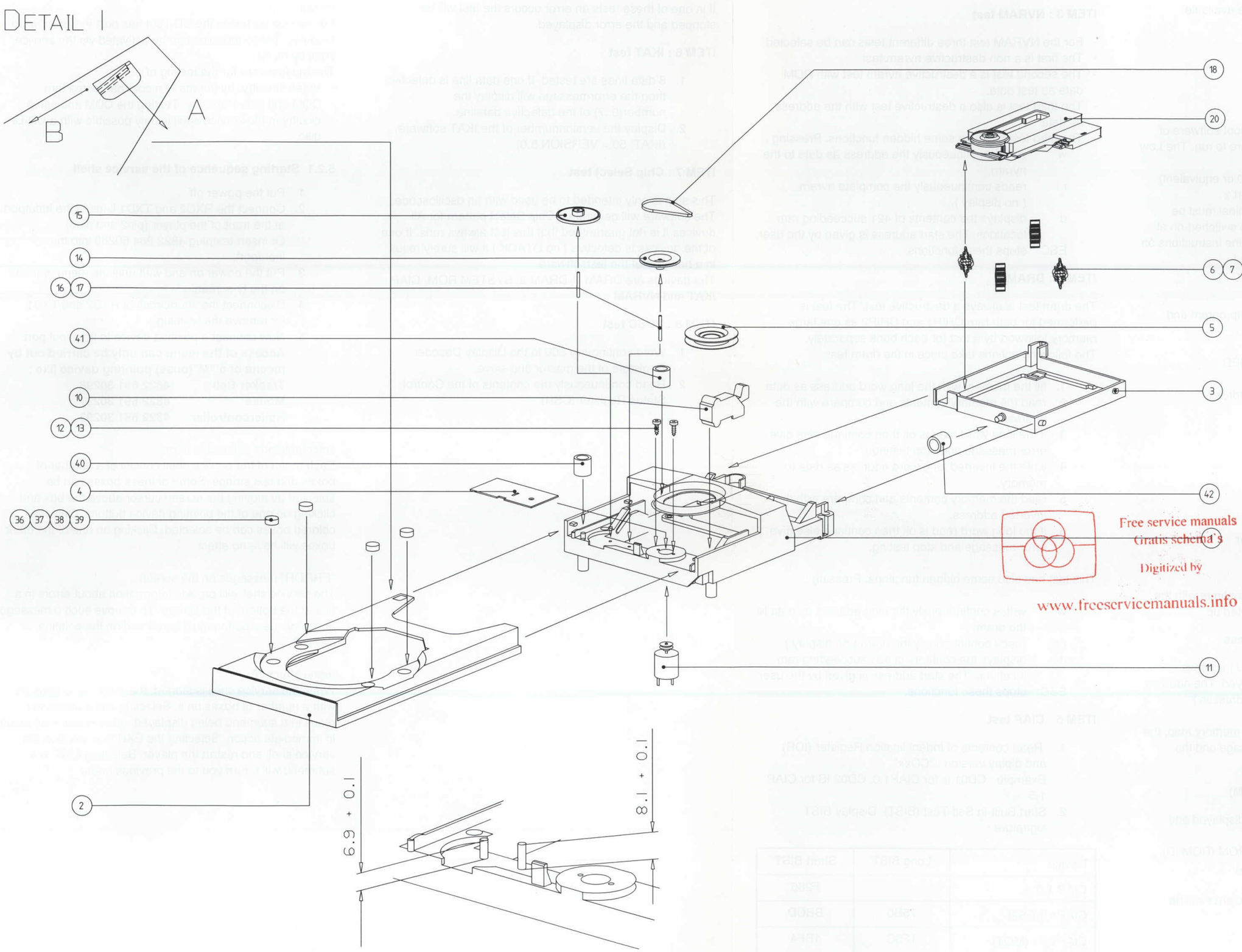
4.1 Exploded view of the cabinet



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4.2 Exploded view of the loader



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5 SERVICE SOFTWARE

In the set there are 2 different testsoftware available:

1. Low Level test
2. Service Shell

5.1 THE LOW LEVEL TEST

Scope
This test is standard implemented in the boot software of CD-RTOS. It doesn't need a lot of hardware to run. The Low Level test is Menu driven.
To run the low level test a terminal (VT100 or equivalent) must be connected to the inputport via Port 2.
To start the test the space-bar on the terminal must be pushed at the same time that the power is switched-on at the CDI-player. To continue with the test, the instructions on the screen of the terminal must be followed.

5.1.1 Testsequence

Table below shows all the steps of the testprogram and what kind of tests are performed.

STEP	ACTION/TEST PERFORMED
0	Exit Low Level test
1	Writing to a default RAM address
2	ROM parity check
3	NVRAM test (32K)
4	DRAM test
5	CIAP test
6	IKAT-CD60-DSIC2 test
7	Chip Select test
8	VDSC test

Display LLtest header and release number

ITEM 0 : Exit Low Level test

Selecting this item will end the lltest and continue with the boot. After the boot the player shell is started up.

ITEM 1 : Writing to a default RAM address

This test writes the powers of 2 to a (word) address.
The result is read again and will be displayed. The address can be selected by the user (only word adresses).
Pressing 'ESC' stops the test.
If one trys to write to unused space in the memory map, the program will NOT generate an error message and the system will hang up.

ITEM 2: ROM parity check (System ROM)

For the ROM the following information is displayed and checked:
- Display the identification code for this ROM (ROM ID)
- Display the release number of this ROM
- Display the checksum of this ROM.
  If the checksum is not ok then a specific error will be displayed.

ITEM 3 : NVRAM test

- For the NVRAM test three different tests can be selected:
- The first is a non destructive nvram test
- The second test is a destructive nvram test with ROM data as test data.
- The third test is also a destructive test with the address as data.
- The third test has also some hidden functions. Pressing :
  - w : writes continueously the address as data to the nvram.
  - r : reads continueously the complete nvram (no display).
  - d : displays the contents of 421 succeeding ram locations. The start address is given by the user.
  - ESC stops these functions.

ITEM 4 : DRAM

The dram test is always a destructive test. The test is performed for both ram CHIP1 and CHIP2 as one large memory followed by a test for each bank separately.
The following actions take place in the dram test:

1. fill the memory with the long word address as data.
2. read the memory contents and compare with the address.
3. if the long word read is ok then continue else give error message and stop testing.
4. write the inverted long word address as data to memory.
5. read the memory contents and compare with the inverted address.
6. if the long word read is ok then continue else give error message and stop testing.

This test has also some hidden functions. Pressing :

- w : writes continueously the long address as data to the dram.
- r : reads continueously the dram (no display).
- d : displays the contents of 421 succeeding ram locations. The start address is given by the user.
- ESC: stops these functions.

ITEM 5 : CIAP test

1. Read contents of Indentification Register (IDR) and diplay version : "CDxx"
   Example : CD01 is for CIAP1.0, CD02 IS for CIAP 1.5
2. Start Built-in Self-Test (BIST). Display BIST signature :

Device	Long BIST	Short BIST
CIAP 1.0		F286
CIAP1.5(ES2)	75B0	BBCD
CIAP1.5 - (MOT)	1F5C	1BF4

If in one of these tests an error occurs the test will be stopped and the error displayed.

ITEM 6 : IKAT test

1. 8 data lines are tested. If one data line is defective then the errormessage will display the number(0..7) of the defective dataline.
2. Display the versionnumber of the IKAT software. (IKAT: 50 = VERSION 5.0)

ITEM 7 : Chip Select test

This step is only intended to be used with an oscilloscope. The software will generate a Chip Select pattern for All devices.It is not guaranteed that this test always runs. If one of the devices is defective (no DTACK) it will surely result in a hang-up of the testsoftware.
The devices are DRAM 1, DRAM 2, SYSTEM ROM, CIAP, IKAT and NVRAM.

ITEM 8 : VDSC test

1 Write continously $00 to the Display Decoder Registers of the master and slave.
2 Read continueously the contents of the Control Status Register (CSR).

5.2 THE SERVICE SHELL

Introduction.
For service purposes the CD-I set has built-in testsoftware modules. These modules can be activated via the service shell by menu.
The modules are for the testing of :
- Video circuitry, by means of a colorbar testpa tern
- CDM and servo circuitry. Testing the CDM and servo cicuitry in the service shell is only possible with a CD-DA disc.

5.2.1 Starting sequence of the service shell

1. Put the power off
2. Connect the RXD2 and TXD1 lines of the inputport at the front of the player (pin2 and pin3).
   Or insert testplug 4822 264 50263 into the inputport.
3. Put the power on and wait until the menu appears on the tv-screen.
4. Disconnect the shortcircuit of RXD2 and TXD1.
   Or remove the testplug.
5. Now connect a pointing device to the input port:
   Access of the menu can only be carried out by means of a "M"(ouse) pointing device like :
   Tracker Ball 4822 691 30298
   Mouse 4822 691 30297
   Rollercontroller 4822 691 30293

selectable/non selectable items
Each menu of the service shell consist of a number of boxes and text strings. Some of these boxes can be selected by moving the screen cursor above the box and clicking on one of the pointing device buttons. Only the colored boxes can be selected. Clicking on one of the other boxes will have no effect.

"ERROR" messages on the screen
The service shell will provide information about errors in a box at the bottom of the screen. To remove such a message and continue a button must be clicked on the pointing device.

menu structure
When the service shell is started, the main menu appears with a number of boxes on it. Selecting some boxes will result in a submenu being displayed, other boxes may result in immediate action. Selecting the EXIT box will stop the service shell and restart the player. Selecting EXIT in a submenu will return you to the previous menu.

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5.2.2 Subject dependent information

Main menu
The main menu contains three item boxes.

1. TEST IMAGE
2. CD DRIVE
3. EXIT

Selecting TEST IMAGE will give immediate action.
Selecting CD DRIVE will start the CD DRIVE test submenu.
Selecting EXIT will return to the normal usershell.

Test image
A video (75%)colorbar with 750 mV level white bar is generated and send to the video output.

CD drive test

1. First of all the communication with the CD part is checked then after clicking on one of the buttons the IKAT version is displayed.
2. After clicking on one of the buttons the CD drive test menu will appear. The CD drive test will perform the service loop as implemented in the Philips CD audio players. A CDDA disc is needed for this test. Results of this test will be displayed on the tv-screen.
3. When the cd drive test is selected, the next items can be selected:
   - ARM OUT. Clicking on this item will result in a movement of the sledge with laser and the optical pickup to the outside area of the disc if the sledge is at the centre area of the disc.
   - ARM IN. Selecting this item will return the sledge to the centre area of the disc if it is at the outside.
   - NEXT MODE. Selecting this item will put the servo circuit into some modes (or steps). The modes are displayed in the red box on the right at the top of the screen, while messages are displayed in the red box on the left. The drive test consist of the following steps:

   MODE 0
   In mode 0, the ARM IN and ARM OUT buttons can be selected to move the sledge with the optical unit inwards and outwards.
   Selecting NEXT MODE will bring the player in mode 1.

   MODE 1
   In mode 1 the IKAT processor will try to focus. If it manages to do so (a disc must be present!), the message IN FOCUS will appear in the left box. Otherwise, the message NO FOCUS will appear after the processor has tried to focus 3 times. In that case (no focus found) the test will return to mode 0.
   Selecting NEXT STEP will bring the player in mode 2.

MODE 2
The turntablemotor is rotating and controlled by the rough HF. The message MOTOR OK will appear. If an error occurs, the message MOTOR ERROR APEARS and the test will return to mode 0.
Selecting NEXT STEP in mode 2 will bring the player in mode 3.

MODE 3
The radialservo is now activated and the message RADIAL TEST OK appears. The optical pick up will follow the tracks now and the sound is muted.
If an error occurs, an error message will be displayed and the test will return to mode 0.
NEXT STEP in mode 3 will bring the player in normal playing mode, but if something goes wrong at the bottom of the screen an error code ("CD error x")will be displayed.
The meaning of the "x" is in the next list :

0 = no error
1 = focus found
2 = focus error
3 = radial error
4 = turntable motor error
5 = search time error
6 = subcode error
7 = TOC error
8 = fatal sledge error

To exit the SERVICE SHELL the power must be switched off.

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6 ELECTRICAL DRAWINGS

6.1 BLOCKDIAGRAM with FUNCTIONAL SURVEY

The circuitry is build up on one double sided 4-layer main board and consists of the following functional parts and blocks:

Processor part
- CPU (SCC68070)
- IKAT (MC68HC05I8)
- System ROM (27C400)
- NVRAM/CLOCK

CD Interface and Audio Processor part
- CIAP 1.5 (-)

Digital Video part
- VDSC (Video Decoder and System Controller)
- CALVIN(Video Encoder)
- 1MB DRAM with two banks of 512 KB
- CVBS video out
- RGB video out (only for /40/45)
- Y/C video out

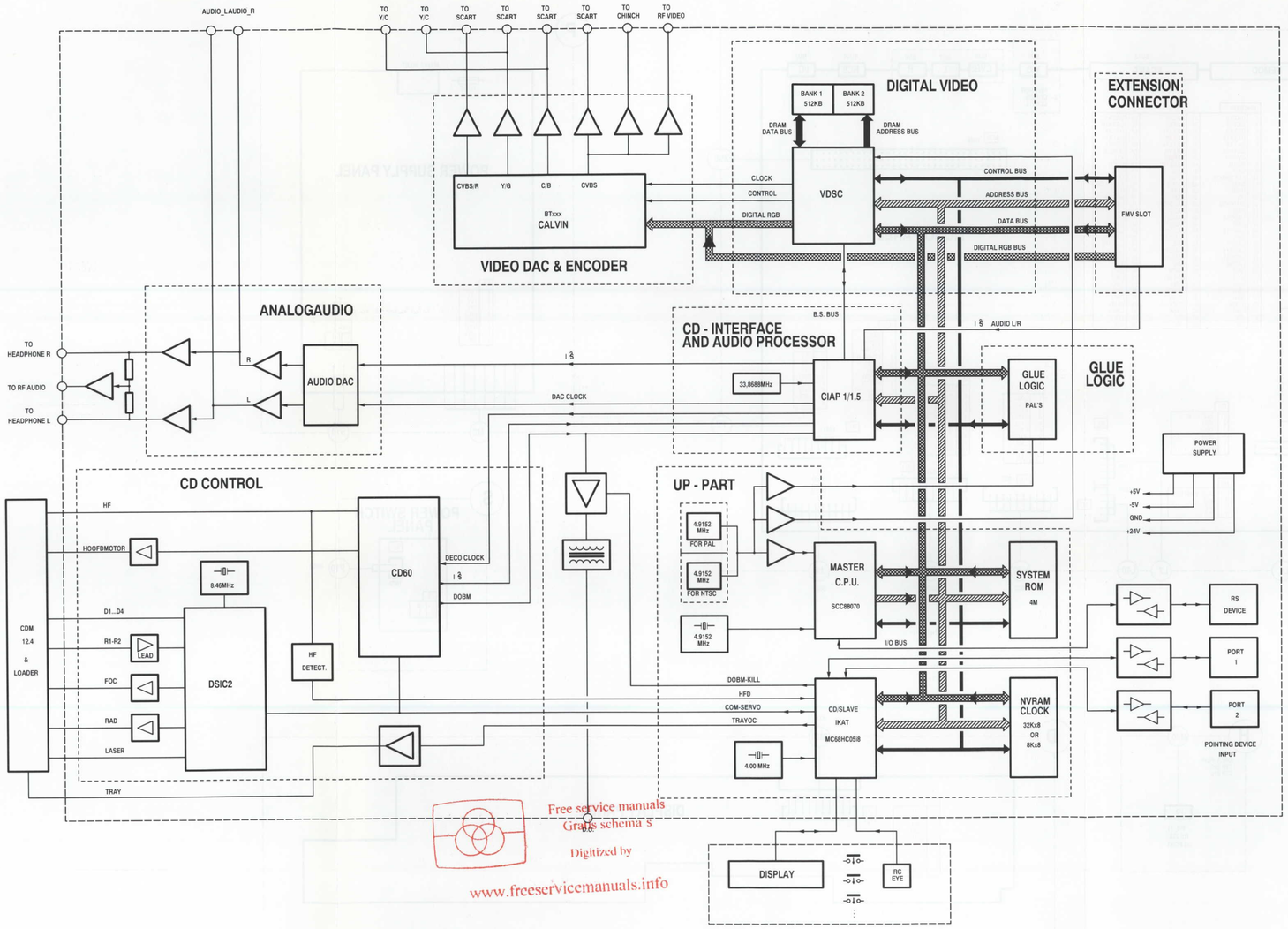
Chip Select and DTACKN generating glue logic
- PAL 16L8-10
- PAL 16R4-10

CD Control part
- CDM 12.1
- TDA 1301 (DSIC 2; Digital Servo IC for Controlling 2 stage 3 beam servo mechanisms)
- Additional discrete HFD and defect detector circuits
- CD 60 (CD Decoder)

Audio part
- DAC (CS4303)
- Audio outputs L/R
- Audio headphone output L/R

Power Supply
- +25V / +5V / -5V

Interfaces
- CDM 12 interface (flex conn. pos.1008)
- Power supply inlet (pos.1001)
- Pointing device input/output front (pos.1022)
- Pointing device input/output rear (pos.1033)
- Extension connector (pos.1096)
- Audio headphone output L/R (pos.1030)
- Audio outputs L/R (pos.1015)
- Video CVBS output (pos.1015)
- Video RGB output (pos.1013) (only for /40/45)
- Video Y/C output (pos.1006) (only for /51)
- RF modulator power outlet (pos.1016)

