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Compact disc interactive player

CDI 210/60/65

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Service
Service
Service



ServiceManual

COMPACT disc Interactive

SURVEY OF PLAYERS

Version	Description
/40	PAL player without RF- modulator
/41	Multivoltage PAL player with RF- modulator
/45	PAL player with RF- modulator for the UK-system

These sets are equiped with Compact Disc Mechanism type CDM12.1; service code 4822 691 30278.
This CDM is also used in CDI220/60/61/65/77.
Service information is included in this manual.

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SURVEY OF MAINPANELS

Version	Mainpanel	LCD-display
/00	4822 214 60019	4822 130 91194
/05	4822 214 60021	4822 130 91194
/20	4822 214 52135	4822 214 52133
/25	4822 214 52136	4822 214 52133

The mainpanels must be repaired via the central repair procedure, if the defective item is on the circuitry of the µP part, digital audio or the digital video part.
All above mentioned players are equiped with CDM9.

Version	Mainpanel
/40 /41 /45 /60 /65	These mainpanels must be repaired down to component level in a local central repairshop ,see chapter 3.6.

(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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PCS 86 029

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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

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



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)	

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.

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

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



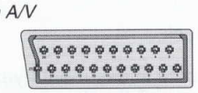
pin *Broche*	signal *Signal*	I/O *E/S*
1	rxd1	I / *E*
2	rxd2	I / *E*
3	tx2	O / *S*
4	rts1	O / *S*
5	ground / Masse	-
6	nc	-
7	rts2	O / *S*
8	+5V (100 mA max)	

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



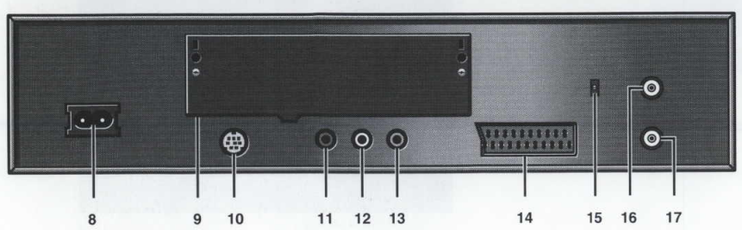
pin *Broche*	signal *Signal*
1	audio R / *audio R (droite)*
2	nc / *non connecté*
3	audio L / *audio L (gauche)*
4	audio ground / *masse audio*
5	blue ground / *masse bleu*
6	nc / *non connecté*
7	blue / *bleu*
8	function switching (0=Antenna ; 1A=A/V Euroconnector with aspect ratio 16:9; 1B=AV/Euroconnector 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*

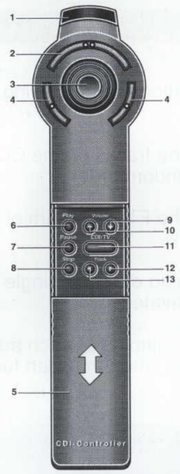
Designs and specifications are subject to change without notice. • *La conception et les spécifications de ce produit sont sujet à modifications sans avis préalable. • Los diseños y las especificaciones están sujetos a cambios sin previo aviso. • Concepten en specificaties kunnen gewijzigd worden zonder 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.*

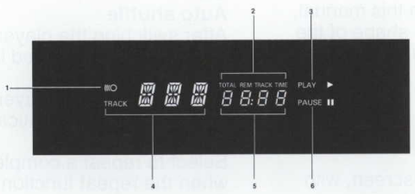
2.2 CONNECTION AND CONTROLS

CDI 210









DESCRIPTION OF CONTROLS AND CONNECTIONS

FRONT
1. Disc loading tray.
2. Open/close button.
3. Soft tone multifunction display with infrared remote control receiver.
4. Play button.
5. Input port for CD-I pointing devices.
6. Stop button.
7. AC power on/off button.

REAR
8. Mains AC (alternating current) input socket.
9. Extension socket (22ER9956).
10. Input port for CD-I serial connections.
11. Audio output R.
12. Audio output L.
13. Video output (CVBS).
14. A/V Euroconnector*.
15. Channel selector*.
16. OUT TO TV*.
17. IN FROM ANTENNA*.

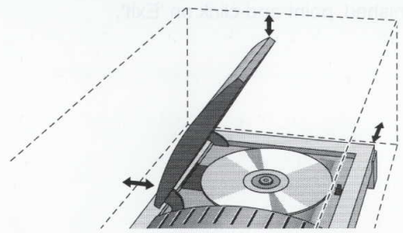
DISPLAY PANEL
1. Remote control active (flashing indicator).
2. Time indicators.
3. Disc playing.
4. Track number (CD-Audio).
5. Elapsed or remaining time (CD-Audio).
6. CD pause active.

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.

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.



POWER CONNECTION

- Connect the female end of the AC (alternating current) cord supplied into the AC socket (8).
- 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.**

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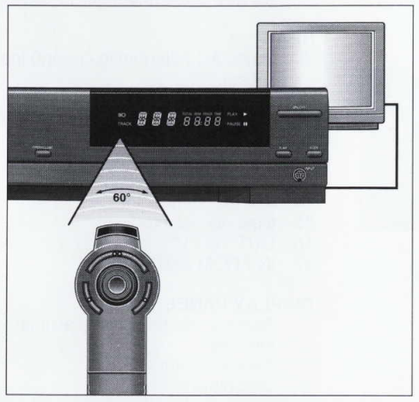
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2.3 BEFORE USING YOUR CD-I PLAYER

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.

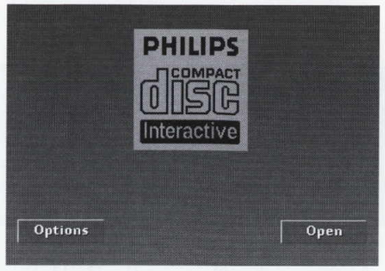
Note: To 'point-and-click' on any screen shown in this manual, any one of the action buttons can be used. The shape of the cursor is different according to the program you are playing, but it is always controlled in the same way.

SETTINGS

- Press the ON/OFF button (7) 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:

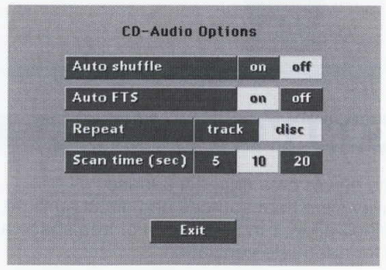
Open/Close: To open or close the disc tray.
Options: See: 'OPTIONS SCREEN'.



- Press the ON/OFF button (7) 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.

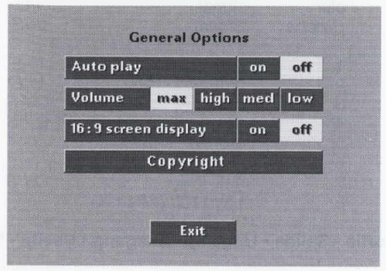


- When finished, point-and-click on 'Exit'.

2.4 SETTING UP

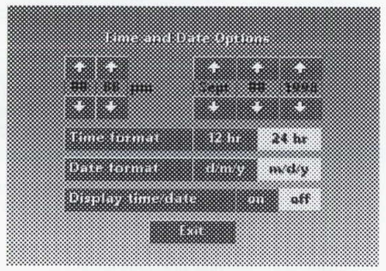
OPTIONS SCREEN CONTINUATION

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.
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'.

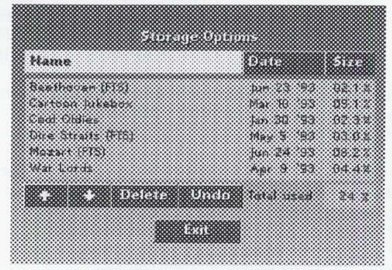
3. Time and Date
To change the player time/date settings:
Time/Date set
If the time or date shown on the screen is wrong, select the appropriate 3 and 4 arrows to set hours, minutes, day, month and year in turn, as required.
Time format
Select 24 hour or 12 hour clock.
Date format
Select d/m/y to present 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'.

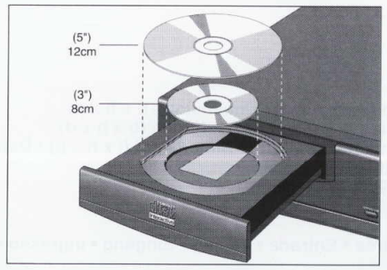


- When finished, point-and-click on 'Exit'.

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.

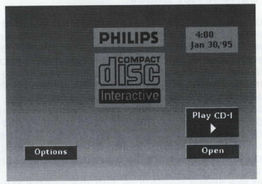
CAUTION

– 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.

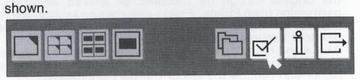
2. When autoplay is "ON":
   After loading the disc, the CD-I program will start up automatically.
   The opening screen of the CD-I program now appears on the TV.
   From this point, all interaction is between you and the program.
   To stop at any time, select the STOP or EXIT function provided by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

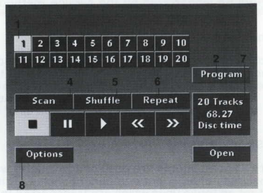
CAUTION

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:**
   – 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-click' with your remote control. The operation of the functions is briefly explained in the following table.

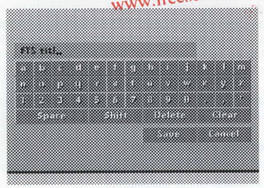
DISC PLAY

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.
Save 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 make 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.
- For information about the actual graphics functions, refer to the instructions that come with the disc.
- 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'.