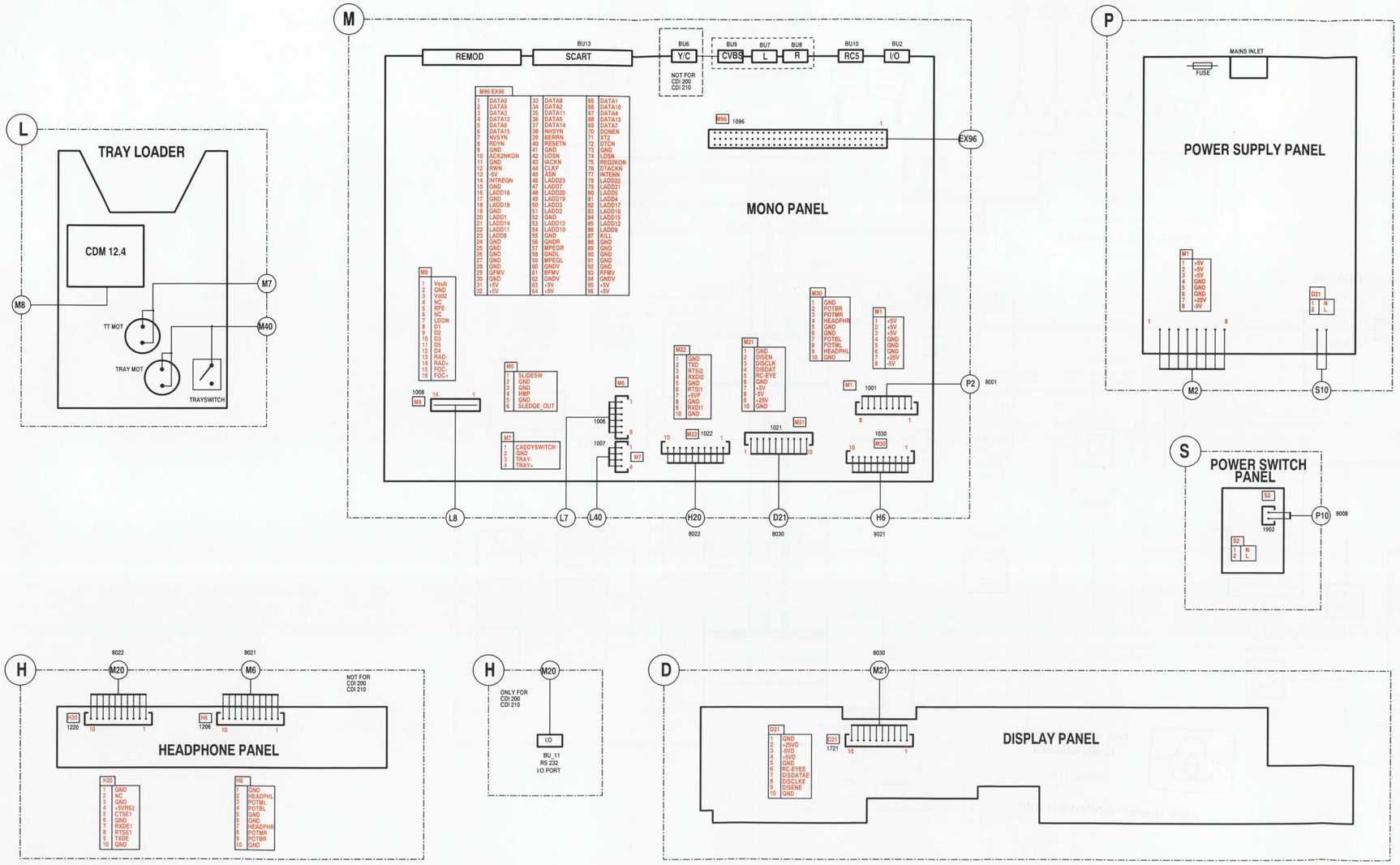


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6.2 WIRING DIAGRAM



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6.3 Alphabetical list of abbreviations

Remark: The list contains all abbreviations, which are ever used in CDI electrical circuitry

A,B,C + : >>control signals for brushless DC-motor
A,B,C, - : >>
ACK2N : DMA REQUEST ACKNOWLEDGE (active low)(of channel 2)
ACM : output AC-motor
ACK2NKON : DMA REQUEST ACKNOWLEDGE (96-pins connector, channel2 :FMV)
ADEN : (=ADENA)ADDRESS ENABLE NOT. When low,the address ADENA coming from the bus (68070)
ADOCLK : output clock from the ADOC (11.2896 MHz)
AM : ADDITIONAL MUTE
ASN : ADDRESS STROBE (active low, tristate) indicates whwn an address is valid on the bus for the system
ASNP : ADDRESS STROBE from processor (active low)
ASPRAT : Aspect ratio switch signal (16:9 or 4:3)
AUDGND : Audio ground (SCART)
AUDL : >>AUDIO LEFT
AUDIOL : >>
AUDIOLSC : >> (scart)
AUDIOREM : Audio signal to remodulator
AUDR : >>AUDIO RIGHT
AUDIOR : >>
AUDIORSC : >> (scart)
AUDIO_CLK : 16.93MHz clock (33.86MHz:2) from CIAP to CD60 and audio DAC
AVN : AUTOVECTORED INTERRUPTS (active low),can be used by an extension
A0..15 : Local addressbus of the audio DSP-processor
B0..7 : digital video (blue) from VDSC DRAM
B0CD..B3CD : input control bits for off-,catch-,play status and DAC output current for radial motor
B,G,R : output colours of the VSD
BERRN : >>BUS ERROR (active low,open drain)
BFMV : blue color coming from the FMV-extension
BGACKN : Bus Grant Acknowledge (active low)
BGN : Bus Grant (active low) access from the cartridge to the base system via bus-mastership
BGND : Blue color ground (SCART)
BIN : blue color input for the CXA1145 encoder
BLANI : (=BLAN1M) BLANKING OUTPUT (active low,tristate) of the VSC
BRN : Bus Request (active low) access from the cartridge to the basecase system via bus- mastership
BSC : blue color (scart)
BSW : blue color coming from the switch CDI/external (FMV) video
BUGCD60 : CD60 anti - hangup line
BUSYLED : signal to control green busy LED - driver
C : Chrominance singnal (Y/C)
CADDYIN : high when reading data
CADDYSWITCH : control signal for position tray
CAS1N : column address strobe 1 (VDSC)
CAS2N : column address strobe 2 (VDSC)
CBA : 68070 bus tranceiver latch (rising edge)
CBSC : CHROMA for S-VHS (Y/C) or BLUE for SCART
CDICDACKN : (=ACK1N) DMA REQUEST ACKNOWLEDGE (active low)
CDICREQN : (=REQ1N) DMA REQUEST (active low)
CDTV : to change by remote control between TV or CDI (only used by CDI 2XX)
CD60_V2 : CD60 -status information line from CD60 to IKAT
CIAPACKN : DMA channel 1;CIAP acknowledge (active low)
CIAPJUC : CIAP Jump Complete
CIAPREQN : DMA channel 2;CIAP request (active low)
CIAP_INTN : CIAP interrupt request (active low)
CL : serial communication clock to DSIC2 and CD60
CLAB=CLAB2 : bitclock for the SAA 7220 chip
CLABCD : bitclock from the 7310 chip
CLK=2BLCK : CLOCK (11,2896 Mhz)
CLKDAC : CLOCK DAC,the clock used to send serial data to the volume adjustment
CLKF : 2B-clock (11,2896 MHz) for the FMV-extension
CLK1 : the clock on which the DSP operates (7,5264 MHz)
CLK11 : not used (connected to ground)
CLK3A : 11.2896 MHz clock for the SAA7310 decoder
CLOCK_27 : 27 MHz clock :used as system clock by the DSP and the LEMM
CRI : COUNTER RESET INHIBIT (low during a real trackloss or during excention of a jump command
COC : COMMAND COMPLETED signal
COXN : serial output clock for the X-bus
COXNDSP : clock DSP, the clock used to send serial data on the X-bus
CSDMAKILL : generates killme :Dot killer enable signal (active for NTSC) and functions as DMA enable for the FMV extension
CSDSPN : signal used by LEMM to generate the DSP chip select signal (KIP) (active low)
CST : combined chipselect signal for NVRAM/system ROM
CPUASN : the address strobe of the 68070 microprocessor
CPULDSN : the lower data strobe of the 68070 microprocessor
CPUUDSN : the upper data strobe of the 68070 microprocessor
CRI-DODS : counter reset inhibit of the 7310 chip
CS : CHIP SELECT
CSCDICN : CHIP SELECT CDIC (active low) bus information is intended for or coming from CDIC
CSCIAPN : CHIP SELECT CIAP NOT
CSIKATN : chip selekt for IKAT (active low)
CSIKATP : modified chip select for IKAT for testing purposes
CSKILL-MEMM : chip select for kill and DMA circuit.
CSKILL-MEMMS : >> syncronized
CSDAC1N : (=CSDAC2N)(if selected,low)it means that data will be adjusted on that channel
CSNVRAMN : CHIP SELECT NVRAM (active low) information is intended for or coming from the NVRAM
CSROMN : >>
CSROM0N : CHIP SELECT ROM (active low) information is coming from the ROM'S
CSSLAVEN : CHIP SELECT SLAVES (active low)
CSON : CHIP SELECT (active low) for the 8Kx8 SRAM'S
CSVDSCN : CHIP SELECT for the VDSC (active low)
CSYN : COMPOSITE SYNCHRONIZATION input from the VSC'S (active low)
CTS1..4 : CLEAR TO SEND (active low) it indicates that the remote receiving device is ready
CTS#2 : >>
CTSE1..2 : CLEAR TO SEND input
CTSI1..2 : >>
CVBS : CVBS output
CVBS-OUT : >>
CVBS-GND : CVBS ground (SCART)
CVBS-REM : CVBS input signal for the remodulator
CVBS-SYNC : composite sync input for the SCART connector
D0..D23 : Local data bus of the audio DSP-processor
D8NVR : data bit 8 (least significant bit) signal for the NVRAM
DA : serial communication data to DSIC2 and CD60
DAAB : (DAAB2,DAABCD) serial data output of the X-bus I^2S standard
DATA0..15 : DATA LINES
DATADAC : data which will be send to the DAC('S) for volume adjustment
DDTACKN : DATA TRANSFER ACKNOWLEDGE (active low) from CDIC
DEEMP : DEEMPHASIS
DIG OUT : DIGITAL OUTPUT
DIRN : DIRECTION CONTROL. indicates the direction of data transfer through the transievers
DISCL : DISPLAY CLOCK
DISCLK : (DISCLKE) DISPLAY CLOCK >>
DISDAT : (DISDATAE) DISPLAY DATA >>
DISEN : (DISENE) DISPLAY ENABLE >>
DISSEL : software selection signal (CDI210/220)
DIV4 : DIVIDE BY 4 signal
DMAEN : DMA enable for the FMV extension
DOBM : Digital Out from CD60
DOBM_KILL : DIGITAL OUT KILL signal
DS : Data memory select output of the DSP-processor (active low)
DSPACKN : DMA acknowledge (Channel 1) : 68070 -- LEMM (active low)
DSPREQN : DMA request (Channel 1) : LEMM -- 68070 (active low)
DSP-INTN : interrupt request DSP -- 68070 (active low)
DTACKN : data transfer acknowledge (68070) (active low)
DTCNC : data transfer completed corrected (CDIC)
DTRAM : DTACKN generation signal for NVRAM acces
DTROM : DTACKN generation signal for system ROM acces
DTCN : Data transfer completed (active low; 68070)
DO : DIGITAL OUT
DODS : DROP-OUT DETECTOR SUPPRESSION
DONEN : DONE (active low).open drain),operates in the DMA-mode
DOXN : serial data output of the X-bus
DPSRWN : read (high) or write (low) from or to the DSP
DSN2N : DATA STROBE (active low) of the DSP
DATACK ROM : DATA TRANSFER ACKNOWLEDGE of the ROM
DTACKSLAVEN : DATA TRANSFER ACKNOWLEDGE of the SLAVE processor
DTCN : DATA TRANSFER COMPLETE (active low,open drain) operates in the DMA-mode
DUARTCSN : DUART CHIP SELECT,when low businfo is coming from or going to the DUART
DZF : DATA ZERO FLAG
D1...5 : CDM photo diodes inputs
D8NVR : DATA 8 to NVRAM
EFAB : ERROR FLAG
EFLAG : ERROR FLAG input to CIAP
EFLAGCD60 : ERROR FLAG output from CD60
FILTERN : filter select when high:levelC,when low:level A
FOC- : >>focus out to CDM
FOC+ : >>
FSB : Frame select line output of the LEMM -- DSP :this line is asserted for every WSAB (pin 66 of the LEMM) transition
GFMV : green color coming from from the FMV-extension
GGND : Green color ground (SCART)
GIN : green color input for the CXA1145 encoder
GN : when low:the outputs and inputs of the trancievers are enabled
GNDC : Ground for the color signal (Y/C)

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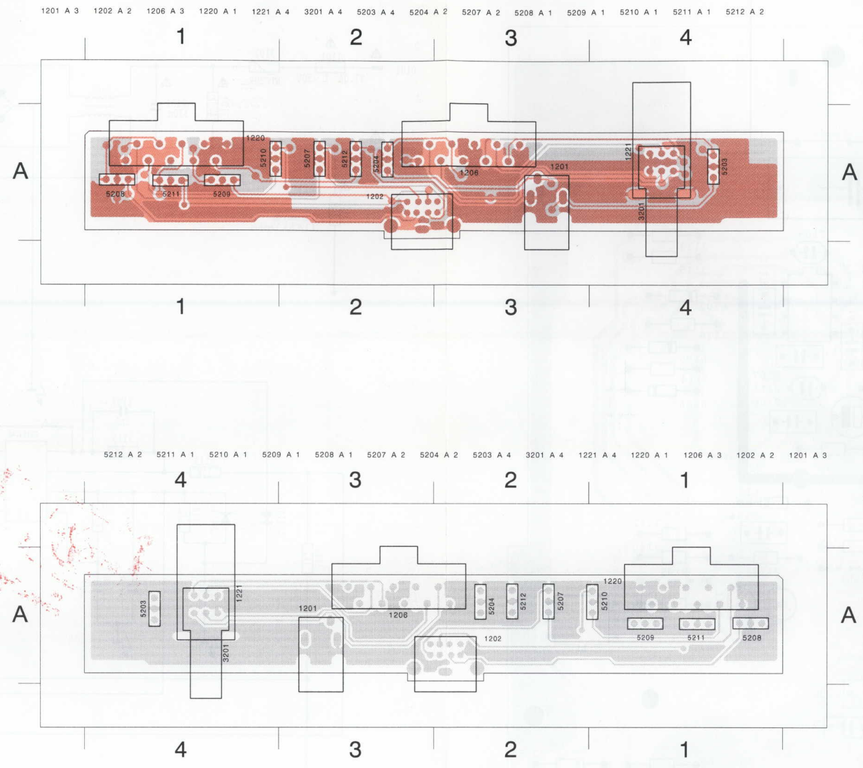
GNDL : Ground for MPEG audio left (96-pins connector)
GNDR : Ground for MPEG audio right (96-pins connector)
GNDV : Ground for MPEG video (96-pins connector)
GNDY : Ground for the luminance
GSC : green color (SCART)
GSW : green color coming from the switch CDI/external (FMV) video
G0..7 : digital video (green) from VDSC DRAM
HALTN : active low,open drain,biderectional.if low together whit the resetn it couses the 68070 to enter the reset state.
HEADPHL : (HPL)headphone audio left
HEADPHR : (HPR)headphone audio right
HFD : High Frequency Detect signal
HFDDEF : signal that indicates when the last session of a multisession-disc has ended
HFIN : HF current input
HMP : Spindle Motor Plus
HSYN : (active low) horizontal synchronisation input from the VSC
HSYNCOUT : (active low) horizontal synchronisation output for monitor or tv
HVID0..7S : 8bit pixel bus for channel 1 VSD from VSC
IACK2 : Interrupt acknowledge from 68070 (active low) -- AVN line of the 68070 (auto-vector interrupt) -- the 68070 generates this signal (IACK2) when the slave proc. as- serts IN2
IACKN : interrupt acknowledge for the FMV-extension
IACKIN2N : >>
IACKIN4N : >>decoded interrupt acknowledge (active low).
IACKIN5N : >>asserted during an interrupt acknowledge
IACKOUT2N : >>sequence to indicate to a peripheral that
IACKOUT4N : >>this interupt request is being serviced
IACKOUT5N : >>
IACKOUT2 : >>
IACKOUT4 : >>
IACKOUT5 : >>
IACKOUT22 : >>
IACKOUT23 : >>
IACKOUT42 : >>
IACKOUT52 : >>
IDAC : 1/2 bit DAC
IFDN2 : main channel word-flag to the DSP
IN2 : interrupt request from slave proc. --68070 (active low)
IN5 : interrupt request input 5 of the 68070 (not used)
INTENN1 : interrupt enable for the FMV-extension
INTENN : >>when low,no extensions use the interupts,when high interupt devices are daisy chained
INTENN2 : >>
INTENN3 : >>
INTENN4 : >>
INTIKATN : INTERRUPT from IKAT (from IKAT to UP)
INTREQN : interrupt request from the FMV-extension
IN2IN : (=IN2OUT)>>
IN4IN : (=IN4OUT)>> decoder interrupt priority inputs
IN5IN : (=IN5OUT)>> (active low) IN2IN has the lower
IN2OUT : >>and IN5IN has the higher priority
IN4OUT : >>IN2IN = SLAVEPROCESSOR (6805),IN4IN =
IN5OUT : >>CDIC (IMS66490),IN5IN = DUART
IN4OUT2 : >>
IN5OUT2 : >>
IN2OUT3 : >>
IRQA : interrupt request from LEMM -- DSP (active low) and mode A pin of the DSP (after the DSP reset, the DSP reads the level on this pin to define the mode of operation)
IRQABN : logical AND of the IRQA and the IRQB line (lemm output pin -- DSP)
IRQB : interrupt request from LEMM -- DSP (active low) and mode B pin of the DSP (after the DSP reset, the DSP read the level on this pin to define the mode of operation)
IRQIN : interrupt request for IKAT (not used)
ISELIN : pin of CIAP (always pulled up)
JUC : jump completed signal from servo proc. --LEMM
KILL : to mute audio outputs by power on and off
KILLME : (KILL-ME)dot killer enable signal (active for NTSC)
KIP : host enable input pin of the DSP-processor :this signal enables a transfer on the DSP host bus DATA0..7 (active low)
LA1 : >>control signals for brushless DC-motor
LB1 : >>
LC1 : >>
LADD1..23 : ADDRESS-BUS (active high,tristate)for direct addressing of 16 Mbyte of memory
LBOT : for HPL volume control
LDON : switches laser on (5V) & off (0V) (LASER DRIVE ON)
LDSN : LOWER DATA STROBE of the bus
LIDSWITCH : Lid detection switch
LM : LASER MONITOR diode input
LO : laser amplifier current OUTPUT
LRDN : when low select,the ROM'S or NVRAM read the lower data byte
LS : switches between DOUBLE (0V) & SINGLE (5V) SPEED
LTAP : >>for HPL volume control
LTOP : >>
LVID0IN..7IN : >>8 bit pixel-bus for channel 2 (VSC-SLAVE)
LVID0OUT..7OUT : >>
LWN : read/write enable (for the lower part of the data: MD0..7) for the DRAM (VDSC)
LWRSN : R/W lower memory data to DRAM from VSC slave
LWRMN : R/W lower memory data to DRAM from VSC master
MA0..8 : VDSC DRAM address bus
MC : MOTOR CONTROL signal
MD0..15 : VDSC DRAM data bus
MISO : MASTER IN SLAVE OUT
MOSI : MASTER OUT SLAVE IN
MPEGL : left audio signal color coming from the FMV-extension goes the adder CDI/FMV audio
MPEGR : right audio signal color coming from the FMV-extension goes the adder CDI/FMV AUDIO
MSM : master slave selection input
MSMA0..8 : ADDRESS-BUS between the DRAM'S of the VSC'MASTER and the VSC MASTER
MSMD0..15 : DATA-BUS between the DRAM'S of the VSC'MASTER and the VSC MASTER
NCSYNV : composite sync for the VDSC
NHSYN : active low horizontal sync input for the FMV-extension
NPORE : Power on Reset for CD60 (active low)
NRESET : when low the video synthesizer is in reset
NVDS : digital output to control an external switch for TV overlays (active low)
NVDSI : >>synchronized with NXT2
NVDSN : Digital video switch - line (active low)
NVSYN : (active low) vertical sync input for the FMV-extesion
OTD : Off Track Detection from DSIC2
PCLK1IN : PIXEL CLOCK for channel 1
PCLK2IN : PIXEL CLOCK for channel 2
PLAYSEL : SELECTION of PLAYER type
PLOIN1 : input clock for CDIC (22,5792 MHz)
PLOIN2 : input clock for CDIC (19,3536 MHz)
PLOIN : clock signals for emulator panel
PLOINE : >>
POTBL : headphone left volume control
POTBR : headphone right volume control
POTML : headphone left volume control
POTMR : headphone right volume control
PRTS11 : request to send from main processor
QCL : Q-channel CLOCK
QDA : Q-channel DATA
QRA : Q-channel REQUEST INPUT/ACKNOWLEDGE OUTPUT
Q22 : output to PLL (22,5792 MHz) devided by 14
Q21 : output to PLL (19,3536 MHz) devided by 12
Q_DATA : I^2S data from LEMM -- audio DAC
Q_CLK : I^2S bit clock from LEMM -- audio DAC
Q_WCLK : I^2S word clock from LEMM -- audio DAC
RAB : hand shake protocol signal for CD60
RAD+ : >>RADIAL OUT to CDM
RAD- : >>
RASN : row address valid (active low) for the VDSC DRAM'S
RBOT : for HPR volume control
RC5 : wired RC input (cinch)
RC-EYEDIS : RC-EYE DISABLE signal (not used)
RCEYE : (RCEYEE)REMOTE CONTROL EYE
RCLED : REMOTE CONTROL LED
RD : READ signal DSP : this signal is asserted to read external memory (three SRAM'S FCB61C65) on the data bus D0..23 (active low)
RDN : READY signal, starting up procedure finished
RDYN : READY (active low) of the DMA channel
REDIG : RADIAL ERROR DIGITAL
REFHCA : reference voltage pin of CD60
REFLCA : reference voltage pin of CD60
REM : power supply remodulator
RESETCD : when low resetsequence starts
RESETINN : when low VSC is in reset
RESETN : this is the rest for all other ic's on MMC
RESETSYS : system reset (controlled by the slave-processor)
REQ2N : DMA-request of channel 2
REQ2NKON : DMA-request (96-pins connector, channel 2 : FMV
REQ2KON : DMA-request of channel 2 via DMA 2 on/off circuit
RFE : high-frequent signal coming from CDM (disc)
RFMV : red color coming from the FMV-extension
RGBS_GND : incoming video SCART (not used) ground
RGND : red color ground (SCART)
RIN : red color input for the CXA1145 encoder
RSC : red color (scart)
RSTOUT : RESET OUT of the slave processor when high resetsequence starts
RSW : red color coming from the switch CDI/external (FMV) video
RTAP : >>for HPR volume control
RTOP : >>
RTS12 : REQUEST TO SEND 2 from IKAT
RTSE1..2 : REQUEST TO SEND
RTSI1..2 : REQUEST TO SEND
RTSUART : REQUEST TO SEND from the slave processor to the UART of the 68070 processor
RST1..4 : >>REQUEST TO SEND (active low)
RST#1..2 : >>
RWN : READ - WRITE (low is write) signal