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2.6 ACCESSORIES • ACCESSOIRES

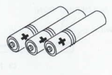
SUPPLIED ACCESSORIES • ACCESSOIRES FOURNIS

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

Ces accessoires sont fournis pour vous permettre d'utiliser ou d'installer votre lecteur de CD-I.



"Thumbpad" Remote Control Handset
Télécommande à manette



Three Batteries
Trois piles R6



Euroconnector * Cable
Câble péritélévision/ CINCH
SBC 5510



Antenna Cable *
(RF coaxial cable)
Câble d'antenne (Câble RF)



AC Cord
Cordon d'alimentation



Digital Video Cartridge*
Cartoùche Digital Vidéo
22ER9956

* available on some player versions only * disponible uniquement sur certains modèles de lecteurs * disponible únicamente en determinadas versiones de reproductor * slechts op enkele versies aanwezig * nicht für alle Player-Modelle lieferbar * disponibile solo su alcune versioni di lettore * apenas disponível nalgunas versões

type no. of product • Numéro de série du produit

Date of purchase • Date d'achat • Kaufdatum • Koopdatum • Fecha de compra • Data da compra • Data di acquisto • Købsdato • Kjøpedato • Inköpsdato • Ostopäivä • Ημερομηνια αγοράς

day • Jour month • Mois year • Année 19

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.

Augmentez votre plaisir grâce aux accessoires d'avant-garde spécialement conçus pour votre lecteur CD-I.
Les accessoires en option présentés ici peuvent être acquis auprès de votre revendeur.



CD-I Mouse
Souris CD-I
22ER9011



Roller Controller
Boule de commande
22ER9012



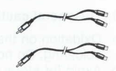
CD-I Trackball
Trackball pour CD-I
22ER9013



Gamepad
Clavier de jeux
22ER9021



I/O Port Splitter for 2 devices
Doubleur pour dispositif de pointage pour 2 commandes
22ER9208



Audio Stereo Splitter
Doubleur pour Audio Stéréo
22ER9209



Audio L-R Cable
Double câble audio stéréo
SBA2135A01



Video (CVBS) Cable
Câble vidéo (CVBS)
SBV1127A01

Dealer's name, address and signature • Nom, adresse et signature du revendeur • Name, Anschrift und Unterschrift des Händlers • Naam, adres en handtekening van de handelaar • Nombre, dirección y firma del distribuidor • Nome, indirizzo e firma del fornitore • Nome, morada e assinatura do vendedor • Forhandlerens navn, adresse og underskrift • Återförsäljarens namn, adress och namnteckning • Myyjän nimi, osoite ja allekirjoitus • Όνομα/Επώνυμο Αντιπροσώπο

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.

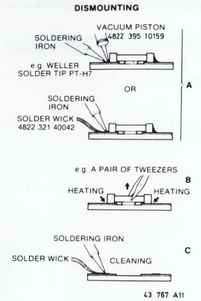


Fig. 1

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).

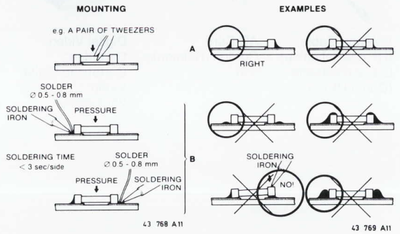


Fig. 2

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

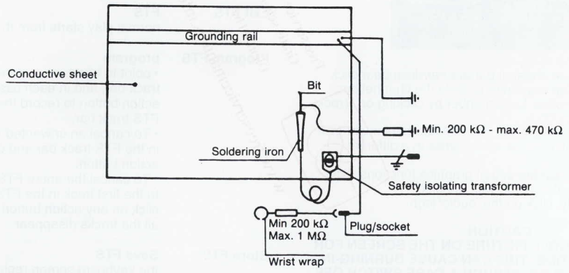
Transport and store the circuits and PCBs in their original packages.
As an alternative to the original package one may use a conductive material or special IC package which short-circuits all the pins of the component with one another.
Always discharge the package before opening it.

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.

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.

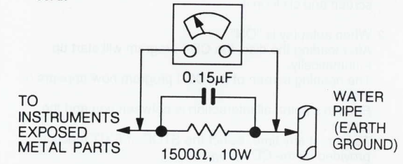
Fire and Shock Hazard (Continued)

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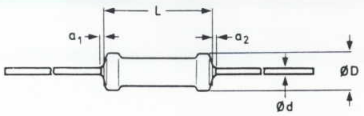
The codenumber above is completed by inserting the first two figures (resistance code)followed by the multiplier.

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

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NFR25 fusible resistors ⚠



Dmax	Lmax	d	a1 + a2
2.5	6.5	0.6	⩽ 1

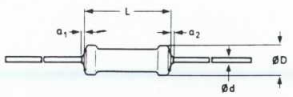
Composition of the service number for the NFR25
Main subgroup: 4822 052 10...

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

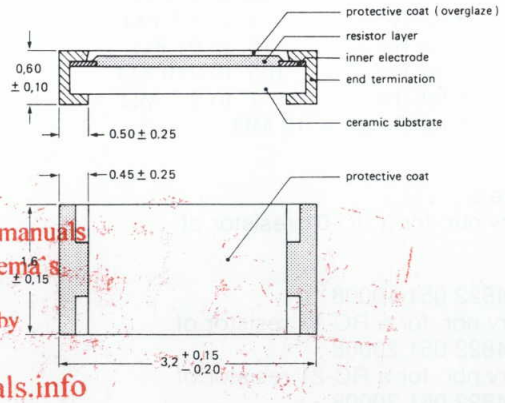
Composition of the service number for the NFR25H
Main subgroup: 4822 052 11...

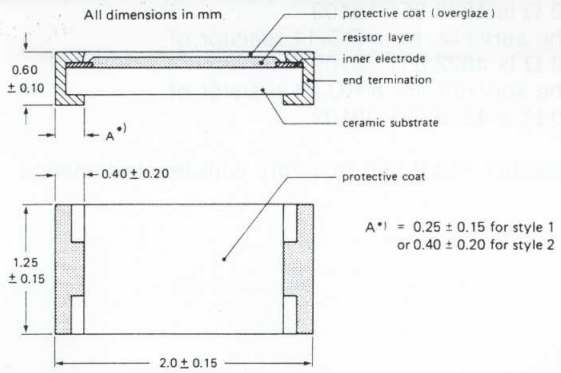
The codenumber above is completed by inserting the first two figures (resistance code)followed by the multiplier.

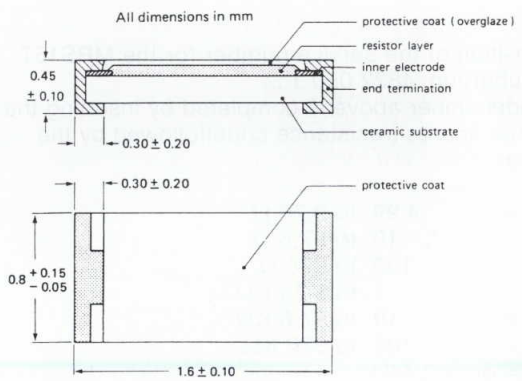
8 for R= 1 to 9,1 Ω
9 for R= 10 to 91 Ω
1 for R= 100 to 910 Ω
2 for R= 1 to 9,1 KΩ
3 for R= 10 to 91 KΩ

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

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.

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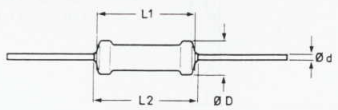
8 for R= 0 to 9.1 Ω
9 for R= 10 to 91 Ω
1 for R= 100 to 910 Ω
2 for R= 1 to 9.1 KΩ
3 for R= 10 to 91 KΩ
4 for R= 100 to 910 KΩ
5 for R= 1 to 9.1 MΩ
6 for R= or > 10 MΩ

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

MRS16T metal film resistors with low-inductance



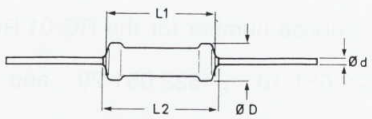
D	L	L2 max.	d
$1,7^{+0,2}_{-0,1}$	$3,5^{+0,2}_{-0,15}$	3,7	0,5 −0,04

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....

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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3.3.9 Advises on replacement of large surface mounted components (SMC's)

3.3.9.1 General

The usual trend development in complexity on ICs and µPs has to make the handling for service workshops as normal practice.

Parts like the VDSC and CIAP are 160 pins plastic Quad Flat Packages (QFP) with :

Lead widt = 0,3 mm
Pitch = 0,65 mm

Replacing the QFPs with fine pitch requires careful handling and good workmanship preventing a damage of the QFP leads, leadpads on the PCB-substrate and the adjacent parts with their solder connections.