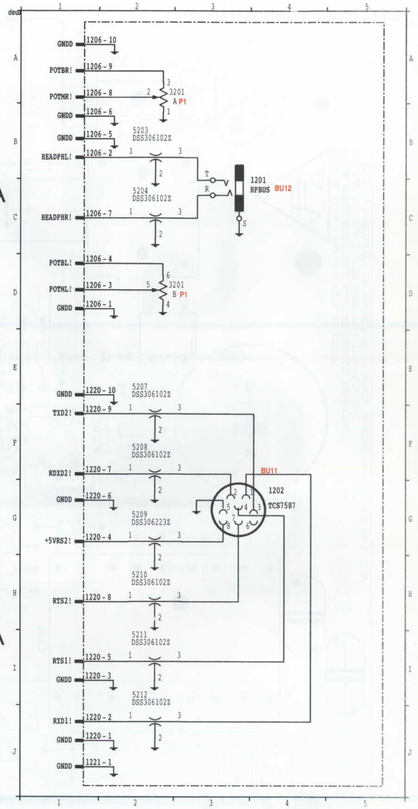
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RWN2	:	READ - WRITE (low is write) signal from CDIC to the DSP
RWRAM	:	READ - WRITE signal from the CDIC to the S RAM'S
RXDE1..2	:	RECIEVE DATA
RXDI1..2	:	RECIEVE DATA
R0..7	:	digital video (red) from VDSC DRAM
RXD1..4	:	>>RECIEVE DATA RXD is data input
XD#1..2	:	>>
SCAB	:	subcode data clock (2,8224 MHz) from the 7310
SCK	:	serial clock output from the LEMM -- DSP :the data and frame select for the DSP is clocked out on the rising edge of this clock
SCL	:	I^2C clock to HOBBES
SCLK	:	I^2S clock out from CD60
SDA	:	I^2C data to HOBBES
SDAB	:	subcode data from the 7310
SDATA	:	signal from CD60 data
SDAT	:	I^2S data out from CD60
SERVORESETN	:	Reset for DSIC2 from IKAT
SI	:	on - off control for laser supply and focus circuit
SI-RD	:	on - off control for laser supply and focus circuit/ready signal,starting up procedure finished
SILD	:	Serial communication Load to DSIC2
SLEDGE	:	sledge motor control
SLEDGE_OUT	:	power signal for activating the sledge motor
SLEEPAUDN	:	Audio kill line (active low)
SLEEPVID	:	Video kill line (active low)
SLIDESW	:	SLIDE SWITCH ;detection of sledge - endposition
SLMA0..8	:	VSC-slave memory address bus to the DRAM'S
SLMD0..15	:	VSC-slave memory data bus to the DRAM'S
SOCKGND	:	socket ground (SCART)
SOXENN	:	SERIAL OUTPUT ENABLE FOR THE X-BUS (enabled when low)
SOXRQN	:	SERIAL OUTPUT REQUEST FOR THE X-BUS (when low)
SOYENN2	:	SERIAL OUTPUT ENABLE FOR THE Y-BUS (when low)
SPICLK	:	SERIAL PERIPHERAL INTERFACE CLOCK
SPISS	:	(SPISSN) SERIAL PERIPHERAL INTERFACE SLAVE SELECT
SRD	:	serial data from LEMM -- DSP
SRTS1	:	request to send 1 from IKAT
STAND	:	NTSC or PAL selection signal
STANDARDOUT	:	software choise between PAL and NTSC
STANDARDSW	:	handware choise between PAL and NTSC
STANDEM	:	status from emulator,input for DUART
STANDEMEN	:	enable signal for switch signal on emulator
STANDIN	:	NTSC or PAL selection signal (input for slave)
STATUS	:	RF/external video selection signal
STATUSF	:	CVBS/RGB video selection signal
STD	:	serial data from DSP -- LEMM
SSCLKIN	:	pin of CIAP (always pulled up)
SSM	:	START STOP MOTOR
SWAB	:	SUBCODING WORD CLOCK INPUT
SWAB-SSM	:	subcoding word clock output and start/stop input of the 7310
SWCLK	:	I^2S Word Select Clock out from CD60
SWEM	:	software dat to switch on the emulator
SYSCLK	:	>>SYSTEM CLOCK
SYSCLKA	:	>>
SYSCLK1	:	>>
SYSCLK2	:	>>
SYSCLK3	:	33.86MHz system clock to CIAP
TCAP	:	input capture feature for the on-chip timer
TCMP	:	output for the output compare feature of the on chip timer
TCK	:	scan clock boundary
TDI	:	boundary scan input
TDOCIAP	:	boundary scan output of CIAP
TDOVDSC	:	boundary scan output of VDSC
TL	:	TRACK LOSS of the TDA8808 combined with the radial error signal of the TDA8809
TMOUT	:	TRAY MOTOR OUT
TMS	:	boundary scan control line
TRAY	:	tray open/close signal
TRAYOC	:	TRAY open/close
TRAYSWITCH	:	tray open/close detection signal
TX2	:	transmit data from IKAT
TXDE1..2	:	transmit data
TXDI1..2	:	transmit data
TXD1..4	:	>>TRANSMIT DATA TXD is data output
TXD#1..2	:	>>
UDSN	:	UPPER DATA STROBE (active when low)
URDN	:	READ UPPER DATA BYTE (active when low)
UWN	:	read/write enable (for the upper part of the data: MD8..15) fir the DRAM (VDSC)
UWRN	:	Upper Write Read Not for NVRAM
UWRSN	:	read/write (write when low) UPPER MEMORY DATA FROM DRAM'S FROM VSC-SLAVE
VC	:	output DC-motor (VOLTAGE CONTROL)
VDSC-INTN	:	interrupt request of the VDSC
V-FLAG	:	output to the DSP
VREFA	:	Reference Voltage on audio DAC
Vsub	:	substrate voltage
VSCM-INTN	:	when low,interrupt from VSC master to 68070 processor
VSCS-INTN	:	when low,interrupt from VSC slave to 68070 processor
VSYN	:	(active when low) VERTICAL SYNCHRONISATION INPUT from the VSC
V1	:	off track detection from DSIC2 to CD60
WIREDRC	:	see RC5
WR	:	write enable output of the DSP :this signal is asserted to write external memory (three SRAM'S FCB61C65) on the data bus D0..23 (active low)
WRMN	:	read/write (write when low) UPPER MEMORY DATA FROM DRAM'S FROM VSC-MASTER
WRN	:	WRITE UPPER DATA BYTE (active when low)
WRPN1M..S	:	control input for channel 1 or 2 (active low) of the VSD
WSAB	:	>>WORD SELECT from A to B CHIP
WSAB2	:	>>
WSABCD	:	11.2896 MHz bitclock (I^2S)
XINB	:	delayed clock XIN from CDIC goes back to CDIC
XIN	:	>>11,2896/9,6768/4,8384 symmetrical clock
XIN2	:	>>
X-TAL2	:	the same as the system clock,coming out of the VSC'S
XT2	:	(XT2N) the system clock devided by two
XT4	:	>>the system clock devided by four
XT41N	:	>>
XY	:	this DSP output signal selects which external memory space (X or Y) is selected
X_CLK	:	external audio I^2S -clock
X_DATA	:	external audio I^2S -data
X_WSIN	:	external audio I^2S -word select
Y	:	luminance signal (Y/C)
Y_GSC	:	Y (luminance) S-VHS (Y/C) or G for SCART
0AD..12AD	:	>>ADDRESS BUS,between CDIC-SRAM'S and SYSTEM ADDRESS BUS BUFFERS
10ADA..12ADA	:	>>
0D..15D	:	DATA BUS between CDIC and DSP
0DA..15DA	:	DATA BUS between CDIC-SRAM'S and SYSTEM DATA BUS TRANCIEVERS
2BCLK	:	CLOCK for the 2 B-chip
12A..15A	:	ADDRESS BUS between CDIC and DSP

6.4 HEADPHONE PANEL





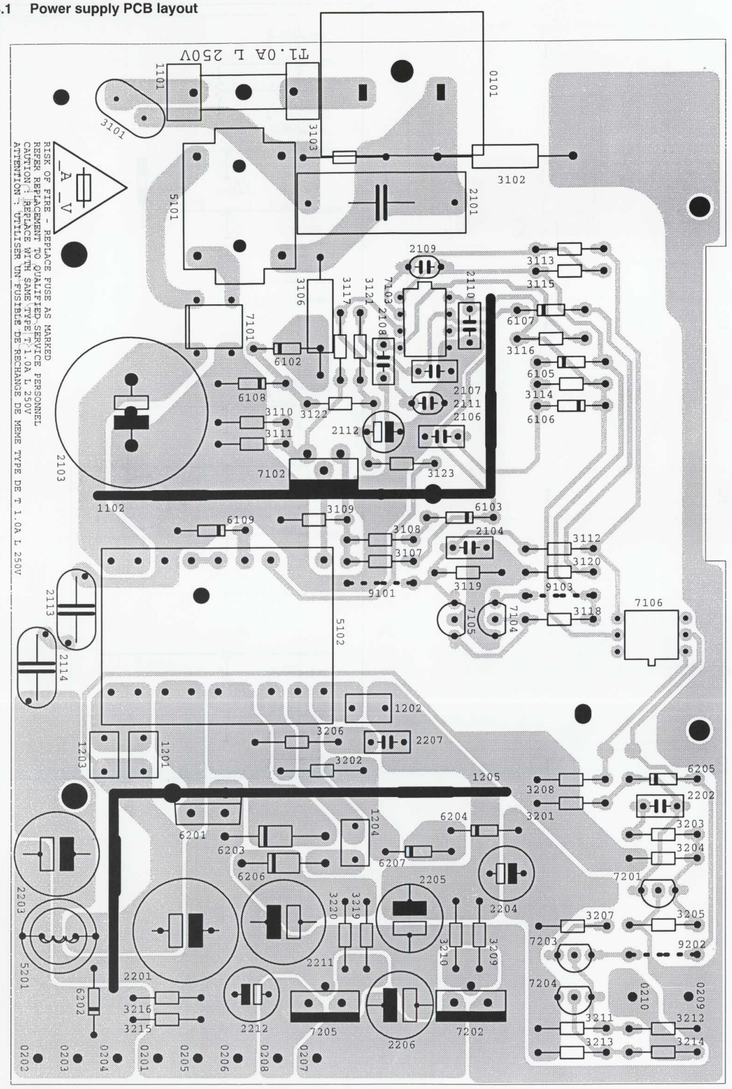
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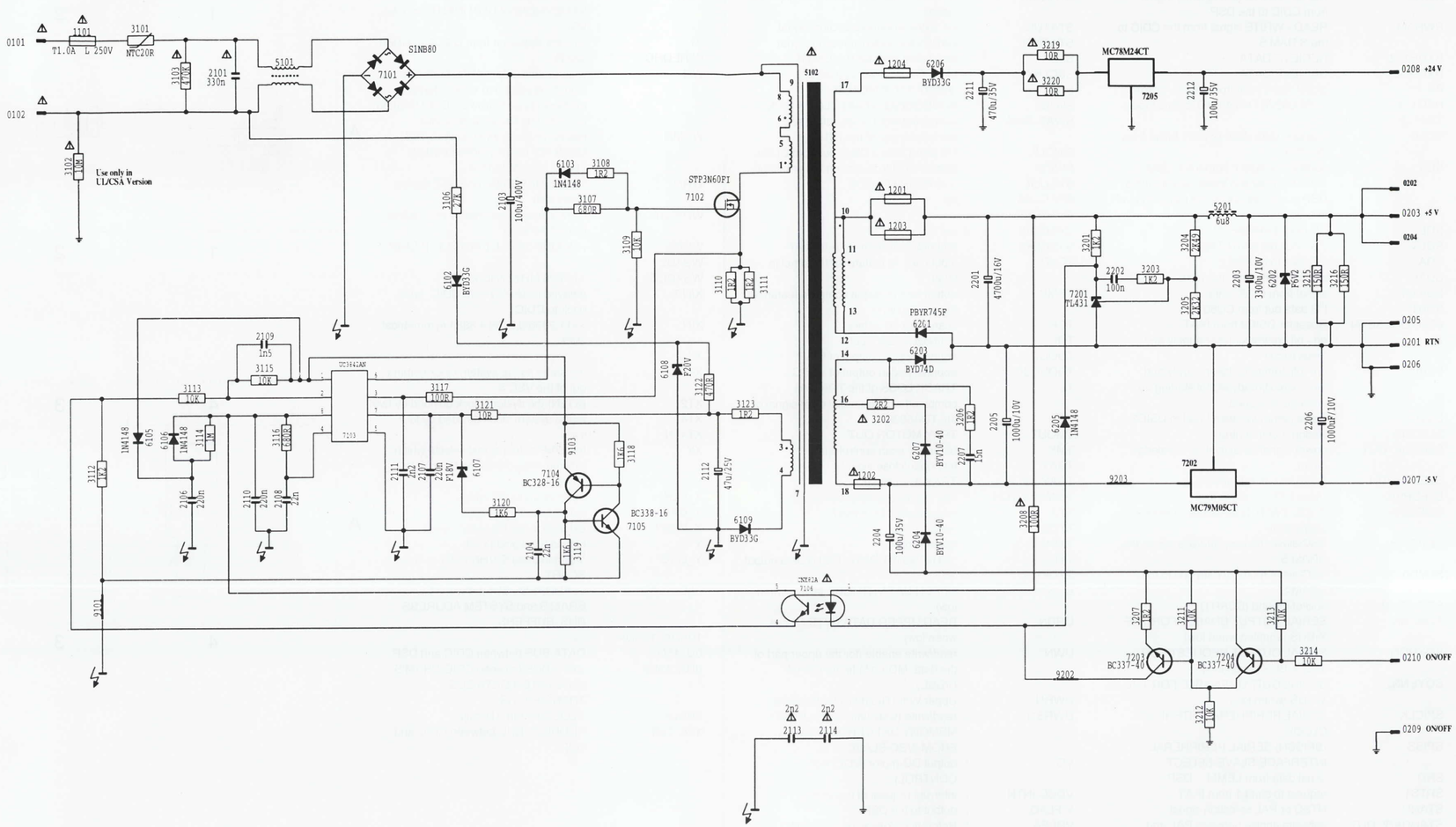
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6.5 POWER SUPPLY UNIT