3.3.9.2 Advises

- Work carefully
- Apply appropriate equipment
- Use proper lighting
- Apply a magnifying-glass for visual inspections
- Do not cut with a knife
- Leads are sensitive for bending or damage during handling
- Take care for ESD

3.3.9.3 Workmanship

- Keep temperature as low as possible
- Keep time of desoldering restricted
- Pay attention to the differences in desoldering and resoldereing
- Do not apply mechanical forces to lift the QFP from the PCB
- Select good flux and solder
- Look with attention and monitor your process
- Clean after desoldering

3.3.9.4 Methods for removal by desoldering

- By contact heating
- By hot air flow

3.3.9.4.1 Desoldering by contact heating

Advantages :

* Heat is directly introduced in the leads
* Adjacent components will not be heated

Disadvantages :

* Proper contact on all leads simultaneously sometimes problematic
* Risk of damage of leads

Method:

* Select proper desolder tip according to the instruction for use
* Use solder for improving thermal contact
* Temperature : from 250°C for 6 sec. to 300°C for 3sec.
  Max. temp. : 320°C for 3 sec. max.
* Remove excessive solder with solderwick or litze
* Clean after desoldering
* Inspect lead pads on PCB

3.3.9.4.2 Desoldering by heated air

Remark: The hot air for these methods has a temperature far over 400°C. Keep in mind the proper distance to prevent burning of material and keep the time as short as possible.
Advise: With lower air temperature the risk on burned material is less !

Advantages:

* No contact necessary
* No damage of leads

Disadvantage:

* Adjacent components to be protected from hot air flow
* Overheating, risk of burning and fatal damage

Method:

* Read and follow precisely the instructions from the equipment
* Select nozzle with related temperature and air flow setting
* Shield adjacent parts from heat, also do not touch adjacent parts during heating
* Use NO-CLEAN flux for proper solder process
* Keep nozzle e.g. 5 mm above QFP leads according to instructions of the equipment
* Desoldering time in between 3-5 sec.
* Lift QFP
* Remove excessive solder instructions with solderwick or litze
* Clean after desoldering

3.3.9.5 Methods for soldering QFPs

- By hot air
- By conventional soldering iron

3.3.9.5.1 Soldering QFP's by hot air

This method requires a high degree of experience and process control. For soldering a paste is used containing solder particles. The handling of paste is critical as the final control of the total of soldering quality is difficult to be carried out.
Unless with proven available experience this method is advised to be avoided.

3.3.9.5.2 Soldering QFP's with a soldering iron

Method

* Select and use appropriate soldering tip
* Do not touch leads by fingers
* Check the proper positioning of all leads
* Position QFP on cleaned location
* Check references of the position
* Apply NO-CLEAN flux
* use the appropriate thickness of soldering wire 0,3 - 0,5 mm
* Solder lead by lead by moving your solder + iron
* Monitor by magnifiying glass or microscope
* Remove excessive solder and short circuits

3.3.9.6 Equipment

Within PHILIPS the Netherlands the preferred supplier is PACE Inc. for various types of surface mount soldering equipment. This equipment can be applied also for all types of components.
Contact the PACE Inc. distributor in your country or else.Soldering material

3.3.9.7 Soldering material

The thickness of the wire is important for the solder/flux core relation for fine pitch QFP's. The line techniques require wire thickness of max. 0,5 mm.
Do not use usual types with diameter 0,8 or 1 mm

3.3.9.8 Flux material

The usual flux (like 4822 390 50025) leaves residues after desoldering and soldering. The residues usually can be aggressive and have negative influence on the sodering quality.
The NO-CLEAN flux types are less aggressive and do not require cleaning afterwards.
Contact the PACE Inc. distributor in your country or else.

3.3.9.9 Cleaning material

Use clean alcohol (or ethanol) with a little brush or special cleaning-kits.

3.3.9.10 Manual repair procedure for fine pitch.

This procedure is a guide to manually repair fine-pitch components with a pitch down to 0.4 mm. The equipment used is:

- MBT 250 from PACE, including:
  - TP-65 Thermopik thermode hand piece
  - SX-70 Desoldering hand piece
  - TT-65 Thermo Tweeze hand piece
  - TJ-70 Mini thermo jet hot air hand piece
  - IR-70 Soldering iron with "mini wave" tip
- Microscope magnification 2-20x
- Flux paste type 5-412-A
- Solder wire with 2% Ag
- Micro Care Pro-Clean

Since installation of a new component is the most difficult part of a fine-pitch repair job, this subject will get the most attention.

3.3.9.10.1 Board preparation

If the board is old and grimy, the component should be cleaned before removal, to make a proper contact to all the leads possible.

3.3.9.10.2 Removal

To remove a fine-pitch component, a component specific thermode is used. To improve the heat transfer from the thermode to the leads, all the leads are bridged together with a large amount of solder (use solder wire of 1.5mm diameter). The desoldering iron has a larger thermal mass so it is easier to use this tool to apply a string of solder, instead of the solder iron. By applying the solder to the leads instead of to the thermode, a larger amount of solder can be applied, and one can see if all the leads are covered with solder.

The temperature setting of the thermode hand piece is ± 340 °C. For large components the temperature of the thermode should be ± 350 °C; for smaller components a temperature of 330 °C is sufficient. Always clean the thermode just before use with a wet sponge. To remove the component, the thermode is placed over the component and pressed gently into the solder. By gently moving / rotating the thermode one can feel when the component is loose and vacuum of the thermo-pick hand piece can be turned on, and the component can be lifted. This should not take longer than 2-3 seconds.

Another method of removal is the use of the hot-air desoldering station from JBC. It uses shields around the component to prevent thermal influences to adjacent components. These shields have a small, spring loaded nozzle, to lift the component when all the joints are molten. A simple hot air gun is used as a heat source.

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3.3.9.10.3 Site preparation

After removal, there is a lot of solder left on the board. Before a new component can be installed, this has to be removed. With a desoldering iron (sucks the solder from the board) the solder is then removed. Remember to always clean the tip with a wet sponge before use. During the operation there is contact between the desoldering iron and the copper pads, so this has to be done gently and with a tip temperature of ± 300 °C. Do not move the tip of the desoldering iron perpendicular to the pads but with a corrugated profile (see Fig 1).

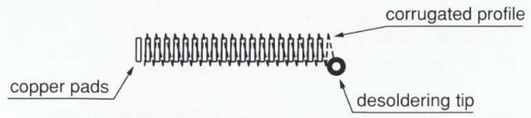


Fig 1 Removal of solder via a corrugated profile.

After the solder is removed, the pads are cleaned to remove flux residues and other irregularities.

3.3.9.10.4 Installing new component

Installation of fine-pitch components is the most difficult part of repair. The use of a microscope is needed to properly align the component to the pads. Handling of the component should be done very carefully to prevent bending of leads. Use a vacuum pipette to pick up the component from tray and place it on the board. Align the component to the pads, and hold one finger on it to keep it in place. Now flux two opposite corners, and fix it by soldering the two opposite corner leads. Use only a very small amount of solder on the solder iron to prevent bridging. When your finger, which holds the component in place, is a little bit sticky, put the solder iron on top of the body when lifting your finger. This prevents a force on the soldered leads when lifting your sticky finger away from the body.

Now the component is fixed in place, the rest of the leads can be soldered, using a tip temperature of 280 - 290 °C. Apply a string of flux paste from a syringe (see Fig 2) for good soldering results.

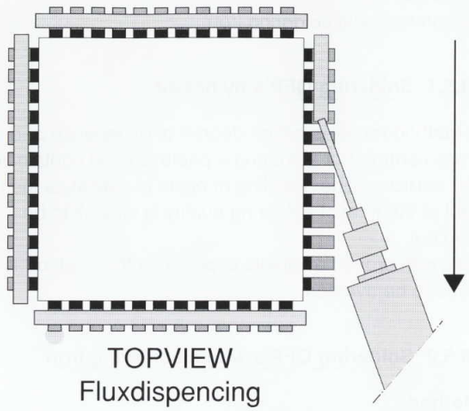


Fig 2 Applying flux to the component

First the component sides of which no leads are fixed have to be soldered. Use the same solder as with the reflow process, in this case solder with 2% Ag. Apply only a small amount of solder to the cleaned "mini- wave" tip, to prevent bridging. Place the tip onto the first lead of the row (see Fig 3) and gently move the tip over the leads.

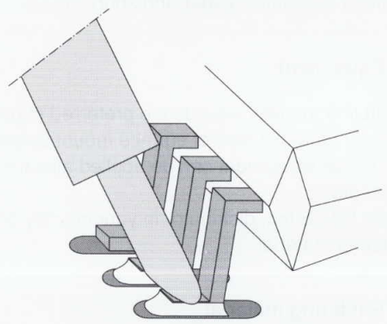


Fig 3 Start of soldering action

Make sure that the tip is flat on the leads (see Fig 4) during movement.

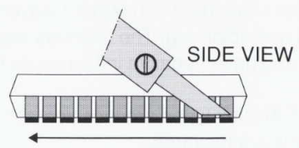


Fig 4 Movement of the soldering iron

The speed of movement is dependent on the melting speed of the solder and wetting of the leads. Typically an average speed of ± 1 mm/s is required. When the end of the row of leads is reached the tip has to be moved away from the body (see Fig 5).

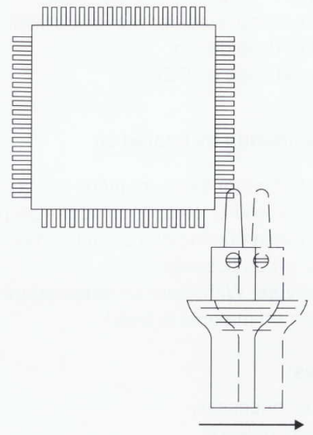


Fig 5 Movement of tip at end of row .

After the first side is finis hed, go to the opposite row of which no leads are fixed, and then finish the last two sides. If a bridge is formed between two leads, it can be removed quite easily. First apply fresh flux to the bridge. Then clean the tip and make sure it is free from solder. Place the tip on top of the bridge and, like at the end of a row, move the tip perpendicular to the body. By this method the excess of solder is pulled away on the tip.