6.5.1 Power supply PCB layout



6.5.2 Powersupply circuit diagram



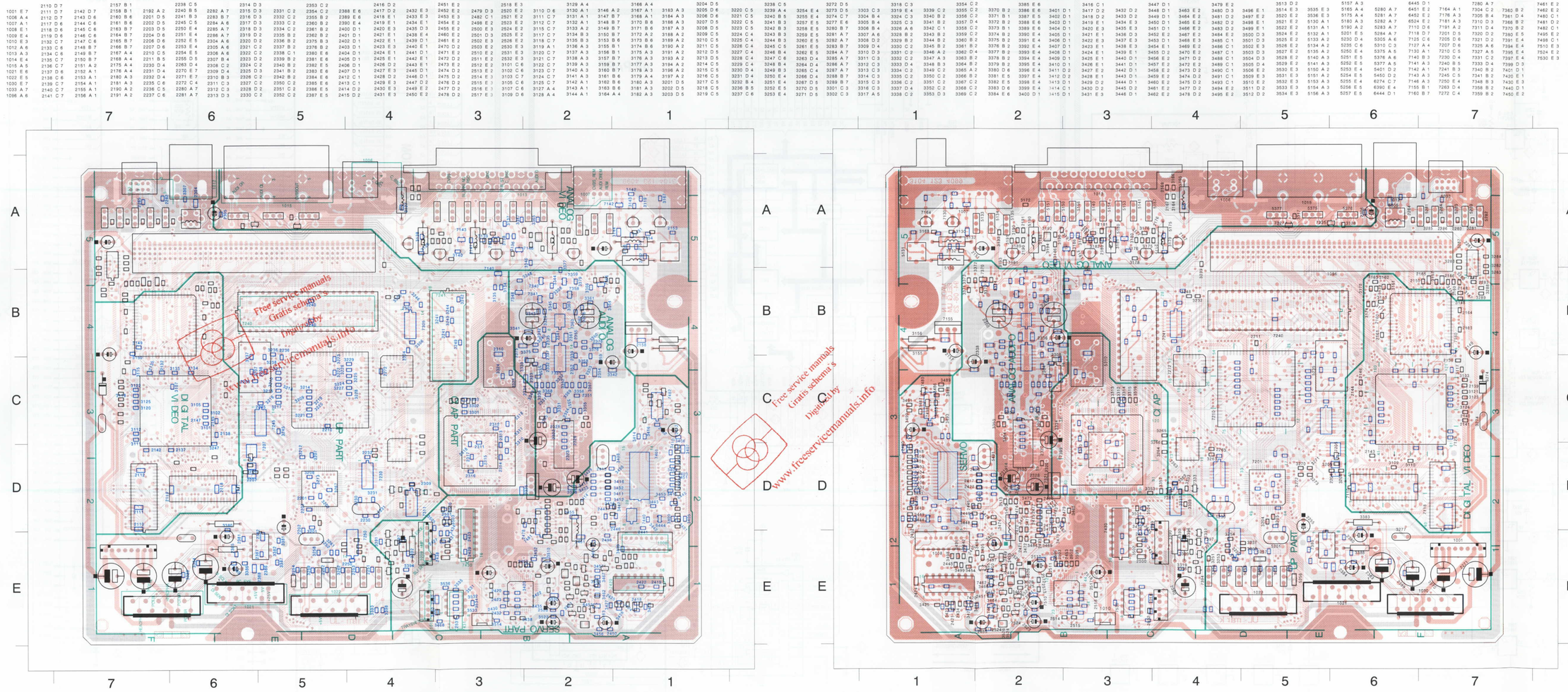
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6.6 MAINPANEL

6.6.1 Mainpanel PCB layout, Tracks side

6.6.2 Mainpanel PCB layout, Component side



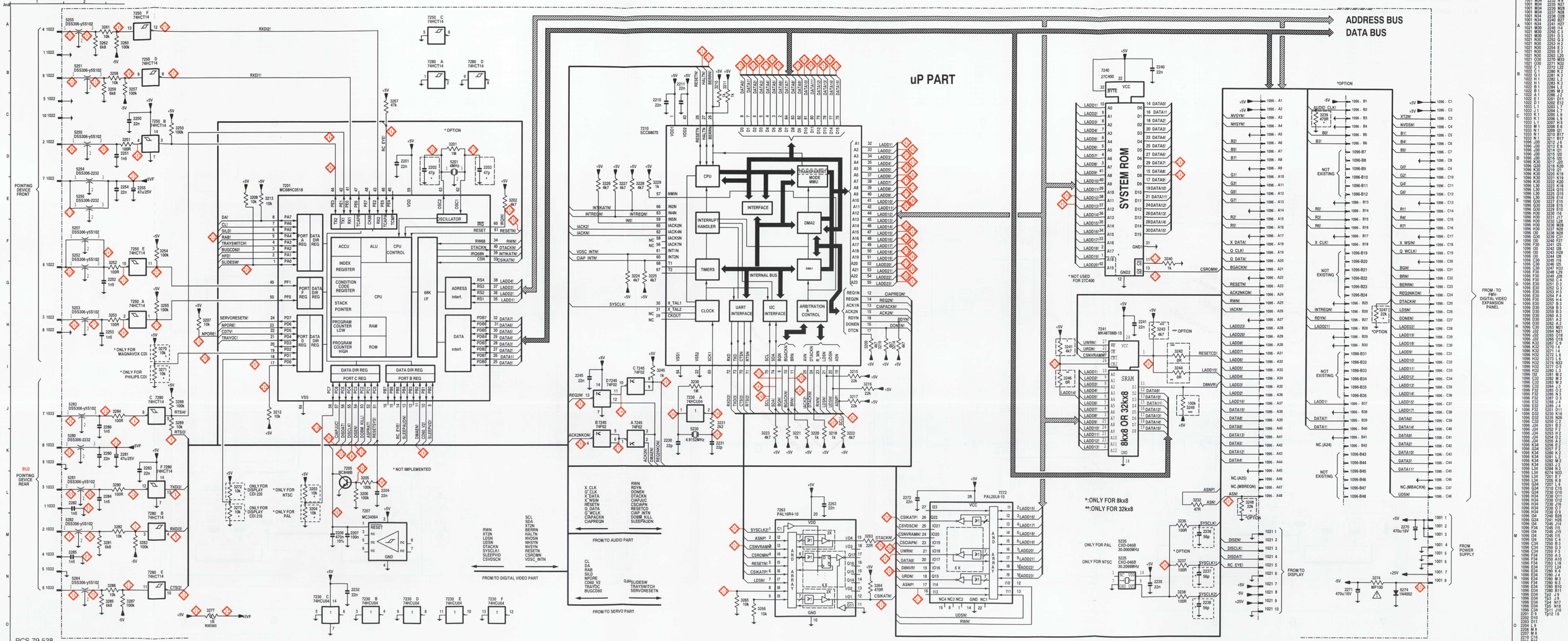
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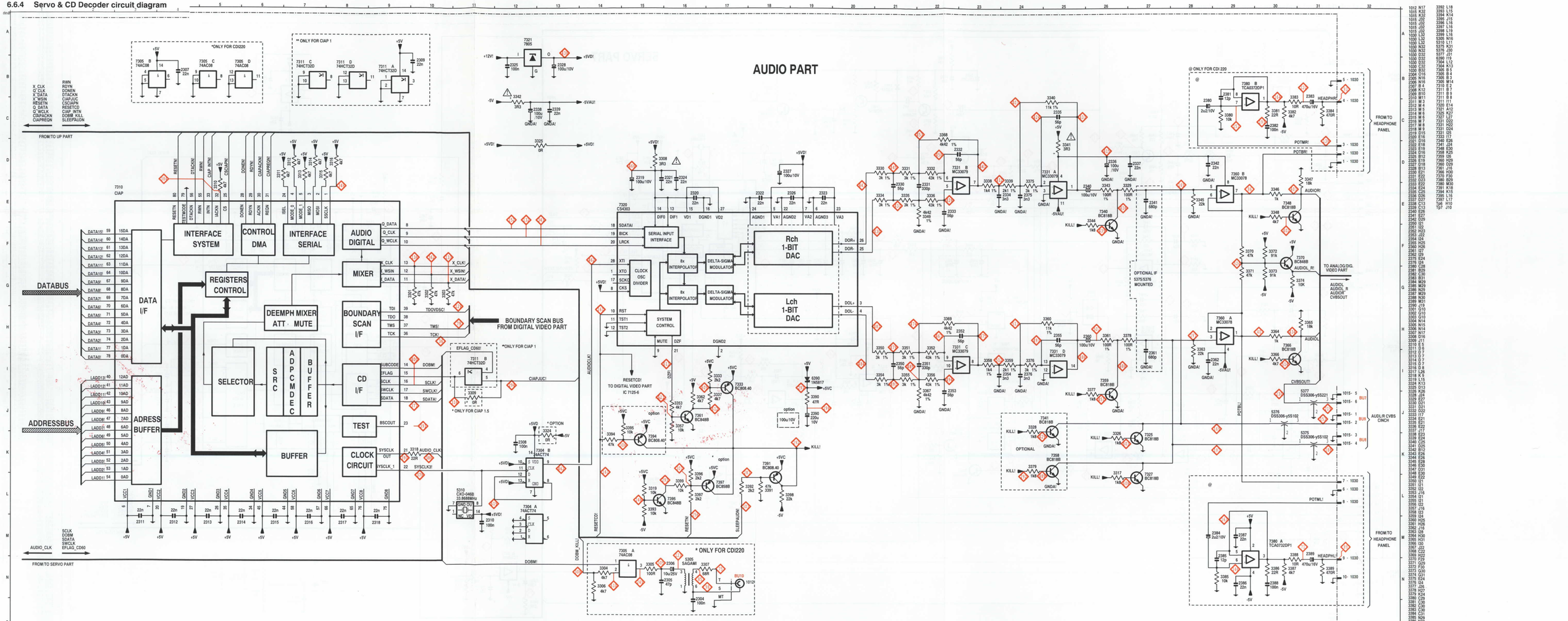
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6.6.3 µP part circuit diagram

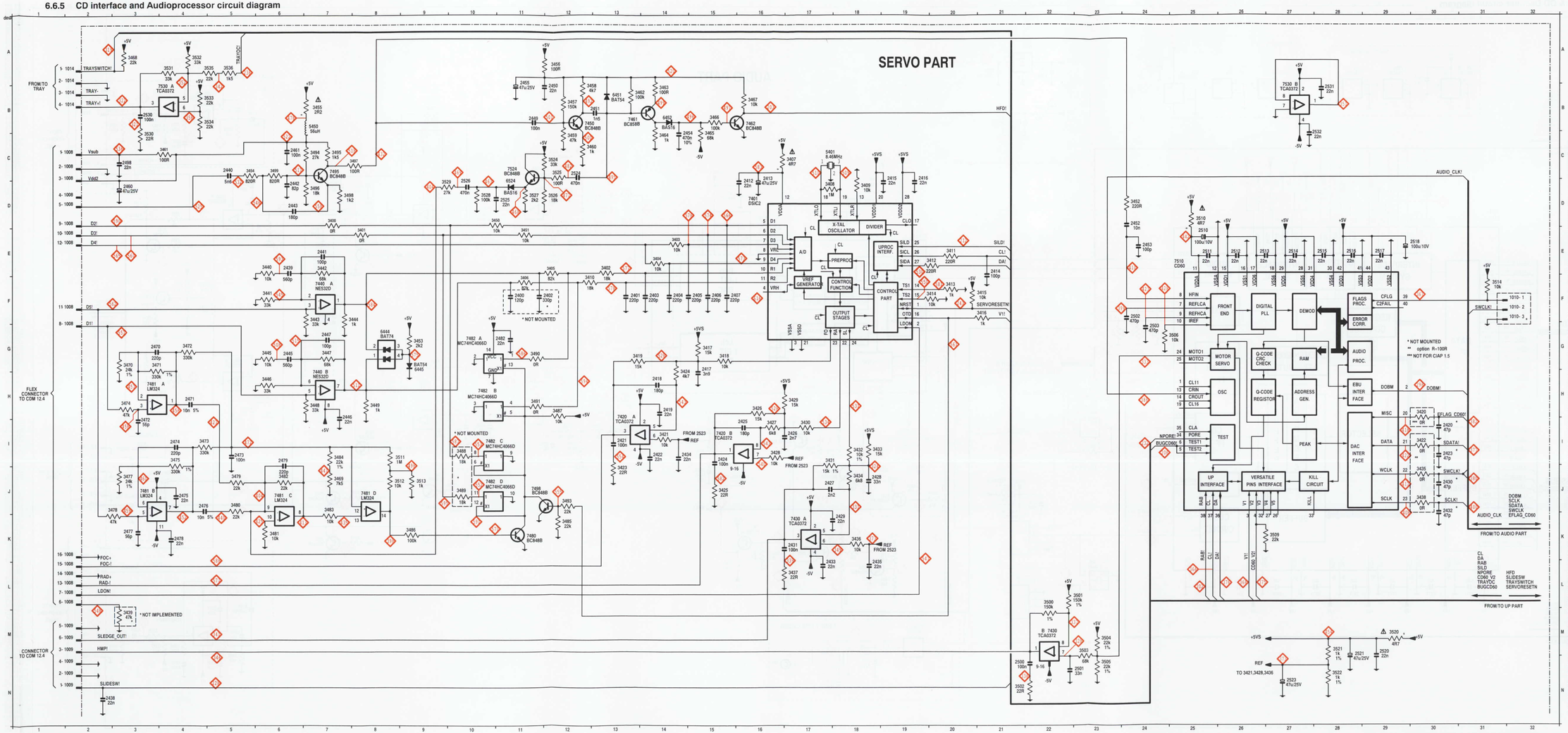


6.6.4 Servo & CD Decoder circuit diagram



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6.6.5 CD interface and Audioprocessor circuit diagram

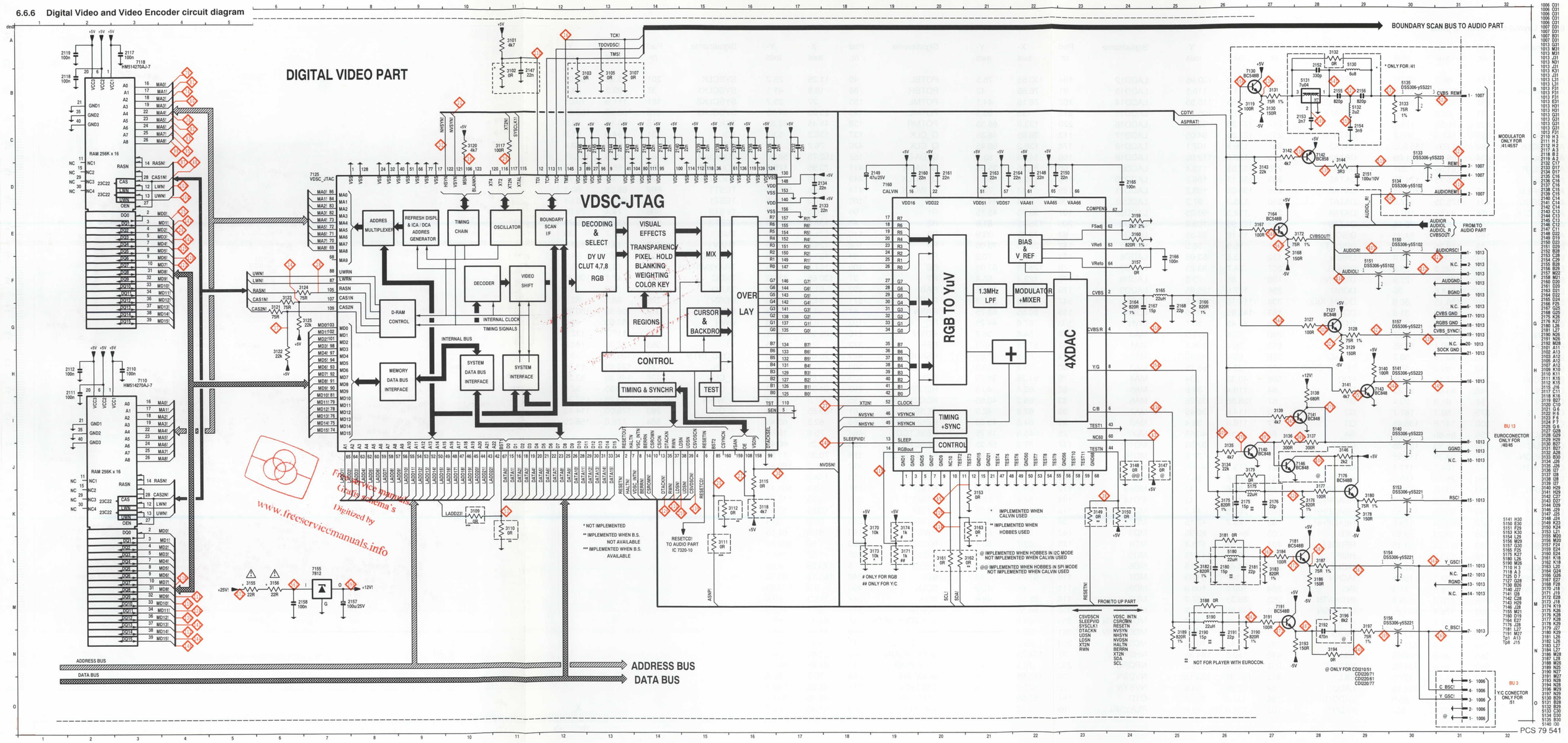


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6.6.6 Digital Video and Video Encoder circuit diagram



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6.6.7 Layout of Measuring pads