3.3.9.10.5 Inspection

Most of the inspection is done during soldering, but lean joints can only be found when looking at an angle and not from the top. If a lean joint is found apply new flux, and try to put solder only to the lean joint.

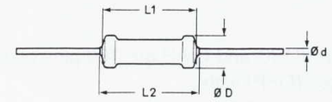
3.3.9.10.6 Completion

Because an excess of flux is used, it is preferred to clean the board. Also for cosmetic reasons.

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	D_{max}	$L_{1\,max}$	$L_{2\,max}$	d
VR25	2,5	6,5	7,5	0,6

ype	D_{max}	$L_{1\,max}$	$L_{2\,max}$	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...

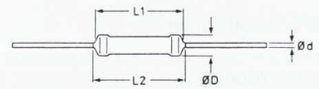
The codenumber above is completed by inserting the first two figures (resistance code) followed by the multiplier.

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

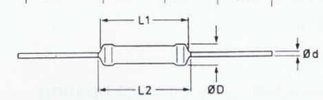
Example's:
The serv.nbr. for a VR25 resistor of 100 KΩ is 4822 053 20104
The serv.nbr. for a VR37 resistor of 33 MΩ is 4822 053 21336

PR01, PR02 and PR03 power metal film resistors

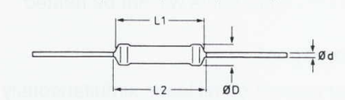
ϕD_{max}	L1	$L2_{max}$	ϕd
2.5	6.5	8.0	0.6



ϕD_{max}	$L1_{max}$	$L2_{max}$	ϕd
3.9	10	11	0.8



ϕD_{max}	$L1_{max}$	$L2_{max}$	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...

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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.

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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 Processo de Reparação Brasil

- Reutilizar a embalagem original para retornar o Palnel Principal para a Philips
- Painéis danificados ou quebrados devido más condicões de embalagem não serão aceitos para crédito.
- Todos os retomos estarão sujeitos à inspeção de mau uso ou uso indevido. A Philips se reserva ao direito de não conceder o crédito nosses casos.
- Se o circuito defeituoso não retornar à Philips dentro de 8 dias após a reparação, será emitido fatura correspondente à peça.

Retornar o painel defeituoso para:

PHILIPS DA AMAZÔNIA IND. ELETR. LTDA
AV. ERMANO MARCHETTI, 642
SÃO PAULO - SP - 05038-000
CGC: 04.182.861/0005-12
IE: 113.830.921.116

Em caso de dúvida, contatar o Help-Desk (PSC-Técnico).

3.6.9 Other countries

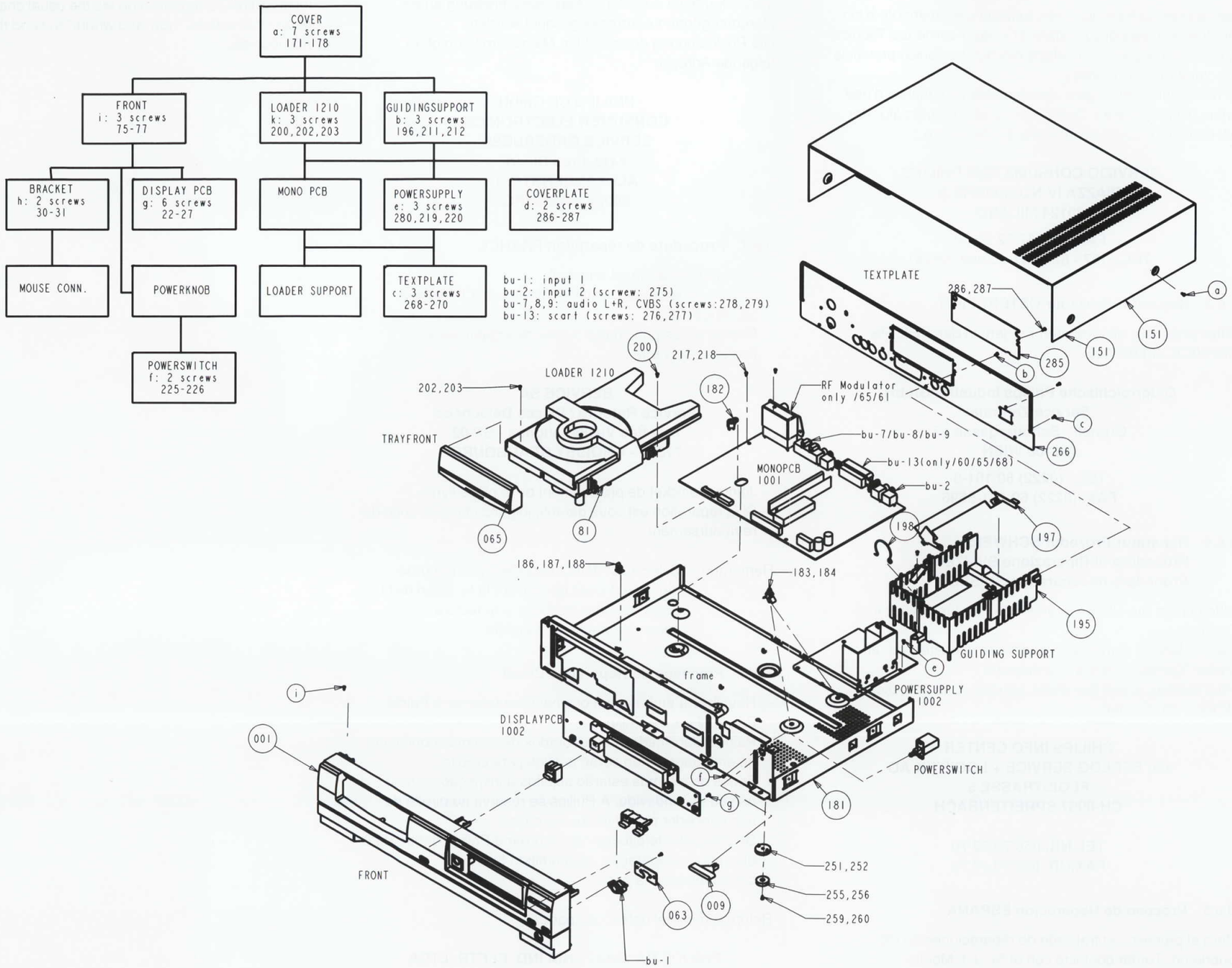
For the **not** above mentioned countries please contact your local SERVICE organization via the usual channels to obtain instructions "how and where" to send the mainboards.

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4 MECHANICAL DRAWINGS

4.1 Exploded view of the cabinet

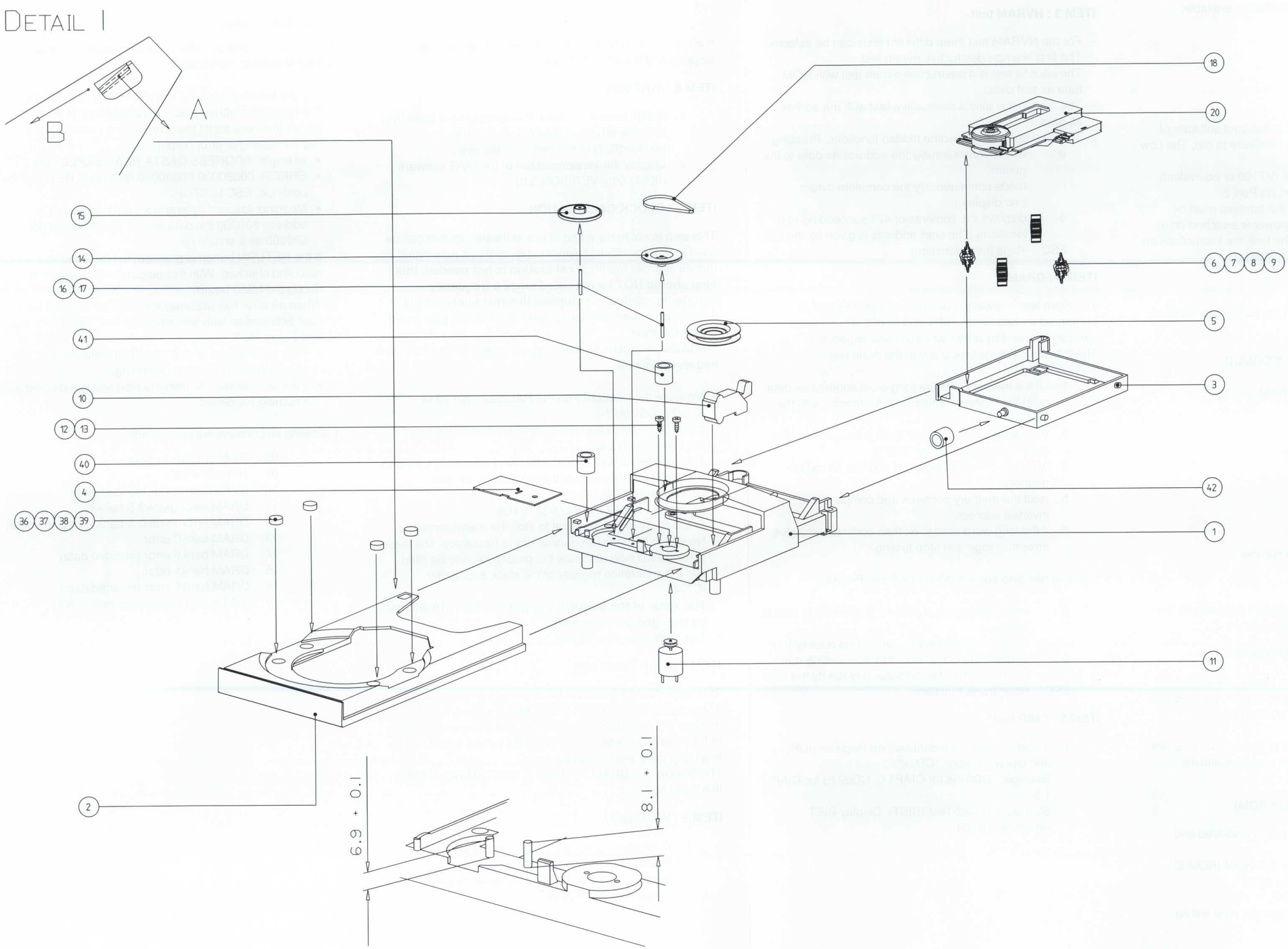


PCS 86 031

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4.2 Exploded view of the loader



PCS 79 528

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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 (8K)
4	DRAM test
5	CIAP test
6	IKAT-CD7 test
7	Clock Calibration
8	Chip Select test
9	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 : 07C1

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 : CLOCK CALIBRATION

This step is not really a test. It is a software tool that can be used to trim the clock&calendar chip so that it runs within 1 minute acc. per month. **If calibration is not needed, this step should NOT be executed since a frequency counter is needed to complete this test successfully.** If this test is entered accidently, just switch off the power and restart the lltest.
The clock calibration should be performed with an external frequency counter.

- Measure the frequency on the PAL20L8 : pin 23 of IC7272, CSCIAPN!
- Start the test with the gate time of the frequency counter set to minimum 5 sec.
- The counter display should now show a frequency near to 512 Hz. If not, then check if everything is set and connected properly.
  (range : 511,96724 to 512,03276 Hz)
- Press a key on the terminal to stop the measurement.
- Now fill in the measured value of the frequency. The lltest software will now calculate the proper value to be filled into the calibration register of the clock & calendar IC7241.
  The value of the frequency at pin 25 of IC7310 will not be changed or influenced.
- The calibration is done now.

ITEM 8 : 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 9 : 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).

5.1.2 Error Codes

When during a test an error occurs the user should be aware of followig conventions:

- For the terminal low level test the error is displayed on the outermost lefthand side of the terminal. In some cases (memory tests) the error code is replaced by a more meaningful error output.
  - example: ADDRESS DASTA READ EXPECTED
  - ERROR: 00080000 F0080000 00080000 RETURN to continue, ESC to STOP.
  - Meaning: (assuming long word data is used); On address $80000 the data was $F0080000 and not $80000 as it should be.
- If the RETURN button is pressed, the next address will be read and checked. With this output it will be easier to debug the MMC board.
- When an error has occurred the program will wait for a user intervention with following question: RESTART the test Tes or No ?
  - If the answer was 'Y' then the lltest software is executed again from the beginning.
  - If the answer was 'N' then the next test is executed as if nothing happened.

Following error codes are generated:

05	ROM checksum error
09	NVRAM error
10	NVRAM error (for inverted data)
11	DRAM error (bank0 & bank1)
12	DRAM error (bank0 & bank1, inverted data)
13	DRAM bank0 error
14	DRAM bank0 error (inverted data)
15	DRAM bank1 error
16	DRAM bank1 error (inverted data)
20	IKAT error (wrong echo from slave)

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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**
or Remote Control	

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.

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.

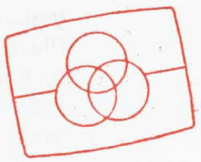
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MODE 2
The turntablemotor is rotating and controlled by the rough HF. The message MOTOR OK will appear. If an error occurs, the message MOTOR ERROR APEARS and the test will return to mode 0.
Selecting NEXT STEP in mode 2 will bring the player in mode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



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

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6 DIAGNOSTICS AND SHORT DESCRIPTIONS

6.1 SHORT DESCRIPTION OF THE KEYCOMPNENTS

6.1.1 CPU SCC68070

- Microcontroller (UART, I/O-bus, I^2C-bus, 2 DMA-channels, memory management unit)
- 16 datalines (DATA0 .. DATA15) and 24 addresslines (LADD0 .. LADD23)
- 16 MByte addressrange:
  - 5 MByte on the mainboard
  - The rest on extension boards
- Clockfrequency : 30 MHz for PAL
  30.2 MHz for NTSC
  This **systemclock** (**SYSCLK**) is also a clock for the 'video chip' (VDSC)
- The UART works on 4.9 MHz and provides in the communication between processor and terminal. This UART is used for access of the Low Level test.

6.1.2 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 CDI470 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).

6.1.3 SYSTEMROM 27C400

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

6.1.4 IKAT MC68HC05I8

- Integration of servo- and slave processor
  - Generates chip select for CD7
  - Control of the pointing device port and the player control keys.
- Works on 4 MHz.
- CMOS technology, 64 pin QFP

6.1.5 CIAP 1.5-
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 CD7 for both main channel and subchannel 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; this clock is also fed to the CD7 decoder

6.1.6 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).

6.1.7 CALVIN or HOBBES

- 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

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6.1.8 GAL's

- Glue logic
- GAL20V8-10. Generates chip selects for IKAT, VDSC, NVRAM and CIAP.
- GAL16V8-10. Generates DTACKN for the NVRAM and the SYSTEMROM

6.1.9 CD7 Digital Servo IC + CD-decoder

- 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
- Special functions to improve the playability, to perform reliable access and to realize a high degree of shock insensitivity.
- I^2C communication
- 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)
- Works on 33 Mhz

6.2 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).

6.2.1 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.

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6.2.2 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 and CD7.
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)

6.2.3 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

6.3 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 6.4.7 LAYOUT OF THE MEASURING PADS

Initial faultexamining :
If the CDI player is not functioning at all (i.e. if even the LLtest will not startup), then proceed as follow :

1 Check the power supply voltages, see chapter 5.1.1
2 Check all clocks, see chapter 5.1.2
3 Check RESETCD, RESETN, HALTN and DTACKN
   1. For RESETCD AND RESETN see chapter 5.2.1.
      If RESETCD is not present, check IC7207.
      If RESETN is not present on pin2 of IC 7125 and if RESETCD is present, then the VDSC IC must be checked.
   2 HALTN
      HALTN must become high 60 µs after RESETN has gone high.
   3. DTACKN
      Check if the DTACKN line shows activity
4 Check address- and databus for short circuits.
5 Check if an IC becomes extremely hot.

6.3.1 A general check of the main panel

6.3.1.1 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 or HOBBES	16, 22, 51, 57, 61, 65, 66	+5V ± 10%
7331	CIAP	6, 20, 27, 35, 45, 58, 66, 76	+5V ± 10%
7334	TDA1305ST	1, 10, 14, 28,	+5V ± 5%
7402	CD7	2, 19, 30, 47,59	+5V ± 5%

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6.3.1.2 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 minimize 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

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 7300 on pin 11 the CIAP-clock must be present:

33.8688 MHz ± 50 ppm

At IC 7402 on pin 21 the AUDIO_CLK-clock must be present:

16.9344 MHz ± 50 ppm

6.3.1.3 Test of the I^2S Interface

SDATA IC 7402, pin 45 : block wave signal
SWCLK IC 7402, pin 46 : 44.1 kHz (CDDA)
SCLK IC 7402, pin 48 : 2.8224 MHz (CDDA)

6.3.1.4 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

6.3.1.5 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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7 ELECTRICAL DRAWINGS

7.1 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 470/00, 470/05]
- Y/C video out [Only for 470/11, 470/17]