Signalname	Pad nr.	X-axis	Y-axis
ACK2N	171	96.3	65.25
ACK2NKON	154	86.85	59.55
ASN	291	157.8	117.6
ASNP	41	81.9	25.2
ASPRAT	405	70.65	173.7
ASPRAT	369	141.3	160.2
AUDIOCLK	462	91.695	188.805
AUDIOL	434	166.05	181.05
AUDIOL_R	505	161.55	201
AUDIOR	407	165.75	174.75
AUDIOREM	516	173.85	204.45
AUDIORSC	421	178.35	177.6
AUDIO_CLK	386	92.55	167.7
AUDL	197	167.7	78.15
AUDR	169	167.1	64.35
B0	39	116.25	25.05
B1	44	114	26.4
B2	50	120.3	28.2
B3	49	116.25	27.9
B4	54	114.6	30
B5	58	138.15	30.6
B6	59	116.85	31.5
B7	61	145.05	33.45
BERRN	210	103.2	83.7
BGACKN	208	89.1	83.55
BGN	150	92.25	58.2
BRN	149	89.4	58.2
BUGCD60	206	57.15	83.25
CAS1N	48	64.05	27.75
CAS2N	52	61.8	29.4
CD60_V2	375	59.7	161.7
CDTV	330	147.6	138.45
CIAPACKN	259	95.85	106.2
CIAPJUC	294	65.25	125.85
CIAPREQN	276	94.35	112.95
CIAP_INTN	277	104.7	113.1
CL	366	25.35	159.3
CSCIAPN	394	94.05	170.4
CSIKATN	315	72.9	131.7
CSIKATP	295	80.25	125.85
CSNVRAMN	312	109.35	129.6
CSROMN	135	105.3	53.55
CSVDSCN	139	101.55	54.15
CTSI3	12	150.9	14.1
CVBSOUT	230	167.4	92.25
CVBS_REM	503	173.1	199.5
CVBS_SYNC	335	178.8	141.3
C_BSC	268	179.7	109.8
C_BSC	393	178.8	170.25
D1	557	34.8	221.25
D2	590	45.75	234.6
D3	560	34.8	223.95
D4	565	34.8	226.65
D5	562	44.4	224.55
D8NVR	304	104.25	127.5
DA	376	24.45	161.85
DATA0	239	143.4	96.9
DATA1	251	133.2	102
DATA10	269	135.3	109.95
DATA11	285	134.7	116.1
DATA12	271	143.85	110.85
DATA13	258	143.7	105.75
DATA14	247	127.35	99.45
DATA15	235	127.35	94.05
DATA2	261	136.5	107.1
DATA3	275	132.6	112.05
DATA4	278	137.55	113.4
DATA5	265	132.15	108.3
DATA6	255	136.05	103.2
DATA7	240	135.3	97.2
DATA8	241	132.3	98.25
DATA9	254	127.95	103.2
DISCLK	143	15.15	55.35
DISDAT	151	15.9	58.5
DISEN	132	15.6	52.65
DISSEL	207	74.7	83.25
DMAEN	190	81	73.8
DOBM	296	117.6	125.85
DOBM_KILL	308	114.15	129.15
DONEN	183	145.95	70.95
DTACKN	126	84.45	50.1
DTACKP	290	76.5	117.3
DZF	613	59.4	146.1
EFLAG	316	68.4	132.45
EFLAG_CD60	382	22.8	165.75
FOC-	588	40.35	234
G0	64	116.4	34.5
G1	67	128.85	35.25
G2	70	114.6	36.45
G3	77	116.4	38.4
G4	84	114	40.65
G5	72	123.45	37.35
G6	73	126.15	37.8
G7	101	113.7	43.65
HALTN	217	108.6	86.7
HEADPHL	89	30.6	42
HEADPHL	90	33.6	42
HEADPHR	105	26.25	44.7
HEADPHR	93	23.7	42.15
HFD	203	54.45	82.95
HFDDEF	404	51	173.4
HMP	346	32.1	147.75
IACK2	227	106.65	90.15
IACKN	167	147	64.05
IN5	264	109.5	108.3
INTIKATN	263	85.35	107.7
INTREQN	176	146.85	67.5
IREF	428	27.75	179.7
IRQIN	233	55.65	93.6
ISELIN	395	78.42	170.63
KILL	446	150.3	184.35
KILL	292	17.4	118.2
KILL	325	142.05	135.15
LADD1	62	82.95	33.6
LADD10	186	137.4	72.75
LADD11	192	137.4	75.6
LADD12	194	130.35	76.5
LADD13	91	76.65	42
LADD14	102	78.15	44.1
LADD15	215	135	85.5
LADD16	223	133.8	88.35
LADD17	113	76.65	46.35
LADD18	174	136.2	66.45
LADD19	166	142.8	63.6
LADD2	66	85.35	35.25
LADD20	170	132.9	65.1
LADD21	189	147	73.5
LADD22	106	84	44.85
LADD23	107	93.75	45.15
LADD3	200	135.45	81.6
LADD4	63	73.35	33.9
LADD5	187	128.25	73.05
LADD6	182	127.8	70.2
LADD7	178	129.75	67.95
LADD8	172	122.4	65.4
LADD9	179	132.75	68.85
LDON	547	43.95	217.8
LDSN	159	80.55	60.75
LWN	103	57.6	44.25
MA0	78	54.6	38.7
MA1	81	57.75	39.3
MA2	74	61.5	37.95
MA3	60	55.2	33.3
MA4	76	64.35	38.25
MA5	82	62.4	40.5
MA6	83	66.3	40.65
MA7	95	67.8	42.9
MA8	99	64.8	43.35
MD0	25	48.9	18.75
MD1	147	57.6	58.05
MD10	124	68.25	49.95
MD11	130	66.15	51.6
MD12	141	67.05	55.05
MD13	112	69.3	45.9
MD14	144	64.8	56.7
MD15	148	67.35	58.05
MD2	26	51.9	18.75
MD3	142	57.9	55.2
MD4	125	53.7	50.1
MD5	128	57.45	50.85
MD6	121	61.65	49.5
MD7	116	57.75	48
MD8	111	66	45.9
MD9	118	65.55	48.6
MISOIN	356	86.55	153
MODE_0IN	359	84.9	155.1
MODE_1IN	361	86.4	157.35
MOSIIN	353	84.3	151.5
NHSYN	31	138.75	20.7
NPORE	232	70.5	93.45
NVDSN	30	112.95	20.55
NVSYN	22	121.5	18
OTD	561	82.05	224.4
PLAYSEL	199	72	80.85
POTBL	40	11.25	25.2
POTBR	86	19.8	41.1
POTML	155	27	59.7
POTML	145	25.05	57.75
POTMR	138	45.45	53.85
Q_CLK	137	136.2	53.7
Q_CLK	420	76.2	177
Q_DATA	152	162.75	58.95
Q_DATA	411	73.95	175.2
Q_WCLK	343	142.95	146.1
Q_WCLK	414	78.6	175.65
R0	100	117.3	43.5
R1	96	120.3	43.05
R2	88	138.9	41.85
R3	110	121.8	45.45
R4	108	124.5	45.15
R5	94	135.6	42.75
R6	109	127.2	45.15
R7	97	130.65	43.05
RAB	202	61.2	82.8
RAD-	571	44.7	228.3
RASN	87	59.7	41.25
RC_EYE	162	16.5	63
RDYN	216	100.95	86.1
REF	373	5.4	161.25
REFHCA	423	25.65	177.75
REFLCA	399	30.3	171.9
REM	523	173.85	208.2
REQ2N	193	91.05	76.2
REQ2NKON	195	81.3	77.4
RESETCD	161	109.65	61.95
RESETCD	165	82.5	63.45
RESETCD	464	75.6	189.6
RESETN	156	77.25	60.45
RESETSYS	185	70.35	71.55
RFE	432	35.7	180.45
RSC	355	178.8	152.4
RTSI1	257	48.3	105.45
RTSI2	279	45.15	113.85
RTSI3	9	138.3	13.65
RTSI4	242	55.2	98.4
RWN	160	91.5	61.65
RXDI1	253	60	102.75
RXDI2	256	57	104.7
RXDI3	5	149.85	10.95
SCL	246	105.15	99.15
SCLK	400	9.3	172.05
SDA	248	117.3	99.6
SDATA	377	92.7	162.3
SERVORESETN	243	64.35	98.4
SILD	212	11.55	84.3
SLEDGE_OUT	341	38.85	145.2
SLEEPAUDN	303	22.05	126.9
SLEEPVID	140	94.05	54.75
SLIDESW	228	70.2	90.6
SSCLKIN	348	83.25	149.1
STANDIN	234	48.15	94.05
SWCLK	380	57.45	164.7
SYSCLK	201	115.65	82.05
SYSCLK1	37	99.3	24.6
SYSCLK2	181	111.9	70.05
SYSCLK3	378	106.95	163.05
TCK	16	105.15	15.9
TDI	131	94.5	51.9
TDI	134	96.9	53.4
TDOCIAP	401	68.25	172.35
TDOCIAP	389	68.1	169.65
TDOVDSC	129	99	51.45
TEST1	607	68.25	80.1
TEST1	605	68.85	76.65
TEST2	606	74.4	79.05
TEST2	604	73.35	75.75
TMS	79	101.7	39
TRAY+	322	18.9	133.5
TRAYOC	236	63	94.2
TRAYSWITCH	319	10.8	133.5
TXDI2	267	47.7	109.35
TXDI3	8	147	13.2
UDSN	205	98.1	83.1
URDN	313	106.35	130.35
UWN	104	61.65	44.4
UWRN	317	117.3	132.9
V1	368	32.25	160.2
VDSC_INTN	211	106.65	83.7
XT2N	27	128.85	19.65
X_CLK	136	146.55	53.55
X_DATA	133	140.85	52.8
X_WSIN	362	93.75	157.35
Y_GSC	283	178.05	114.45
Y_GSC	364	178.8	158.25

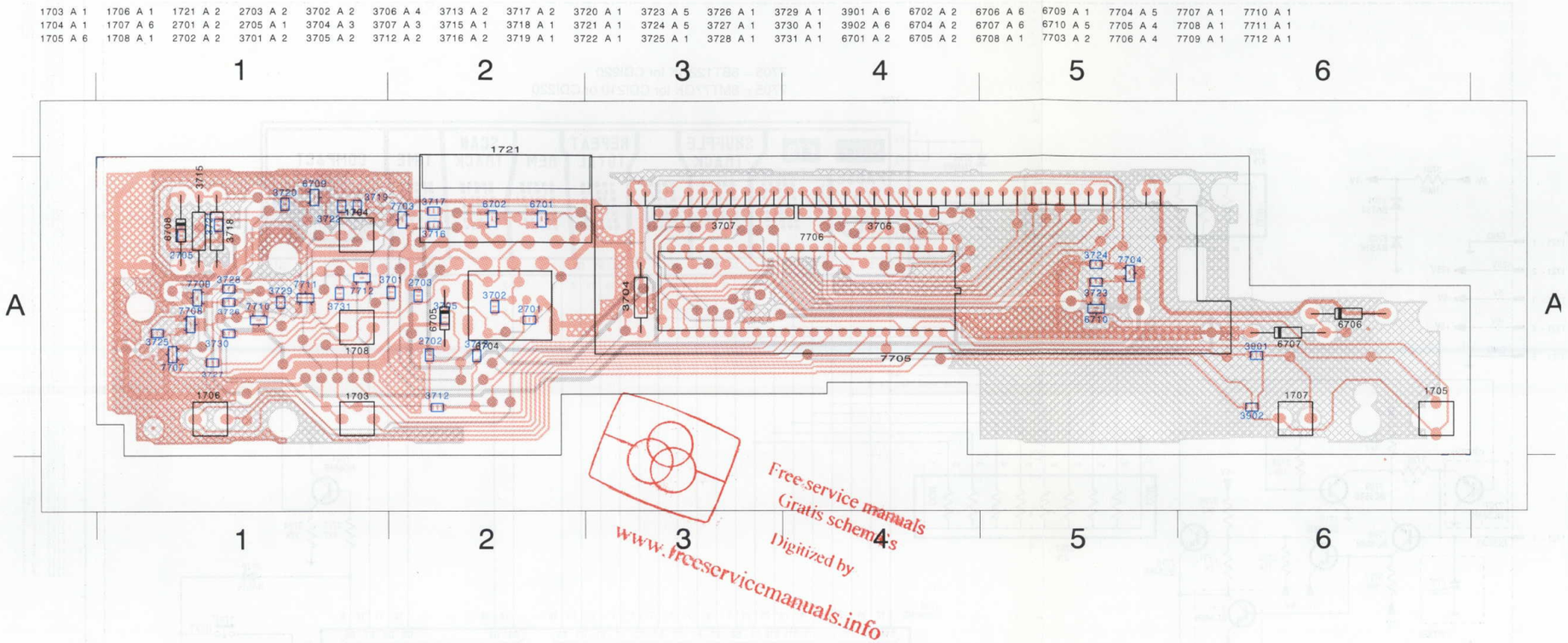


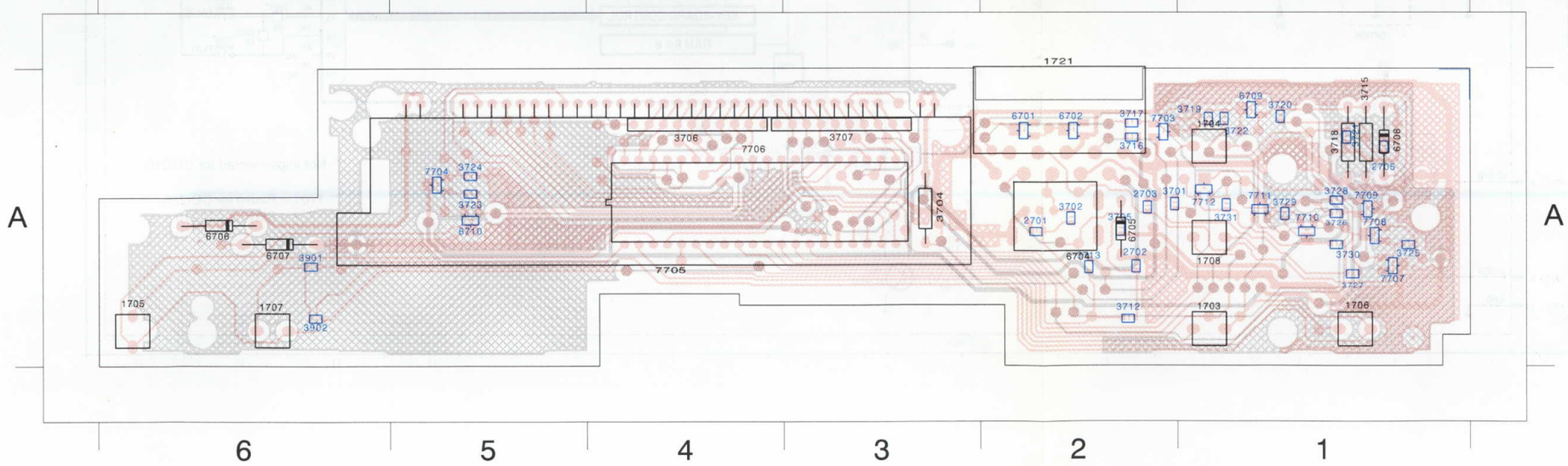
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6.7 CONTROL & DISPLAY PANEL

6.7.1. Control & Display PCB



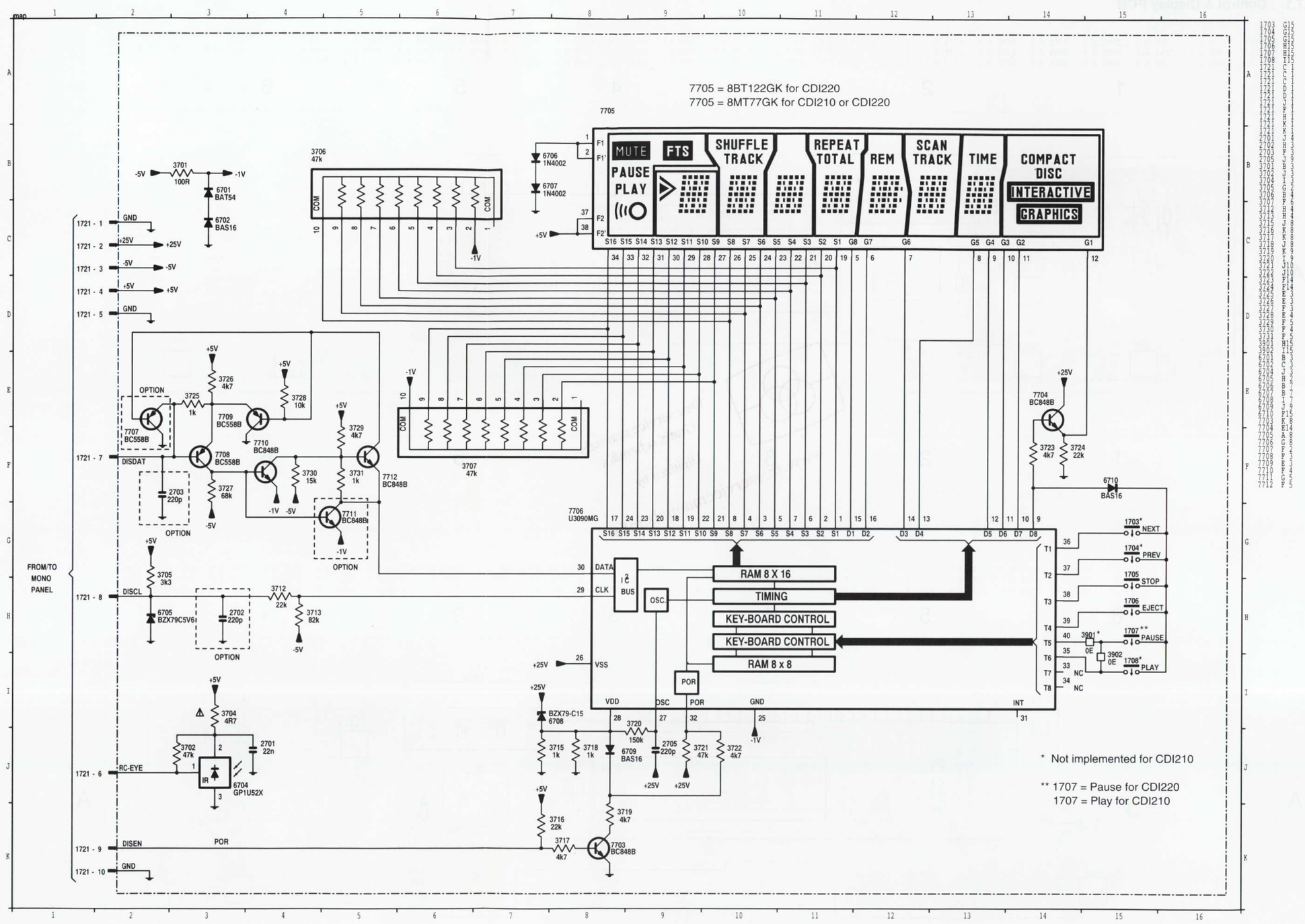


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6.7.2. Control & Display circuit diagram



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7 DIAGNOSTICS AND SHORT DESCRIPTIONS

7.1 SHORT DESCRIPTION OF THE KEYCOMPNENTS

7.1.1 CPU SCC68070

- Microcontroller (UART, I/O-bus, I^2C-bus, 2 DMA-channels, memory management unit)
- 16 datalines (D0 .. D15) and 24 addresslines (A0 .. A23)
- 16 MByte addressrange:
  - 5 MByte for the monoboard
  - The rest for the extension
- Clockfrequency :
  30 MHz for PAL
  30.2 MHz for NTSC
  This **systemclock** is also a clock for the 'video chip' (VDSC) and PAL 7302 (16R4-10).
- The UART works on 4.9 MHz and provides in the communication between processor and terminal.

7.1.2 VDSC : Video Decoder and System Controller

System Interface

- Direct interface for 680X0 bus compatible devices
- 1 MByte ROM control
- 1 kByte I/O control
- Reset sequencer, including ROM shadowing
- Watchdog timer
- Generates chip selects for the systemrom

DRAM Interface

- On chip DRAM controller
- 4 MByte direct drive
  For CD-i 450 this is 1 MByte spread over 2 DRAM banks of 512 kByte.

Video Interface

- Up to 768 x 560 screen resolution
- Capability to display run-length coded files
- Mosaic effects
- 256 Color Look Up Table (CLUT)
- Two Delta YUV decoders
- Cursor shape, color and blink control
- Overlaying of four planes (cursorplane, plane A, plane B and backdrop plane)
- Special effects via weight control, priority control, etc.
- Dynamic programmable registers and CLUT reload in retrace period
- Digital RGB output (8 bit per component)
- Synchro generator for 50 and 60 Hz scan
- Synchronization with external video

General

- CMOS technology
- 160-pin QFP package

The DRAM banks are constantly being read by the VDSC to generate video. The VDSC has the highest priority but the DRAM is also a kind of system- memory (which is asynchronously read by the CPU).

7.1.3 SYSTEMROM 27C400

- 4 Mbit (EP)ROM
- Contains boot, operating system, hardware drivers and the player shell.

7.1.4 IKAT MC68HC05I8

- Integration of servo- and slave processor
  - Generates chip select for DSIC2 (servo controller) and CD60 (CD decoder)
  - Communication with and control of DSIC2
  - Control of the pointing device port and the player control keys.
- Works on 4 MHz.
- CMOS technology, 64 pin QFP

7.1.5 CIAP : CD-Interface and Audio Processor

- Establishes the link between the 'standard' CD- part and the CD-i part of the player.
- Decoding of the ADPCM-audio (base case audio).
- To perform audio mixing functions (as described in the Green Book).
- To be able to add external audio to the base case audio.
- At the CD-side the CIAP has to interface with the CD 60 for both main channel and subchan nel data.
- The CIAP does not control the servo but it can, via the Q-channel data, indicate which sector is currently read.
- it interfaces directly to the 68070.
- Works on 33 MHz; the devided by two clock is fed to the CD60 decoder and the audio DAC.

7.1.6 NVRAM + CLOCK

- 8Kx8 SRAM
- Time keeper
- Contains CSD-files (Configuration Status Description: info about system set-up) and FTS-files (files for the player shell and applications).

7.1.7 CALVIN

- Digital RGB to video encoder
- Four DAC's on chip
- Two NTSC/PAL Composite outputs
- Y/C outputs
- Analog RGB outputs
- Digital RGB inputs
- Automatic detection and support of PAL and NTSC modes
- Automatic detection and support of interlaced/noninterlaced modes
- Internal voltage reference available
- 68-pin PLCC

7.1.8 PAL's

- Glue logic
- Generates chip selects for IKAT, VDSC, NVRAM and CIAP. PAL 16L8-10]
- Generates DTACKN for the NVRAM and the SYSTEMROM [PAL 16R4-10].

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7.1.9 DSIC2 Digital Servo IC

- Sophisticated digital servo controller which provides all servo functions needed in a two stage three spot CD-system.
  [two stage means fine control by the actuator and coarse control by the sledge]
- Provides in all servo functions except the spindle motor control (which is done by the CD60).
- Special functions to improve the playability, to perform reliable access and to realize a high degree of shock insensitivity.
- 'Programmable' servo characteristics
- a three wire microprocessor interface
- Works on 8.46 MHz

7.1.10 CD60 CD-decoder

- Complete CD decoder
- HF is being transformed into a I^2S-format and digital out.
- Errorcorrection
- Spindle motor control with programmable motorloop bandwidths.
- On chip AGC for the EFM input signal
- On chip front end 6 bits ADC
- Subcode data processing
- Audio data interpolation processing
- Digital audio interface (EBU)

7.2 TROUBLESHOOTING AND REPAIR

This section contains some guides to aid the technician in troubleshooting the CDI player. The CD servo section and Analog Audio section are similar to any CD player. Thus, the same techniques for troubles hooting a CD player may be used. Added features in servicing the CDI player is the Low Level Test and the Service Shell, see section 5." Service Software". The Low Level Test needs a VT100 terminal(or equivalent) to run and test the functioning of the µP section, CIAP section or digital video section.
The Service Shell provides tests for the Video and Servo and Decoder circuits. Section 5.3 covers all the Service Shell test procedures.
The analog video/audio and servo & CD decoder circuitry can be serviced to the component level, the CD Mechanism (CDM12) is also replaced as an assembly. Disassembly instructions are provided on the exploded views.
If the defective item is in the circuitry of the µP section, CIAP section or digital video section, then the complete main board must be replaced and sent back to a local central repairshop. See section 3.5 and 3.6.

Troubleshooting hints:

Symptom:
Service Shell cannot be started with the test plug.
Possible fault:
Connections between input port and IKAT may be bad. Test plug could be wrong. IKAT may be defective.
Hint:
If the Player Shell cannot be started, perform the Low Level Test (LL TEST).

7.2.2 Troubleshooting and Service the µP section, CIAP section or digital video section

The mainboard is replaced as a module when parts of the µP section, CIAP section or digital video section are defective. The technician must know the functioning of those sections to diagnose a CDI player. The CDI player contains some built-in diagnostics to aid in troubleshooting. One diagnostic tool is the Service Shell (see section 5.2) and the other is the Low Level Test or LL Test (see section 5.1). The LL Test should be performed if there is access to neither the Player Shell nor the Service Shell. If the Low Level test indicates a fault, replace the complete mainboard. If the test cannot be initiated, check the power sources and main clock signals on the µP section. If all supplies and clock signals are present, replace the mainpanel.

7.2.3 Servo & CD Decoder and Audio Section Troubleshooting

A problem in the CD-I player can be isolated to a particular circuit by carefully observing the symptoms. For example, if there is no audio, but a picture from a CD-I disc is displayed, it is obvious that the CD Servo and decoding circuits are functional. Therefore the fault can be isolated to the audio decoding circuits only. Or the symptom may be opposite, the audio circuits may be working, but not the video. Again, the servo circuits must be functioning. Troubleshooting of the video decoding should then be followed.
Also if a disc is inserted and the disc type is recognized it is obvious that the Servo and CD decoder circuit is functioning When there is a symptom indicating a fault in the Servo circuitry, troubleshooting techniques used in CD players can be followed since the CD Unit portion of the CD-I player is basically a CD player (refer to the Servo & CD decoder schematic diagrams). If the CDM does not start, check for Vdd, clock, and reset on the IKAT, DSIC2 and CD60.
If these signals are present, perform the CD drive test in the Service Shell or Low Level test. If there is a communication failure, proceed with the Low Level Test to determine if there is a failure in the system control circuitry. If the communication buses are functional, check the CD servo circuits using the Service Shell CD drive test modes. These modes are the standard CD servo test modes to test the Focus, radial and turntable control functions. If there is a failure in the servo test modes, further checks with measurements should reveal the fault If the servo circuits are functioning, check the decoder circuits. Activity should be seen on the (SDATA, SWCLK and SCLK) and DOBM. If there is no activity, check the supply (Vdd) and input signals (HF, AUDIO_CLK).
When the servo and decoder circuits are functioning properly, there may be a problem in the CD interface & Audio Processor circuitry (CIAP)

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7.2.4 Video Section Troubleshooting

The symptoms displayed can help the technician isolate the problem to a particular circuit. The following examples illustrate how a fault can be isolated.

Symptom 1:
the player shell is displayed, and the disc is recognized, but video from the disc cannot be displayed. If this condition exists, the Digital Video section, Servo and analog video circuits are functioning. Since the player shell is displayed, the video synthesizer circuit is functioning. However, there must be a fault on the CD interface section, because the video data from the disc comes via this section in the first place.

Symptom 2:
no video, while audio is functioning. This symptom may be caused by either the Digital Video part or by the Analog Video circuit. A few voltage and signal measurements can quickly isolate the problem.

Symptom 3:
no color. This symptom is most likely caused by a problem in the CALVIN ic. Check the CVBS output on pin 2 of IC7160

7.3 MEASUREMENTS

All signals, which are refered to a name and/or to a pin number of an IC can be measured at certain measuring pads on the board. Use these pads on the board, to prevent short circuiting caused by the metal point of measuring probes. See drawing 6.4.6 LAYOUT OF THE MEASURING PADS

7.3.1 A general check of the main panel

Test of the DC power supply voltages

Measurement method
Check if the voltages on the key-components listed below are within the tolerance range.

component pos. nr.	name	pin	voltage
7210	68070	1, 43	+5V ± 10%
7201	IKAT (MC68HC05I8)	59	+5V ± 10%
7240	SYSROM (27C400)	22	+5V ± 10%
7241	NVRAM	28	+5V ± 10%
7125	VDSC	3, 9, 27, 36, 41, 61, 80, 95, 100, 112, 119, 124, 130, 140, 148	+5V ± 10%
7160	CALVIN	16, 22, 51, 57, 61, 65, 66	+5V ± 10%
7310	CIAP	6, 20, 27, 35, 45, 58, 66, 76	+5V ± 10%
7401	DSIC2	12, 20, 28	+5V ± 5%
7510	CD60	11, 15, 17, 29, 31, 42, 44	+5V ± 5%

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7.3.2 Test of the clocksignals

Measurement method
These measurements have to be carried out just after hardware reset. This is done each time after opening the lid or after power-on.
Use a FET-probe to minimalise the oscillator-loads.

System clock

30.2098 MHz ± 20 ppm (NTSC)
30.0000 MHz ± 50 ppm (PAL)

This system clock must be present at the following points:

IC 7210 on pin 30
IC 7125 on pin 115
IC 7302 on pin 1

At IC 7210 pin 29 the Clock divided by two must be present:

15.0000 MHz ± 50 ppm (PAL)
15.1049 MHz ± 20 ppm (NTSC)

At IC 7210 pin 69 the UART-clock must be present:

4.9152 MHz ± 50 ppm

At IC 7201 the clock of the 68HC05I8 must be present:

4.000 MHz ± 55 ppm

At connector 1096 on pin C3 the XT2N-clock must be present:

15.1049 MHz ± 20 ppm (NTSC)
15.0000 MHz ± 50 ppm (PAL)

At IC 7310 on pin 22 the CIAP-clock must be present:

33.8688 MHz ± 50 ppm

At IC 7401 on pin 19 the DSIC2-clock must be present:

8.4672 MHz ± 50 ppm

At IC 7510 on pin 13 the AUDIO_CLK-clock must be present:

16.9344 MHz ± 50 ppm

7.3.3 Test of the I2S Interface

SDATA IC 7510, pin 21 : block wave signal
SWCLK IC 7510, pin 22 : 44.1 kHz (CDDA)
SCLK IC 7510, pin 23 : 2.8224 MHz (CDDA)

7.3.4 Test of the microcontroller 68070

Check after power on and RESET = +5V.
HALTN IC 7210, pin 27 : +5V
RESETN IC 7210, pin 28 : +5V
DTACKN IC 7210, pin 24 : changing +5V/0V
BERRN IC 7210, pin 26 : +5V

7.3.5 Test of the hardware with the Low Level Test

This test makes it possible to test the hardware with software.
Connect a terminal to the UART of the microcontroller 68070 via connector 1032.

Settings of the terminal:
Baudrate : 9600
start bit : 1
data bits : 8
stop bits : 0
no parity/no handshake

To start the low level test, hit the space bar while putting the power on.
To test the PCB you only have to follow the instructions on the screen.

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8 PARTSLIST

8.1 Partslist of the cabinet

Item	Codenumber	Description
1	4822 444 40608	Front assy
1	4822 444 40638	Front assy /77
9	4822 410 62316	Powerknob assy
22	4822 502 30408	PL3X10PAN<STZNBK
23	4822 502 30408	PL3X10PAN<STZNBK
24	4822 502 30408	PL3X10PAN<STZNBK
25	4822 502 30408	PL3X10PAN<STZNBK
26	4822 502 30408	PL3X10PAN<STZNBK
27	4822 502 30408	PL3X10PAN<STZNBK
30	2511 076 50011	PL3X6PAN<STZNBK
31	2511 076 50011	PL3X6PAN<STZNBK
44	4822 413 51434	Volume knob
63		Bracket
65	4822 444 40802	Tray front
70	4822 502 12795	M2,5X5PAN<STZNBK
75	4822 502 12795	M2,5X5PAN<STZNBK
76	4822 502 12795	M2,5X5PAN<STZNBK
77	4822 502 12795	M2,5X5PAN<STZNBK
81	Tray loader	SEE SEPARATE LIST
100		Sticker
151	4822 444 60898	Cover
171	4822 502 12795	M2,5X5PAN<STZNBK
172	4822 502 12795	M2,5X5PAN<STZNBK
173	4822 502 12795	M2,5X5PAN<STZNBK
174	4822 502 12795	M2,5X5PAN<STZNBK
175	4822 502 12795	M2,5X5PAN<STZNBK
177	4822 502 12795	M2,5X5PAN<STZNBK
178	4822 502 12795	M2,5X5PAN<STZNBK
181		Frame assy
182		Loader support
183		Spacer locking
184		Spacer locking
185		Remod. bracket
186	4822 402 61422	Spacer
187	4822 402 61422	Spacer
188	4822 402 61422	Spacer
191		ZN 3X6 TORX
192		ZN 3X6 TORX
195		Gliding support
196	2511 077 00031	ZN M2,5X28 TORX
200	2511 077 00031	ZN M2,5X28 TORX
202	4822 502 12795	M2,5X5PAN<STZNBK
203	4822 502 12795	M2,5X5PAN<STZNBK
207		ZN 3X6 TORX
208		ZN 3X6 TORX
209	4822 502 12795	M2,5X5PAN<STZNBK
210	4822 502 12795	M2,5X5PAN<STZNBK
211	4822 502 30408	PL3X10PAN<STZNBK
212	4822 502 30408	PL3X10PAN<STZNBK
213	4822 502 30408	PL3X10PAN<STZNBK
214	4822 502 30408	PL3X10PAN<STZNBK
217	4822 502 12795	M2,5X5PAN<STZNBK
218	4822 502 12795	M2,5X5PAN<STZNBK
219	4822 502 12795	M2,5X5PAN<STZNBK
220	4822 502 12795	M2,5X5PAN<STZNBK
223	4822 502 30438	PL3X6PAN<STZNBK
224	4822 502 30438	PL3X6PAN<STZNBK
225		M3X4PAN<STZNBK
226		M3X4PAN<STZNBK

Item	Codenumber	Description
251	4822 462 41992	Foot
252	4822 462 41992	Foot
255	4822 462 40409	Plate for foot
256	4822 462 40409	Plate for foot
259	4822 502 12795	M2,5X5PAN<STZNBK
260	4822 502 12795	M2,5X5PAN<STZNBK
266		Textplate
268	4822 502 12795	M2,5X5PAN<STZNBK
269	4822 502 12795	M2,5X5PAN<STZNBK
270	4822 502 12795	M2,5X5PAN<STZNBK
274	4822 502 12795	M2,5X5PAN<STZNBK
275	4822 502 11667	M3X6PAN<STZNBK
276	4822 502 30408	PL3X10PAN<STZNBK
277	4822 502 30408	PL3X10PAN<STZNBK
278	4822 502 30408	PL3X10PAN<STZNBK
279	4822 502 30408	PL3X10PAN<STZNBK
280	4822 502 30408	PL3X10PAN<STZNBK
282		Earth plate
285		Cover plate assy
286	3104 128 91091	M2,5X6 TRX SLT
287	3104 128 91091	M2,5X6 TRX SLT
301	4822 321 10249	Mainscord /40
301	4822 321 10886	Mainscord /45
302	4822 321 20308	Audio cord set
309	4822 736 22247	Dir. for use
313	4822 321 61452	Digital Out cable
315	4822 321 61579	Video cord set
316	4822 321 61849	TPX 3500 cord
317	4822 320 11096	Antenna cable /77
318	4822 218 10523	IR-remote Control
1005	4822 214 52229	Power supply unit \60\61\65
1005	4822 214 52235	Power supply unit \77
BU-11	4822 267 51216	MINIDINN socket
BU-12	4822 267 31572	Headphone socket
P-1	4822 101 21199	10 kΩ Log.

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8.2 Parts List Of The Tray Loader

Item	Codenumber	Description
1	4822 464 50896	Chassis assy
2	4822 444 50679	Slide assy
3	4822 464 50895	Subchassis
4		Cover plate
5	4822 402 61412	Clamper assy
6	4822 325 50215	Suspension
7	4822 325 50215	Suspension
8	4822 325 50215	Suspension
9	4822 325 50215	Suspension
10	4822 276 13222	Switch assy
11	4822 361 21492	Motor assy
12		Screw M2,2x4
13		Screw M2,2x4
14	4822 528 81465	Pulley gear
15	4822 528 81464	Drive pinion
16	see item 1	Spindle
17	see item 1	Spindle
18	4822 358 31168	Drive belt
20	4822 691 30354	CDM 12.4
21		Lead assy
24		Polylub. GLY801
25		Familysheet
35		Fondam FM3
36	see item 2	Ornamental tule
37	see item 2	Ornamental tule
38	see item 2	Ornamental tule
39	see item 2	Ornamental tule
40	4822 325 60379	Damping grommet
41	4822 325 60379	Damping grommet
42	4822 325 60379	Damping grommet
61		Lead assy

8.3 Partslist of the display and powersupply panel

Item	Codenumber	Description		
1703	4822 276 13114	TACT SWITCH		
1704	4822 276 13114	TACT SWITCH		
1705	4822 276 13114	TACT SWITCH		
1706	4822 276 13114	TACT SWITCH		
1707	4822 276 13114	TACT SWITCH		
1708	4822 276 13114	TACT SWITCH		
1721		CONN 10P M RFK1		
2701	5322 122 32654	22n	X7R	PM10
2705	4822 122 33575	220p	50V	
3701	4822 122 33575	100R		PM5
3702	4822 051 20473	47k		PM5
3704	4822 052 10478	4R7		PM5
3705	4822 051 20332	3k3		PM5
3706	4822 116 90857	8x 47k		PM5
3707	4822 116 90857	8x 47k		PM5
3712	4822 051 20223	22k		PM5
3713	4822 051 20823	82k		PM5
3715	4822 050 21002	1k0	1/8W	PM5
3716	4822 051 20223	22k		PM5
3717	4822 051 20472	4k7		PM5
3718	4822 050 21002	1k0	1/8W	PM5
3719	4822 051 20472	4k7		PM5
3720	4822 051 20154	150k		PM5
3721	4822 051 20473	47k		PM5
3722	4822 051 20472	4k7		PM5
3723	4822 051 20472	4k7		PM5
3724	4822 051 20223	22k		PM5
3725	4822 051 10102	1k		PM5
3726	4822 051 20472	4k7		PM5
3727	4822 051 20333	33k		PM5
3728	4822 051 20103	10k		PM5
3729	4822 051 20472	4k7		PM5
3730	4822 051 20153	15k		PM5
3731	4822 051 10102	1k		PM5
3902	4822 051 20008	0R05		
3999		PROCES SCHIP RP		
6701	4822 130 80622	BAT54		
6702	5322 130 31928	BAS16		
6704	4822 214 52009	GP1U58XP		
6705	4822 130 34173	BZX79-C5V6		
6706	5322 130 30684	1N4002GP		
6707	5322 130 30684	1N4002GP		
6708	4822 130 34281	BZX79-C15		
6709	5322 130 31928	BAS16		
6710	5322 130 31928	BAS16		
7703	5322 130 41982	BC848B		
7704	5322 130 41982	BC848B		
7705	4822 130 91194	DISPLAY FTD		
7706	4822 209 72226	U3090MG-40P		
7708	5322 130 41983	BC858B		
7709	5322 130 41983	BC858B		
7710	5322 130 41982	BC848B		
7712	5322 130 41982	BC848B		