Chip Select and DTACKN generating glue logic
- GAL 20V8-10
- GAL 16V8-10

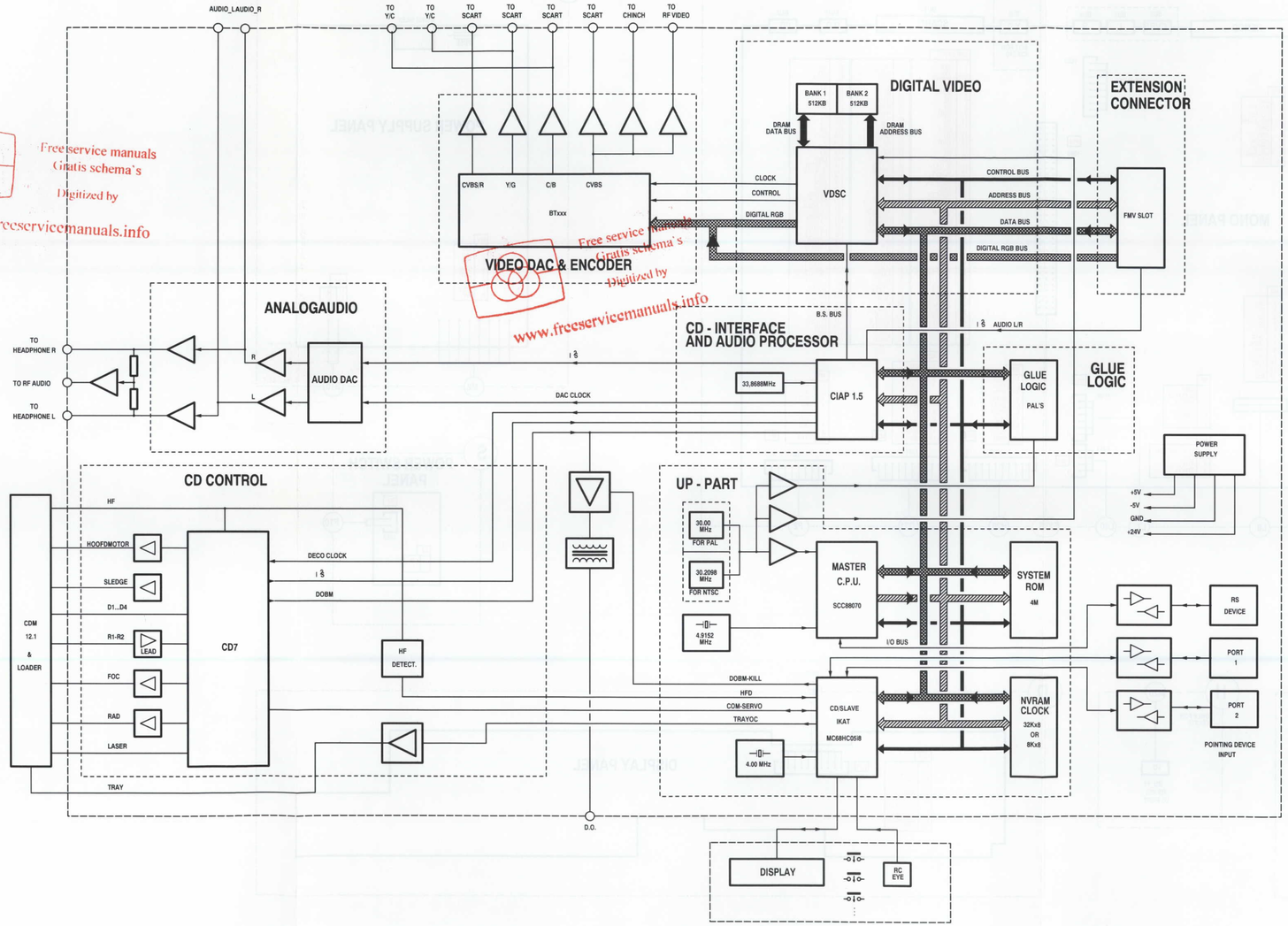
CD Control part
- CDM 12.1
- CD7 (Digital Servo IC for Controlling 2 stage 3 beam servo mechanisms + CD decoder)
- Additional discrete HFD and defect detector circuits

Audio part
- DAC TDA 1305ST
- Audio outputs L/R

Power Supply [+5V / -5V]

Interfaces
- CDM 12 interface (flex connector, pos. nr. 1008)
- Power supply inlet (pos. nr. 1001)
- Pointing device input/output front (pos. nr. 1022)
- Pointing device input/output rear (pos. nr. 1033)
- Extension connector (pos. nr. 1096)
- Audio headphone output L/R (pos. nr. 1030)
- Audio outputs L/R (pos. nr. 1015)
- Video CVBS output (pos. nr. 1015)
- Video RGB output (pos. nr. 1013) [Only for /40, /45]
- Video Y/C output (pos. nr. 1006) [Only for /51]
- Video modulator output (pos. nr. 1007)

BLOCKDIAGRAM

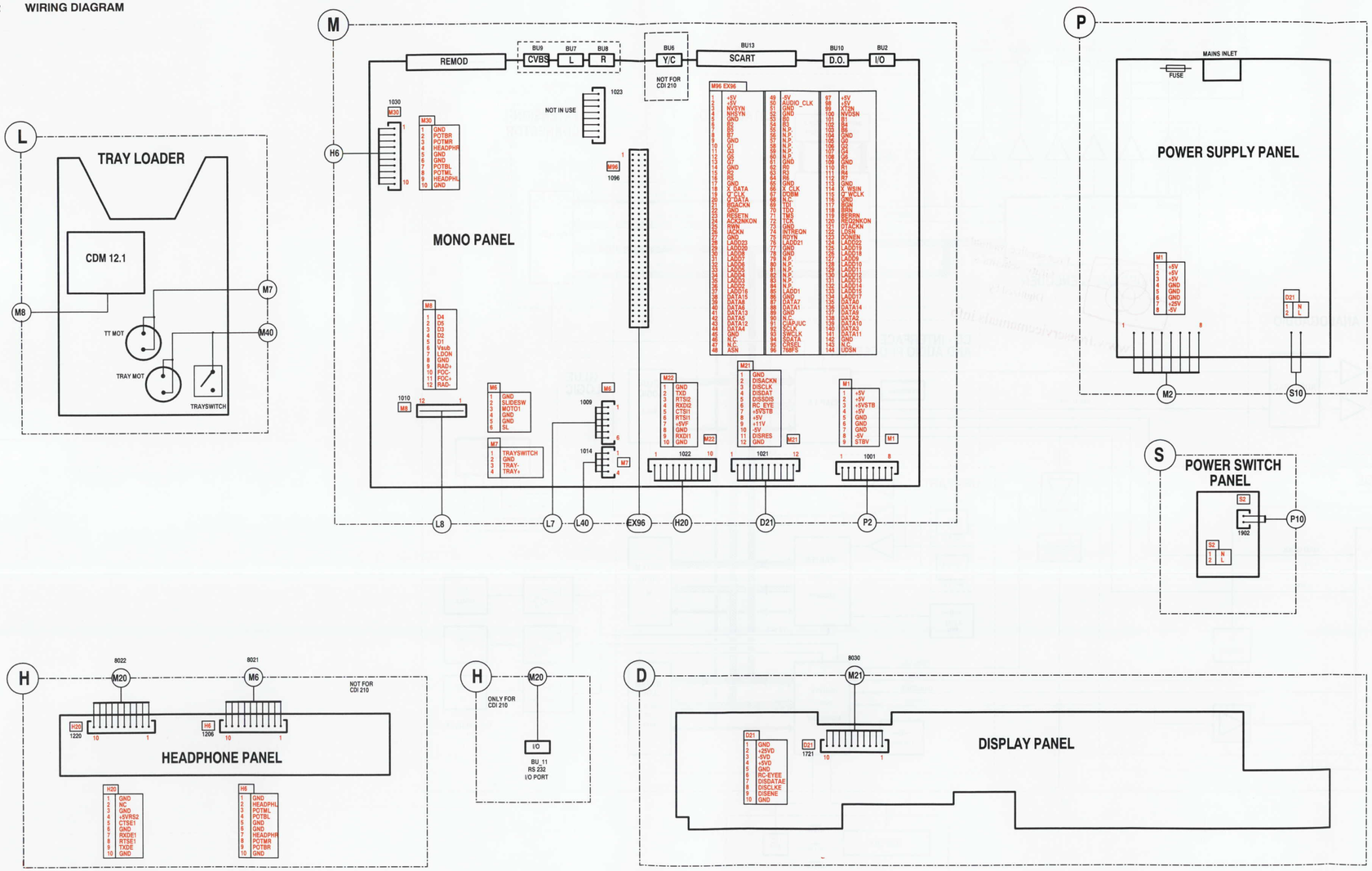


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7.2 WIRING DIAGRAM



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7.3 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, -	:	>>
ACKNDSA	:	DSA communication bus for OEM costumers
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
CD7CLK	:	CD7 clock
CD7_V2	:	V2 flag from CD7 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
COMIK12	:	communication between IKAT1 and IKAT2
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
CRSEL	:	CLOCK SELECT (intern or extern)
CS	:	CHIP SELECT
CSCDICN	:	CHIP SELECT CDIC (active low) bus information is intended for or coming from CDIC
CSCIAPN	:	CHIP SELECT CIAP NOT
CSIKAT1..2N	:	chip selekt for IKAT (active low)
CSIKAT1..2STB	:	STANDBY CHIP SELECT IKAT1..2 (after switch)
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
CTS1P	:	CLEAR TO SEND (to 68070 UP)
CRS#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
C_BSC	:	output C or B (c=y/c) (b=rgb)
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
DATA1_TRANS	:	RS bus for OEM costumers (TRANS=TX)
DATA2_REC	:	>> (REC=RX)
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
DISAKN	:	Display Acknouledge
DISCL	:	DISPLAY CLOCK
DISCLK	:	(DISCLKE) DISPLAY CLOCK >>
DISDAT	:	(DISDATAE) DISPLAY DATA >>
DISEN	:	(DISENE) DISPLAY ENABLE >>
DISRES	:	Display reset
DISSDIS	:	Display disable
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

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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)
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
HOBBES1..2 : HOBBES1 or HOBBES2 select
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 : >>
IO1..IO4 : INPUT or OUTPUT (for OEM costumers)
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 reads 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
RESETSTB : RESET in STANDBY mode
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

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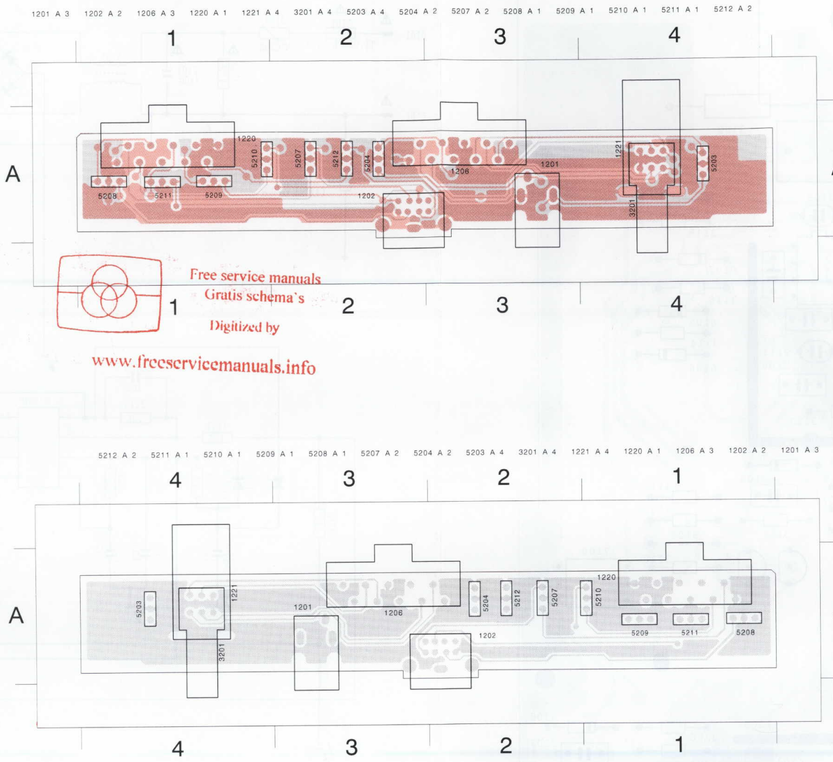
RFE	:	high-frequent signal coming from CDM (disc)
RFMV	:	red color coming from the FMV-extension
RGBS_GND	:	incoming video SCART (not used) ground
RGND	:	red color ground (SCART)
RIN	:	red color input for the CXA1145 encoder
RSC	:	red color (scart)
RSTOUT	:	RESET OUT of the slave processor when high resetsequence starts
RST2IK1	:	REQUEST TO SEND pointing dev.2 (connect on IKAT1)
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)
RTS1IK1RTS1IK2	:	>>
RTS1P	:	>>
RST#1..2	:	>>
RWN	:	READ - WRITE (low is write) signal
RWN2	:	READ - WRITE (low is write) signal from DIC to the DSP
RWRAM	:	READ - WRITE signal from the CDIC to the S RAM'S
RXDE1..2	:	RECEIVE DATA
RXDI1..2	:	RECEIVE DATA
R0..7	:	digital video (red) from VDSC > DRAM
RXD1..4	:	>>RECEIVE DATA RXD is data input
RX1IK1TX2IK2	:	>>RECEIVE SIGNAL
RX1K2	:	>>
RX1P	:	>>
RX2IK1	:	>>
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
SELPAR	:	CD7 in 16MHz or 33MHz mode
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
STBS	:	Standby signal
STBY	:	Standby signal to power supply
STD	:	serial data from DSP --> LEMM
STROBEDSA	:	DSA connection bus for OEM costumers
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
TXCO	:	>>Transmit signal
TX1P	:	>>
TX2	:	transmit data from IKAT
TX2IK1	:	
TXDE1..2	:	transmit data
TXDI1..2	:	transmit data
TXD1..4	:	>>TRANSMIT DATA TXD is data output
TXD#1..2	:	>>
TXLC	:	Transmit signal
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

7.4 HEADPHONE & POWER SUPPLY

7.4.1 Headphone panel

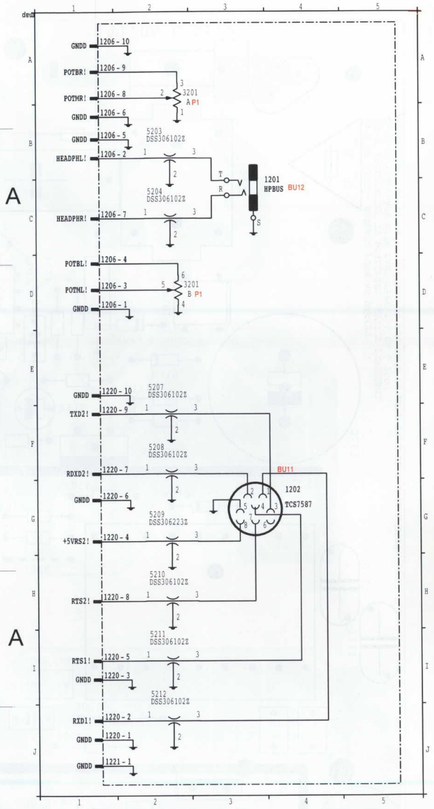


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XIN	:	>>11,2896/9,6768/4,8384 symmetrical clock
XIN2	:	>>
X-TAL2	:	the same as the system clock,coming out of the VSC'S
XT2	:	(XT2N) the system clock devided by two
XT4	:	>>the system clock devided by four
XT41N	:	>>
XY	:	this DSP output signal selects 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

7.4.2 Headphone / Port 1 circuit



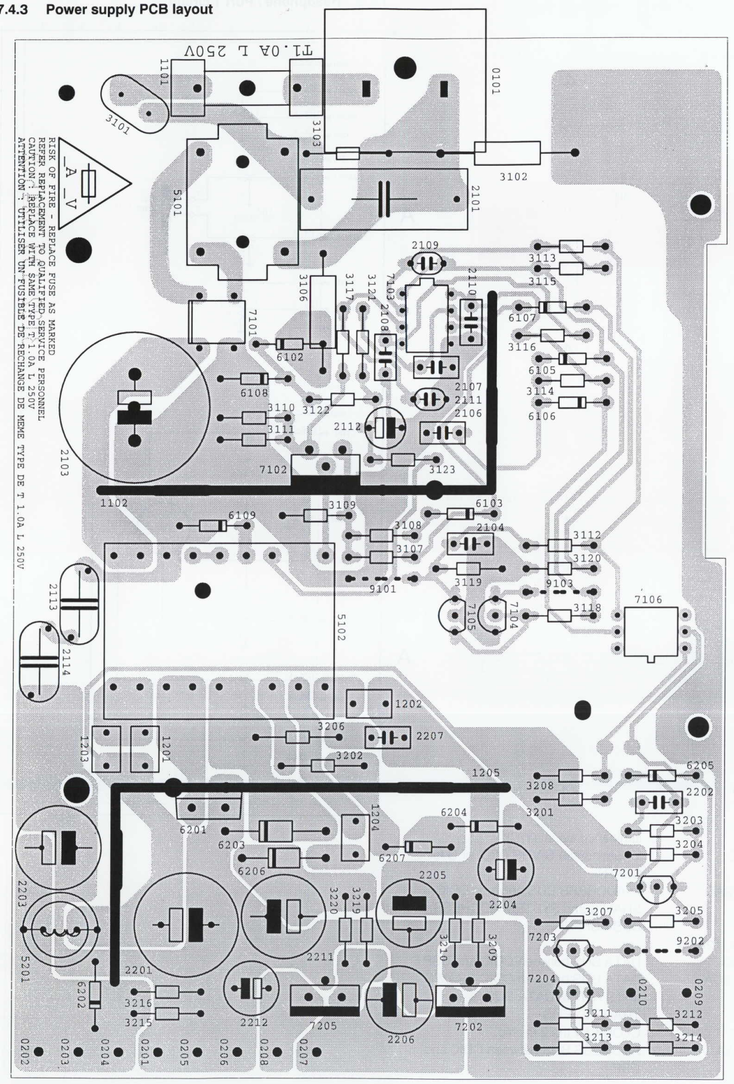
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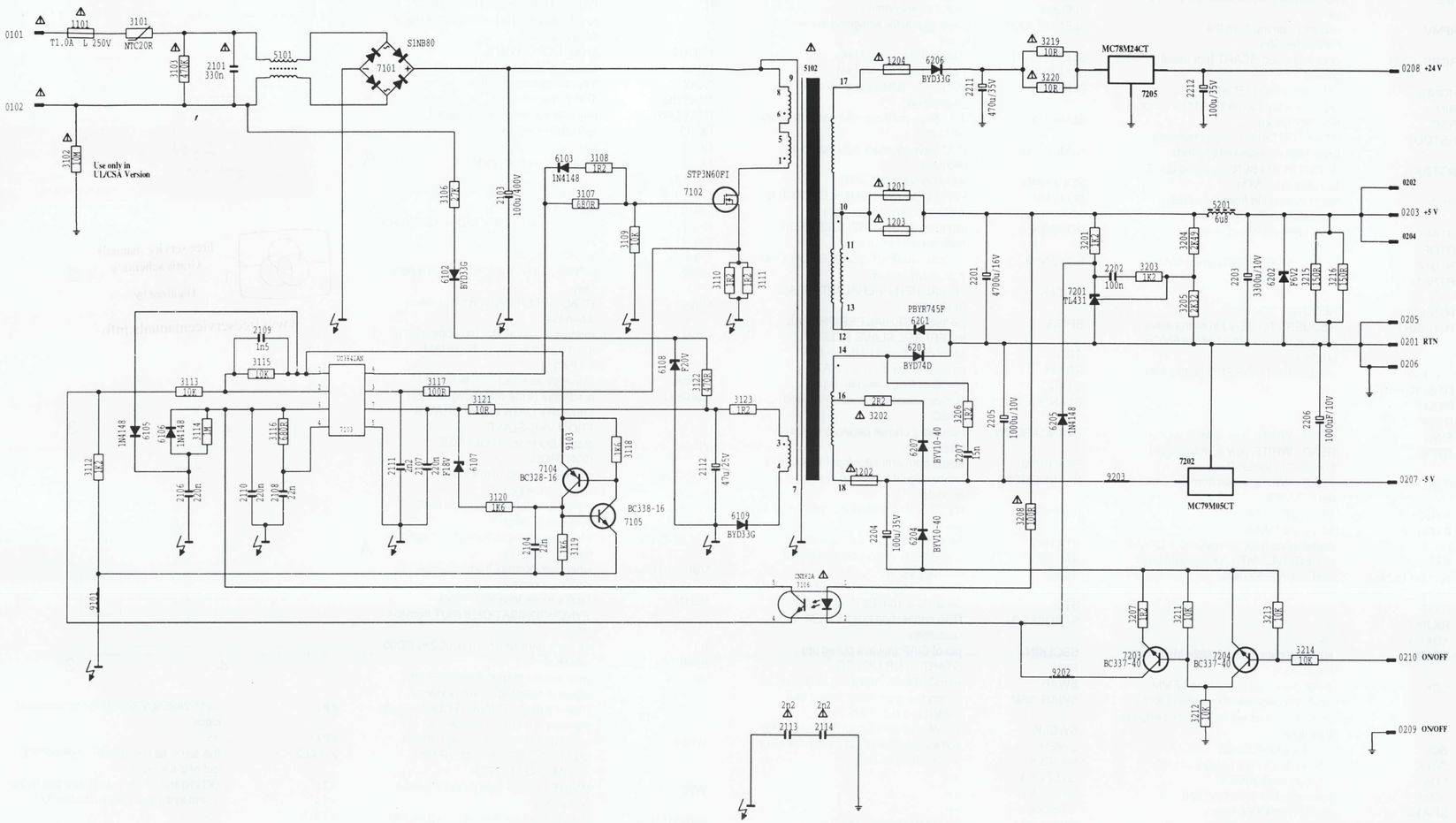
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7.4.3 Power supply PCB layout