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Item	Codenumber	Description		
1	4822 265 31015	SOC SUPP		
1011		HEATSINK		
1112	4822 492 70143	SPRING1		
1213		HEATSINK		
1314	4822 492 70143	SPRING1		
1101	4822 256 30517	FUSE HOLDER		
1201	4822 252 51179	PROT DEV 65V 4A		
1202	4822 252 51179	PROT DEV 65V 4A		
1203	4822 252 51179	PROT DEV 65V 4A		
1204	4822 252 51179	PROT DEV 65V 4A		
2101	5322 121 44222	330n	250V	PM20
2103	4822 124 42191	100µ	400V	PM20
2104	4822 121 41856	22n	100V	PM5
2106	4822 121 42408	220n	50V	PM10
2107	4822 121 42408	220n	50V	PM10
2108	4822 121 41856	22n	100V	PM5
2109		1n5	50V	PM10
2110	4822 121 42408	220n	50V	PM10
2111	5322 122 32818	2n2	63V	P80M20
2112		47µ	25V	PM20
2113	4822 122 32576	2n2	400V	PM20
2114	4822 122 32576	2n2	400V	PM20
2201	4822 124 23183	4700µ	16V	PM20
2202	5322 121 42386	100n	50V	PM10
2203		3300µ	10V	PM20
2205		1000µ	10V	PM20
2206		1000µ	10V	PM20
2207		15n	100V	P50M20
2211	4822 124 41334	470µ	35V	PM20
2212		100µ	35V	PM20
3101		20R	NTC	PM20
3103	4822 053 20474	470k		PM5
3106	4822 053 11273	27k		PM5
3107	4822 116 52228	680R		PM5
3108		1R2		PM5
3109	4822 116 52233	10k	1/6W	PM5
3110		1R2		PM5
3111		1R2		PM5
3112	4822 116 52207	1k2	1/6W	PM5
3113	4822 116 52233	10k	1/6W	PM5
3114	4822 116 52235	1M0	1/6W	PM5
3115	4822 116 52233	10k	1/6W	PM5
3116	4822 116 52228	680R	1/6W	PM5
3117	4822 116 52175	100R	1/6W	PM5
3118	4822 116 52246	1k6	1/6W	PM5
3119	4822 116 52246	1k6	1/6W	PM5
3120	4822 116 52246	1k6	1/6W	PM5
3121	4822 116 52176	10R	1/6W	PM5
3122	4822 116 83883	470R		PM5
3123		1R2		PM5
3201		1K2		PM5
3202	4822 052 10228	2R2		PM5
3203		1k2		PM5
3204		2k49		PM1
3205		2k32		PM1
3206		1R2		PM5

Item	Codenumber	Description		
3207		1R2		PM5
3208	4822 052 10101	100R		PM5
3211	4822 116 52233	10k	1/6W	PM5
3212	4822 116 52233	10k	1/6W	PM5
3213	4822 116 52233	10k	1/6W	PM5
3214	4822 116 52233	10k	1/6W	PM5
3215	4822 116 83868	150R		PM5
3216	4822 116 83868	150R		PM5
3219	4822 052 10229	22R		PM5
3220	4822 052 10229	22R		PM5
5101	4822 157 71268	FILTER CHOKE		
5102		TRANSFORMER		
5201		6µ8		PM20
6102	4822 130 42489	BYD33G		
6103	4822 130 30621	1N4148		
6105	4822 130 30621	1N4148		
6106	4822 130 30621	1N4148		
6107	4822 130 31024	BZX79-F18		
6108	4822 130 34499	BZX79-F20		
6109	4822 130 42489	BYD33G		
6201	4822 130 83073	PBYR745F		
6202	4822 130 34167	BZX79-F6V2		
6203	4822 130 82035	BYD74D		
6204	4822 130 32245	BYV10-40		
6205	4822 130 30621	1N4148		
6206	4822 130 42489	BYD33G		
6207	4822 130 32245	BYV10-40		
7101	4822 130 83707	S1NB80		
7102	4822 130 63689	STP3N60FI		
7103	4822 209 83909	UC3842AN		
7104	4822 130 41023	BC328-16		
7105	4822 130 40892	BC338-16		
7106	4822 130 10025	CNX82A		
7201	4822 209 81397	TL431CLPRM		
7202	4822 209 11079	MC79M05CT		
7203	4822 130 41344	BC337-40		
7204	4822 130 41344	BC337-40		
7205	5322 209 60027	MC78M24CT		

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8.4 Parts list of the mainboard

Item	Codenumber	Description			
1001	4822 265 41119	CON V 08P M			
1007	4822 214 52064	RF modulator /61			
1007	4822 214 52046	RF modulator /77			
1007	4822 214 52071	RF modulator /65			
1008		CON H 16P F			
1009		CON V 06P M			
1012		CINCH H 1P			
1013		CON EURO H 21P			
1014		CON V 04P M			
1015		CINCH H 3P F			
1021		CON V 10P M			
1022		CON V 10P M			
1030		CON V 10P M			
1033	4822 267 51216	MDIN V FEM 8P			
1096		CON V 120PM			
2110	4822 122 33496	100n	X7R	PM10	
2111	4822 122 33496	100n	X7R	PM10	
2112	4822 122 33496	100n	X7R	PM10	
2117	4822 122 33496	100n	X7R	PM10	
2118	4822 122 33496	100n	X7R	PM10	
2119	4822 122 33496	100n	X7R	PM10	
2132	5322 122 32654	22n	X7R	PM10	
2133	5322 122 32654	22n	X7R	PM10	
2134	5322 122 32654	22n	X7R	PM10	
2135	5322 122 32654	22n	X7R	PM10	
2136	5322 122 32654	22n	X7R	PM10	
2137	5322 122 32654	22n	X7R	PM10	
2138	5322 122 32654	22n	X7R	PM10	
2139	5322 122 32654	22n	X7R	PM10	
2140	5322 122 32654	22n	X7R	PM10	
2141	5322 122 32654	22n	X7R	PM10	
2142	5322 122 32654	22n	X7R	PM10	
2143	5322 122 32654	22n	X7R	PM10	
2144	5322 122 32654	22n	X7R	PM10	
2145	5322 122 32654	22n	X7R	PM10	
2146	5322 122 32654	22n	X7R	PM10	
2148	5322 122 32654	22n	X7R	PM10	
2149	4822 124 80483	47µ	6V3	PM20	
2150	5322 122 32654	22n	X7R	PM10	
2157	4822 124 41584	100µ	10V	PM20	COL
2158	4822 122 33496	100n	X7R	PM10	
2160	5322 122 32654	22n	X7R	PM10	
2161	5322 122 32654	22n	X7R	PM10	
2163	5322 122 32654	22n	X7R	PM10	
2164	5322 122 32654	22n	X7R	PM10	
2166	4822 122 33496	100n	X7R	PM10	
2201	5322 122 32654	22n	X7R	PM10	
2204	5322 122 32654	22n	X7R	PM10	
2206	4822 126 12549	470n	25V	PM10	
2207	4822 122 33496	100n	X7R	PM10	
2210	5322 122 32654	22n	X7R	PM10	
2211	5322 122 32654	22n	X7R	PM10	
2230	5322 122 32658	22p	50V		COL
2231	5322 122 32658	22p	50V		COL
2232	5322 122 32654	22n	X7R	PM10	
2235	5322 122 32654	22n	X7R	PM10	
2240	5322 122 32654	22n	X7R	PM10	
2241	5322 122 32654	22n	X7R	PM10	
2245	5322 122 32654	22n	X7R	PM10	
2250	5322 122 32654	22n	X7R	PM10	
2251	5322 122 31865	1n5	X7R	PM10	
2252	5322 122 31865	1n5	X7R	PM10	
2253	5322 122 31865	1n5	X7R	PM10	
2254	5322 122 32654	22n	X7R	PM10	
2255	4822 124 40433	47µ	25V	PM20	COL
2263	5322 122 32654	22n	X7R	PM10	
2270	4822 124 41989	470µ	16V	PM20	
2271	4822 124 41989	470µ	16V	PM20	
2272	5322 122 32654	22n	X7R	PM10	
2280	5322 122 32654	22n	X7R	PM10	
2281	4822 124 80483	47µ	6V3	PM20	
2282	5322 122 31865	1n5	X7R	PM10	
2283	5322 122 32654	22n	X7R	PM10	
2284	5322 122 31865	1n5	X7R	PM10	
2285	5322 122 31865	1n5	X7R	PM10	
2286	5322 122 31865	1n5	X7R	PM10	
2304	4822 122 33496	100n	X7R	PM10	
2305		47p	50V		COL
2306		10µ	50V	PM20	COL
2307	5322 122 32654	22n	X7R	PM10	
2308	4822 122 33496	100n	X7R	PM10	
2310	4822 122 33496	100n	X7R	PM10	
2311	5322 122 32654	22n	X7R	PM10	
2312	5322 122 32654	22n	X7R	PM10	
2313	5322 122 32654	22n	X7R	PM10	
2314	5322 122 32654	22n	X7R	PM10	
2315	5322 122 32654	22n	X7R	PM10	
2316	5322 122 32654	22n	X7R	PM10	
2317	5322 122 32654	22n	X7R	PM10	
2318	5322 122 32654	22n	X7R	PM10	
2319	4822 124 41584	100µ	10V	PM20	COL
2320	5322 122 32654	22n	X7R	PM10	
2321	5322 122 32654	22n	X7R	PM10	
2322	5322 122 32654	22n	X7R	PM10	
2323	5322 122 32654	22n	X7R	PM10	
2324	5322 122 32654	22n	X7R	PM10	
2325	4822 122 33496	100n	X7R	PM10	
2326	5322 122 32654	22n	X7R	PM10	
2327	4822 124 41584	100µ	10V	PM20	COL
2328	4822 124 41584	100µ	10V	PM20	COL
2330	5322 122 32661	56p	50V		COL
2331	5322 122 31863	330p	50V		COL
2332	5322 122 32661	56p	50V		COL
2333	5322 122 32661	56p	50V		COL
2334	5322 122 33897	3n3	63V	PM5	
2335	5322 122 32661	56p	50V		COL
2336	4822 124 41584	100µ	10V	PM20	COL
2337	5322 122 32654	22n	X7R	PM10	
2338	4822 124 41584	100µ	10V	PM20	COL
2339	5322 122 32654	22n	X7R	PM10	
2340	4822 124 22339	100µ	BIP 16V	PM20	
2342	5322 122 32654	22n	X7R	PM10	
2350	5322 122 32661	56p	50V		COL
2351	5322 122 31863	330p	50V		COL
2352	5322 122 32661	56p	50V		COL
2353	5322 122 32661	56p	50V		COL
2354	5322 122 33897	3n3	63V	PM5	
2355	5322 122 32661	56p	50V		COL
2360	4822 124 22339	100µ	BIP 16V	PM20	

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Item	Codenumber	Description			
2362	5322 122 32654	22n	X7R	PM10	
2375	5322 122 33897	3n3	63V	PM5	
2376	5322 122 33897	3n3	63V	PM5	
2380	4822 124 41576	2µ2	50V	PM20	COL
2381	4822 122 32139	12p	50V		COL
2382	4822 122 33496	100n	X7R	PM10	
2383	4822 124 41989	470µ	16V	PM20	
2384	4822 124 41576	2µ2	50V	PM20	COL
2385	4822 122 32139	12p	50V		COL
2386	5322 122 32654	22n	X7R	PM10	
2387	5322 122 32654	22n	X7R	PM10	
2388	4822 122 33496	100n	X7R	PM10	
2389	4822 124 41989	470µ	16V	PM20	
2390	4822 124 40196	220µ	10V	PM20	COL
2401	4822 122 33575	220p	50V		COL
2403	4822 122 33575	220p	50V		COL
2404	4822 122 33575	220p	50V		COL
2405	4822 122 33575	220p	50V		COL
2406	4822 122 33575	220p	50V		COL
2407	4822 122 33575	220p	50V		COL
2412	5322 122 32654	22n	X7R	PM10	
2413	4822 124 40433	47µ	25V	PM20	COL
2414	5322 122 32531	100p	50V		COL
2415	5322 122 32654	22n	X7R	PM10	
2416	5322 122 32654	22n	X7R	PM10	
2417	5322 126 10465	3n9	X7R	PM10	
2418	4822 126 10326	180p	50V		COL
2419	5322 122 32654	22n	X7R	PM10	
2421	4822 122 33496	100n	X7R	PM10	
2422	5322 122 32654	22n	X7R	PM10	
2424	4822 122 33496	100n	X7R	PM10	
2425	4822 126 10326	180p	50V		COL
2426	4822 122 32627	2n7	X7R	PM10	
2427	4822 122 33175	2n2	X7R	PM10	
2428	4822 122 33342	33n	X7R	PM10	
2429	5322 122 32654	22n	X7R	PM10	
2431	4822 122 33496	100n	X7R	PM10	
2433	5322 122 32654	22n	X7R	PM10	
2434	5322 122 32654	22n	X7R	PM10	
2435	5322 122 32654	22n	X7R	PM10	
2438	5322 122 32654	22n	X7R	PM10	
2439	5322 116 80853	560p	50V		COL
2440	4822 122 32646	5n6	X7R	PM10	
2441	5322 122 32531	100p	50V		COL
2442	5322 122 32531	100p	50V		COL
2443	4822 126 10326	180p	50V		COL
2445	5322 116 80853	560p	50V		COL
2446	5322 122 32654	22n	X7R	PM10	
2447	5322 122 32531	100p	50V		COL
2449	4822 122 33496	100n	X7R	PM10	
2450	5322 122 32654	22n	X7R	PM10	
2451	5322 122 31865	1n5	X7R	PM10	
2452	4822 122 33177	10n	X7R	PM10	
2453	5322 122 32531	100p	50V		COL
2454	4822 126 12549	470n	25V	PM10	
2455	4822 124 40433	47µ	25V	PM20	COL
2460	4822 124 40433	47µ	25V	PM20	COL
2461	4822 122 33496	100n	X7R	PM10	
2470	4822 122 33575	220p	50V		COL
2471	4822 122 33177	10n	X7R	PM10	

Item	Codenumber	Description			
2472	5322 122 32661	56p	50V		COL
2473	4822 122 33496	100n	X7R	PM10	
2474	4822 122 33575	220p	50V		COL
2475	5322 122 32654	22n	X7R	PM10	
2476	4822 122 33177	10n	X7R	PM10	
2477	5322 122 32661	56p	50V		COL
2478	5322 122 32654	22n	X7R	PM10	
2479	4822 122 33575	220p	50V		COL
2482	5322 122 32654	22n	X7R	PM10	
2498	5322 122 32654	22n	X7R	PM10	
2500	4822 122 33496	100n	X7R	PM10	
2501	4822 122 33342	33n	X7R	PM10	
2502	5322 122 32268	470p	50V		COL
2503	5322 122 32268	470p	50V		COL
2510	4822 124 41584	100µ	10V	PM20	COL
2511	5322 122 32654	22n	X7R	PM10	
2512	5322 122 32654	22n	X7R	PM10	
2513	5322 122 32654	22n	X7R	PM10	
2514	5322 122 32654	22n	X7R	PM10	
2515	5322 122 32654	22n	X7R	PM10	
2516	5322 122 32654	22n	X7R	PM10	
2517	5322 122 32654	22n	X7R	PM10	
2518	4822 124 41584	100µ	10V	PM20	COL
2520	5322 122 32654	22n	X7R	PM10	
2521	4822 124 40433	47µ	25V	PM20	COL
2523	4822 124 40433	47µ	25V	PM20	COL
2524	4822 126 12549	470n	25V	PM10	
2525	5322 122 32654	22n	X7R	PM10	
2526	4822 126 12549	470n	25V	PM10	
2530	4822 122 33496	100n	X7R	PM10	
2531	5322 122 32654	22n	X7R	PM10	
2532	5322 122 32654	22n	X7R	PM10	
3101	4822 051 20472	4k7	0,1W	5%	
3109	4822 051 20008	0R05			
3111	4822 051 20008	0R05			
3115	4822 051 20008	0R05			
3117	4822 051 20101	100R	0,1W	5%	
3120	4822 051 20472	4k7	0,1W	5%	
3121		75R		1%	
3122	4822 051 20223	22k	0,1W	5%	
3123		75R		1%	
3124		75R		1%	
3125	4822 051 20223	22k	0,1W	5%	
3127	4822 051 20101	100R	0,1W	5%	
3128		75R		1%	
3129	4822 051 20151	150R	0,1W	5%	
3134	4822 051 20223	22k	0,1W	5%	
3135	4822 051 20472	4k7	0,1W	5%	
3136	4822 051 20301	300R	0,1W	5%	
3137	4822 051 20301	300R	0,1W	5%	
3138	4822 051 20681	680R	0,1W	5%	
3139	4822 051 20472	4k7	0,1W	5%	
3140	4822 051 20101	100R	0,1W	5%	
3141	4822 051 20472	4k7	0,1W	5%	
3143	4822 051 20223	22k	0,1W	5%	
3150	4822 051 20008	0R05			
3153	4822 051 20008	0R05			
3155	4822 052 10229	22R	0,1W	5%	
3156	4822 0521 0229	22R	0,1W	5%	

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Item	Codenumber	Description		
3157	4822 051 20008	0R05		
3159	4822 051 20272	2k7		PM2
3160	4822 117 11454	820R		1%
3163	4822 051 20008	0R05		
3164	4822 117 11454	820R		1%
3166	4822 117 11454	820R		1%
3167	4822 051 20101	100R	0,1W	5%
3168	4822 051 20151	150R	0,1W	5%
3170	4822 051 20103	10k	0,1W	5%
3172		75R		1%
3174	4822 051 10102	1k	0,1W	5%
3175		510R		1%
3176		510R		1%
3177	4822 051 20101	100R	0,1W	5%
3178	4822 051 20151	150R	0,1W	5%
3179	4822 051 20008	0R05		
3180		75R		1%
3181	4822 051 20008	0R05		
3182		510R		1%
3183		510R		1%
3184	4822 051 20101	100R	0,1W	5%
3186	4822 051 20151	150R	0,1W	5%
3187		75R		1%
3188	4822 051 20008	0R05		
3189		510R		1%
3190		510R		1%
3191	4822 0512 0101	100R	0,1W	5%
3193	4822 0512 0151	150R	0,1W	5%
3194	4822 0512 0008	0R05		
3197		75R		1%
3201	4822 051 20105	1M	0,1W	5%
3202	4822 051 20472	4k7	0,1W	5%
3204	4822 051 20103	10k	0,1W	5%
3205	4822 051 20104	100k	0,1W	5%
3206	4822 051 20104	100k	0,1W	5%
3207	4822 051 20103	10k	0,1W	5%
3208	4822 051 20103	10k	0,1W	5%
3209	4822 051 20472	4k7	0,1W	5%
3210	4822 051 10102	1k	0,1W	5%
3211	4822 051 10102	1k	0,1W	5%
3212	4822 051 20103	10k	0,1W	5%
3213	4822 051 20103	10k	0,1W	5%
3214	4822 051 20472	4k7	0,1W	5%
3215	4822 051 20223	22k	0,1W	5%
3216	4822 051 20223	22k	0,1W	5%
3217	4822 051 20223	22k	0,1W	5%
3218	4822 051 10102	1k	0,1W	5%
3219	4822 051 20472	4k7	0,1W	5%
3220	4822 051 10102	1k	0,1W	5%
3221	4822 051 10102	1k	0,1W	5%
3222	4822 051 20472	4k7	0,1W	5%
3223	4822 051 20472	4k7	0,1W	5%
3224	4822 051 20472	4k7	0,1W	5%
3225	4822 051 20472	4k7	0,1W	5%
3226	4822 051 20472	4k7	0,1W	5%
3227	4822 051 20472	4k7	0,1W	5%
3228	4822 051 20472	4k7	0,1W	5%
3229	4822 051 10102	1k	0,1W	5%
3230	4822 051 20105	1M	0,1W	5%
3231	4822 051 20222	2k2	0,1W	5%
3232	4822 051 20479	47R	0,1W	5%
3236	4822 051 20101	100R	0,1W	5%
3237	4822 051 20101	100R	0,1W	5%
3238	4822 051 20101	100R	0,1W	5%
3240	4822 051 10102	1k	0,1W	5%
3244	4822 051 20008	0R05		
3245	4822 051 10102	1k	0,1W	5%
3246	4822 051 20008	0R05		
3250	4822 051 20104	100k	0,1W	5%
3251	4822 051 20101	100R	0,1W	5%
3252	4822 051 20101	100R	0,1W	5%
3253	4822 051 20101	100R	0,1W	5%
3254	4822 051 20104	100k	0,1W	5%
3255	4822 051 20104	100k	0,1W	5%
3257	4822 051 20104	100k	0,1W	5%
3258	4822 051 20103	10k	0,1W	5%
3259	4822 051 20682	6k8	0,1W	5%
3260	4822 051 20104	100k	0,1W	5%
3261	4822 051 20103	10k	0,1W	5%
3262	4822 051 20682	6k8	0,1W	5%
3263	4822 051 20229	22R	0,1W	5%
3264	4822 051 20471	470R	0,1W	5%
3265	4822 051 20103	10k	0,1W	5%
3266	4822 051 20103	10k	0,1W	5%
3267	4822 051 20473	47k	0,1W	5%
3271	4822 051 20103	10k	0,1W	5%
3272	4822 051 20103	10k	0,1W	5%
3254	4822 051 20104	100k	0,1W	5%
3255	4822 051 20104	100k	0,1W	5%
3257	4822 051 20104	100k	0,1W	5%
3258	4822 051 20103	10k	0,1W	5%
3259	4822 051 20682	6k8	0,1W	5%
3260	4822 051 20104	100k	0,1W	5%
3261	4822 051 20103	10k	0,1W	5%
3262	4822 051 20682	6k8	0,1W	5%
3263	4822 051 20229	22R	0,1W	5%
3264	4822 051 20471	470R	0,1W	5%
3265	4822 051 20103	10k	0,1W	5%
3266	4822 051 20103	10k	0,1W	5%
3267	4822 051 20473	47k	0,1W	5%
3271	4822 051 20103	10k	0,1W	5%
3272	4822 051 20103	10k	0,1W	5%
3274	4822 252 51173	MP100	65V	1A
3277	4822 116 40264	0R81	60V	PTC
3280	4822 051 20101	100R	0,1W	5%
3281	4822 051 20682	6k8	0,1W	5%
3282	4822 051 20103	10k	0,1W	5%
3283	4822 051 20104	100k	0,1W	5%
3284	4822 051 20101	100R	0,1W	5%
3285	4822 051 20682	6k8	0,1W	5%
3286	4822 051 20103	10k	0,1W	5%
3287	4822 051 20104	100k	0,1W	5%
3288	4822 051 20104	100k	0,1W	5%
3289	4822 051 20103	10k	0,1W	5%
3301	4822 051 20473	47k	0,1W	5%
3302	4822 051 20473	47k	0,1W	5%
3303	4822 051 20473	47k	0,1W	5%
3304	4822 051 20472	4k7	0,1W	5%
3305	4822 051 20101	100R	0,1W	5%
3306	4822 051 20472	4k7	0,1W	5%
3307	4822 051 20689	68R	0,1W	5%
3308		3R3	0,1W	5%
3309	4822 051 20008	0R05		
3310	4822 051 20472	4k7	0,1W	5%

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Item	Codenumber	Description		
3311	4822 051 20472	4k7	0,1W	5%
3312	4822 051 20472	4k7	0,1W	5%
3313	4822 051 20472	4k7	0,1W	5%
3314	4822 051 20472	4k7	0,1W	5%
3315	4822 051 20472	4k7	0,1W	5%
3316	4822 051 20472	4k7	0,1W	5%
3317	4822 051 20182	1k8	0,1W	5%
3318	4822 051 20229	22R	0,1W	5%
3319	4822 051 20103	10k	0,1W	5%
3324	4822 051 20008	0R05		
3326	4822 051 20182	1k8	0,1W	5%
3329	4822 117 11373	100R		1%
3330	4822 117 11143	3k		1%
3331	4822 117 11143	3k		1%
3332		43k		1%
3333	4822 051 20222	2k2	0,1W	5%
3334	4822 117 11143	3k		1%
3335	4822 117 11143	3k		1%
3336		43k		1%
3337	4822 051 20472	4k7	0,1W	5%
3338		1k4		1%
3339		2k1		1%
3340		11k		1%
3341		3R3	0,1W	5%
3342		3R3	0,1W	5%
3343	4822 117 11373	100R		1%
3344	4822 051 20182	1k8	0,1W	5%
3345	4822 051 20223	22k	0,1W	5%
3346	4822 051 10102	1k	0,1W	5%
3347	4822 051 20183	18k	0,1W	5%
3348	4822 051 20472	4k7	0,1W	5%
3349		4k42		1%
3350	4822 117 11143	3k		1%
3351	4822 117 11143	3k		1%
3352		43k		1%
3353	4822 051 20472	4k7	0,1W	5%
3354	4822 117 11143	3k		1%
3355	4822 117 11143	3k		1%
3356		43k		1%
3357	4822 051 20103	10k	0,1W	5%
3358		1k4		1%
3359		2k1		1%
3360		11k		1%
3361	4822 117 11373	100R		1%
3362	4822 051 20472	4k7	0,1W	5%
3363	4822 051 20223	22k	0,1W	5%
3364	4822 051 10102	1k	0,1W	5%
3365	4822 051 20183	18k	0,1W	5%
3366	4822 051 20472	4k7	0,1W	5%
3367		4k42		1%
3368		4k42		1%
3369		4k42		1%
3375	4822 117 11143	3k		1%
3376	4822 117 11143	3k		1%
3377	4822 051 20182	1k8	0,1W	5%
3378	4822 117 11373	100R		1%
3380	4822 051 20103	10k	0,1W	5%
3381	4822 051 20229	22R	0,1W	5%
3382	4822 051 20472	4k7	0,1W	5%
3383	4822 052 10109	10R	0,1W	5%
3384	4822 051 20471	470R	0,1W	5%
3385	4822 051 20103	10k	0,1W	5%

Item	Codenumber	Description		
3386	4822 051 20229	22R	0,1W	5%
3387	4822 051 20472	4k7	0,1W	5%
3388	4822 052 10109	10R	0,1W	5%
3389	4822 051 20471	470R	0,1W	5%
3390	4822 050 14709	47R	0,4W	1%
3391	4822 051 20473	47k	0,1W	5%
3392	4822 051 20222	2k2	0,1W	5%
3393	4822 051 20103	10k	0,1W	5%
3394	4822 051 20473	47k	0,1W	5%
3395	4822 051 20103	10k	0,1W	5%
3396	4822 051 20222	2k2	0,1W	5%
3397	4822 051 20222	2k2	0,1W	5%
3398	4822 051 20223	22k	0,1W	5%
3399	4822 051 20103	10k	0,1W	5%
3400	4822 051 20008	0R05		
3401	4822 051 20008	0R05		
3402	4822 051 20183	18k	0,1W	5%
3403	4822 051 20103	10k	0,1W	5%
3404	4822 051 20103	10k	0,1W	5%
3405	4822 051 20823	82k	0,1W	5%
3406	4822 051 20823	82k	0,1W	5%
3407	4822 117 11152	4R7	0,1W	5%
3408	4822 051 20105	1M	0,1W	5%
3409	4822 051 20103	10k	0,1W	5%
3410	4822 051 20183	18k	0,1W	5%
3411	4822 051 20221	220R	0,1W	5%
3412	4822 051 20221	220R	0,1W	5%
3413	4822 051 10102	1k	0,1W	5%
3414	4822 051 20103	10k	0,1W	5%
3415	4822 051 20103	10k	0,1W	5%
3416	4822 051 10102	1k	0,1W	5%
3417	4822 051 20153	15k	0,1W	5%
3418	4822 051 20103	10k	0,1W	5%
3419	4822 051 20153	15k	0,1W	5%
3421	4822 051 20103	10k	0,1W	5%
3422	4822 051 20008	0R05		
3423	4822 051 20229	22R	0,1W	5%
3424	4822 051 20472	4k7	0,1W	5%
3425	4822 051 20229	22R	0,1W	5%
3426	4822 051 20153	15k	0,1W	5%
3427	4822 051 20682	6k8	0,1W	5%
3428	4822 051 20103	10k	0,1W	5%
3429	4822 051 20153	15k	0,1W	5%
3430	4822 051 20103	10k	0,1W	5%
3431	4822 051 20153	15k	0,1W	5%
3432	4822 051 20103	10k	0,1W	5%
3433	4822 051 20153	15k	0,1W	5%
3434	4822 051 20682	6k8	0,1W	5%
3435	4822 051 20008	0R05		
3436	4822 051 20103	10k	0,1W	5%
3437	4822 051 20229	22R	0,1W	5%
3438	4822 051 20008	0R05		
3440	4822 051 20103	10k	0,1W	5%
3441	4822 051 20333	33k	0,1W	5%
3442	4822 051 20683	68k	0,1W	5%
3443	4822 051 20333	33k	0,1W	5%
3444	4822 051 10102	1k	0,1W	5%
3445	4822 051 20103	10k	0,1W	5%
3446	4822 051 20333	33k	0,1W	5%
3447	4822 051 20683	68k	0,1W	5%
3448	4822 051 20333	33k	0,1W	5%
3449	4822 051 10102	1k	0,1W	5%

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Item	Codenumber	Description		
3450	4822 051 20103	10k	0,1W	5%
3451	4822 051 20103	10k	0,1W	5%
3452	4822 051 20221	220R	0,1W	5%
3453	4822 051 20222	2k2	0,1W	5%
3454	4822 051 20821	820R	0,1W	5%
3455		2R2	0,1W	5%
3456	4822 051 20101	100R	0,1W	5%
3457	4822 051 20154	150K	0,1W	5%
3458	4822 051 20472	4k7	0,1W	5%
3459	4822 051 20473	47K	0,1W	5%
3460	4822 051 10102	1k	0,1W	5%
3461	4822 051 20101	100R	0,1W	5%
3462	4822 051 20104	100k	0,1W	5%
3463	4822 051 20101	100R	0,1W	5%
3464	4822 051 10102	1k	0,1W	5%
3465	4822 051 20683	68k	0,1W	5%
3466	4822 051 20104	100k	0,1W	5%
3467	4822 051 20103	10k	0,1W	5%
3468	4822 051 20223	22k	0,1W	5%
3469	4822 117 10362	7k5		1%
3470	4822 117 10507	24k		1%
3471	4822 117 11537	330k		1%
3472	4822 051 20334	330k	0,1W	5%
3473	4822 051 20334	330k	0,1W	5%
3474	4822 051 20473	47k	0,1W	5%
3475	4822 117 11537	330k		1%
3477	4822 117 10507	24k		1%
3478	4822 051 20473	47k	0,1W	5%
3479	4822 051 20223	22k	0,1W	5%
3480	4822 051 20223	22k	0,1W	5%
3481	4822 051 20103	10k	0,1W	5%
3482	4822 051 20223	22k	0,1W	5%
3483	4822 051 20103	10k	0,1W	5%
3484	4822 117 10354	22k		1%
3485	4822 051 20223	22k	0,1W	5%
3486	4822 051 20104	100k	0,1W	5%
3487	4822 051 20103	10k	0,1W	5%
3490	4822 051 20008	0R05		
3491	4822 051 20008	0R05		
3493	4822 051 20223	22k	0,1W	5%
3494	4822 051 20273	27k	0,1W	5%
3495	4822 117 11139	1k5	0,1W	5%
3496	4822 051 20183	18k	0,1W	5%
3497	4822 051 20101	100R	0,1W	5%
3498	4822 051 20122	1k2	0,1W	5%
3499	4822 051 20821	820R	0,1W	5%
3500		150k		1%
3501		150k		1%
3502	4822 051 20229	22R	0,1W	5%
3503	4822 051 20683	68k	0,1W	5%
3504	4822 117 10354	22k		1%
3505	4822 117 10354	22k		1%
3506	4822 051 20103	10k	0,1W	5%
3509	4822 051 20223	22k	0,1W	5%
3510	4822 117 11152	4R7	0,1W	5%
3514	4822 051 20103	10k	0,1W	5%
3520	4822 117 11152	4R7	0,1W	5%
3521	4822 117 11154	1k		1%
3522	4822 117 11154	1k		1%
3524	4822 051 20333	33k	0,1W	5%

Item	Codenumber	Description		
3525	4822 051 20101	100R	0,1W	5%
3526	4822 051 20183	18k	0,1W	5%
3527	4822 051 20222	2k2	0,1W	5%
3528	4822 051 20104	100k	0,1W	5%
3529	4822 051 20273	27k	0,1W	5%
3530	4822 051 20229	22R	0,1W	5%
3531	4822 051 20333	33k	0,1W	5%
3532	4822 051 20333	33k	0,1W	5%
3533	4822 051 20223	22k	0,1W	5%
3534	4822 051 20223	22k	0,1W	5%
3535	4822 051 20223	22k	0,1W	5%
3536	4822 117 11139	1k5	0,1W	5%
5140	4822 157 70378	22n	16V	
5141	4822 157 70378	22n	16V	
5150		1n	EMI FIL	
5151		1n	EMI FIL	
5153		220p	EMI FIL	
5154		220p	EMI FIL	
5156		220p	EMI FIL	
5157		220p	EMI FIL	
5165	4822 157 50961	22µH		
5201	4822 242 72527	4MHz		RESCER
5230	4822 242 81873	4MHz9152		RES XTAL
5235	4822 242 81419	30.0000MHz for /60/61/65		X-TAL OSC
5235	4822 242 81394	30.2089MHz for /77		X-TAL OSC
5250		1n	EMI FIL	
5251		1n	EMI FIL	
5252		1n	EMI FIL	
5253		1n	EMI FIL	
5254	4822 157 70378	22n	EMI FIL	
5255		1n	EMI FIL	
5280	4822 157 70378	22n	EMI FIL	
5281		1n	EMI FIL	
5282		1n	EMI FIL	PM20
5283		1n	EMI FIL	PM20
5284		1n	EMI FIL	PM20
5305	4822 157 70601	100µH	10%	
5310	4822 242 81872	33,8688 MHz		X-TAL OSC
5375		1n	EMI FIL	PM20
5376		1n	EMI FIL	PM20
5377		220p	EMI FIL	PM20
5401	4822 242 73557	8MHZ467		RES CER
5450		56µH	10%	
6200	5322 130 34885	1N5817		
6274	4822 130 80291	1N4002GP		
6390	5322 130 34885	1N5817		
6444	5322 130 80948	BAT74		
6445	4822 130 80622	BAT54		
6451	4822 130 80622	BAT54		
6452	5322 130 31928	BAS16		
6524	5322 130 31928	BAS16		
7110		UPD424270LE-80		
7118		UPD424270LE-80		
7125		VDSC-JTAG		
7127	4822 130 40937	BC548B		

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Item	Codenumber	Description
7140	5322 130 41982	BC848B
7141	5322 130 41982	BC848B
7143	5322 130 41982	BC848B
7155	4822 209 81726	L7812CV
7160	4822 209 52561	BT9106KPJ-(PLCC68)
7164	482 213 040937	BC548B
7176	482 213 040937	BC548B
7181	482 213 040937	BC548B
7191	482 213 040937	BC548B
7201		IKAT CDI220/PH.IV
7205	532 213 041982	BC848B
7207	482 220 931275	MC34064D-5
7210		SCC68070CCA84
7230	532 220 911517	PC74HCU04T
7240		SYSTEM EPROM
7241		ASSY NVRAM 32k x8
7245	5322 209 61434	N74F02D
7250	5322 209 71568	74HCT14D
7263	4822 209 52683	PAL16R4-10MONO3
7272	4822 209 52682	CSPAL CDI220/PH.IV
7280	5322 209 71568	74HCT14D
7304	4822 209 30696	MC74ACT74DR2
7305	5322 209 33102	MC74AC08DR2
7310		CIAP1.5 QFP80
7320	4822 209 33867	CS4303-KS
7321	4822 209 80817	L7805CV
7325	4822 130 42696	BC818-25
7327	4822 130 42696	BC818-25
7331	4822 209 32071	MC33079D
7333	5322 130 41979	BC808
7340	4822 130 42696	BC818-25
7348	4822 130 42696	BC818-25
7359	4822 130 42696	BC818-25
7360	4822 209 62312	MC33078D
7361	5322 130 41982	BC848B
7366	4822 130 42696	BC818-25
7380	4822 209 62059	TCA0372DP1
7391	5322 130 41979	BC808
7394	5322 130 41979	BC808
7395	5322 130 41982	BC848B
7397	5322 130 41983	BC858B
7401	4822 209 31064	TDA1301T/N1
7420	4822 209 72587	TCA0372DP2
7430	4822 209 72587	TCA0372DP2
7440	5322 209 71553	NE532D
7450	5322 130 41982	BC848B
7461	5322 130 41982	BC858B
7462	4822 130 41982	BC848B
7480	5322 130 41982	BC848B
7481	4822 209 31615	LM324AD
7482	5322 209 61482	74HC4066D
7495	5322 130 41982	BC848B
7498	5322 130 41982	BC848B
7510	4822 209 33414	CD60QFP44
7524	5322 130 41982	BC848B
7530	4822 209 62059	TCA0372DP1

8.5 List of accessories and service tools

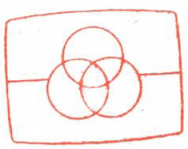
Item	Codenumber	Description
1	4822 395 50145	TORX SCREW DRIVER SET
2	4822 264 50263	PLUG FOR STARTUP OF SERVICE SHELL
3	4822 397 30096	AUDIO TESTDISC SET
4	4822 397 30155	TESTDISC WITH CONTINOUS 1 kHz SIGNAL 70 MIN.
5	4822 397 30184	AUDIOSIGNALSDISC
6	4822 701 11922	SKEW DISC 0,6
7	4822 701 11923	EXCENTRICITY DISC 150l
8	4822 691 30293	ROLLER CONTROLLER
9	4822 691 30309	TRACKER BALL
10	4822 691 30328	TOUCH PAD
11	4822 691 30297	MOUSE

Partslist for rollercontroller

Item	Codenumber	Description
1	4822 321 61841	CABLE ASSY
2	4822 413 90093	BALL
3	4822 276 13359	SWITCH
4	4822 410 62427	KEYTOP-LEFT
4	4822 410 62428	KEYTOP-RIGHT
5	4822 492 42645	SPRING

Partslist for the touch pad

Item	Codenumber	Description
1	4822 321 62311	CABLE ASSY
2	4822 498 91048	STICK



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