7.4.4 Power supply circuit diagram



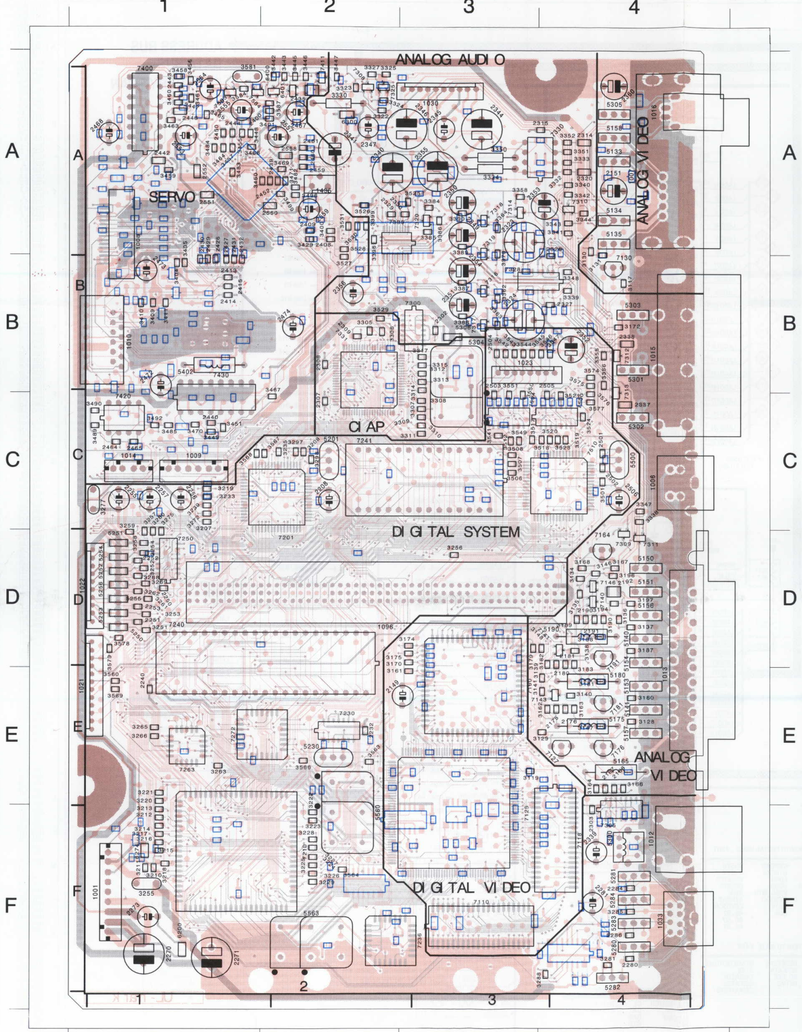
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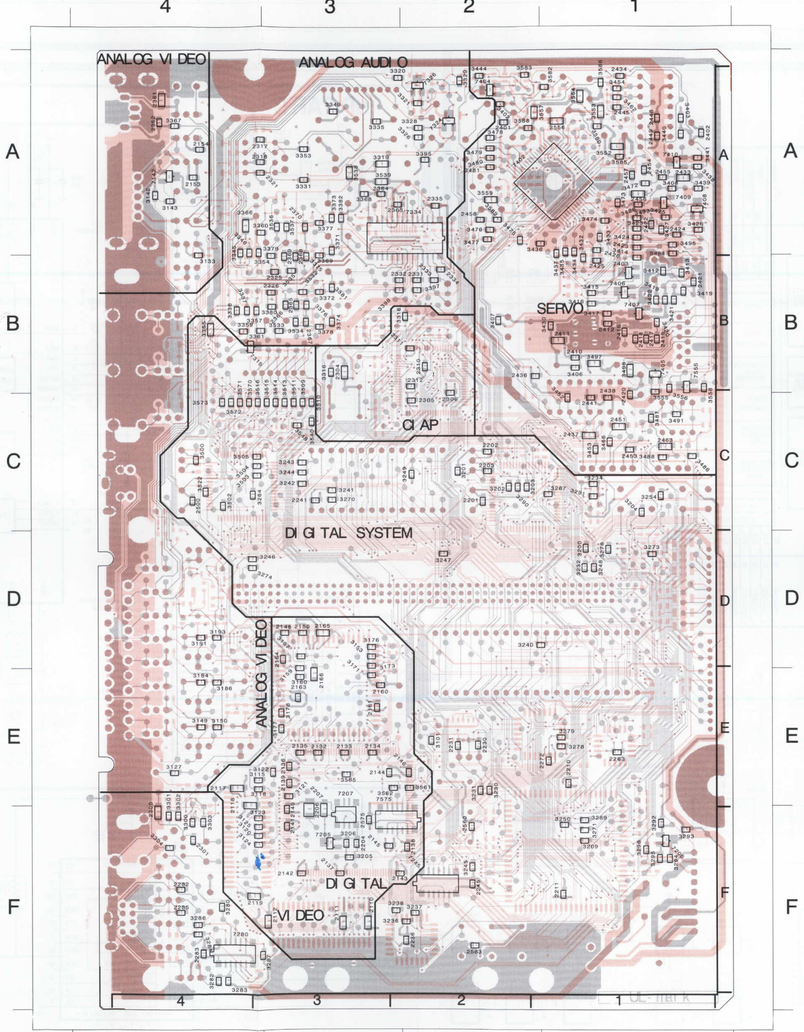
7.5 MAINPANEL

7.5.1 Mainpanel PCB layout, Tracks side



1001 F 1 2474 B 2 3310 C 3 3547 B 4 7420 C 1
1006 C 4 2501 C 4 3311 C 3 3549 C 3 7430 C 1
1007 A 4 2502 C 4 3312 B 3 3550 C 3 7500 C 4
1008 A 1 2503 C 3 3313 B 3 3551 C 3 7504 C 3
1009 C 1 2504 B 3 3314 B 3 3560 E 1 7510 C 4
1010 B 1 2505 C 4 3315 B 3 3563 E 2 7583 A 1
1012 F 4 2506 C 4 3317 B 3 3564 F 2 7584 A 1
1013 D 4 2550 A 2 3322 A 2 3566 E 2
1014 C 1 2551 A 1 3323 A 2 3567 C 2
1015 B 4 2552 A 1 3324 A 2 3568 C 1
1016 A 4 2553 A 1 3325 A 2 3569 E 1
1021 E 1 2554 A 1 3327 A 2 3574 B 4
1022 D 1 2555 A 1 3330 A 2 3575 B 4
1023 B 3 2557 A 1 3332 A 4 3576 C 4
1030 A 3 2558 A 2 3333 A 4 3577 C 4
1033 F 4 2559 A 2 3334 A 3 3578 D 1
1096 D 2 3117 B 4 3338 C 4 3579 D 1
1435 A 2 3119 E 3 3339 B 4 3581 A 1
2149 E 3 3128 E 4 3340 A 4 3584 A 1
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2167 E 4 3130 A 4 3342 A 4 5133 A 4
2168 E 4 3131 B 4 3343 A 4 5134 A 4
2175 E 4 3134 D 4 3344 A 4 5135 A 4
2176 E 4 3135 D 4 3347 C 4 5140 D 4
2180 D 4 3136 D 4 3348 B 4 5141 E 4
2181 D 4 3137 D 4 3350 A 3 5150 D 4
2190 D 4 3138 D 4 3351 A 4 5151 D 4
2191 D 4 3139 E 4 3352 A 4 5153 E 4
2192 D 4 3140 E 4 3355 B 4 5154 D 4
2208 C 2 3141 E 4 3356 B 4 5156 D 4
2232 E 2 3146 D 4 3358 A 3 5157 E 4
2240 E 1 3147 E 4 3362 B 3 5158 A 4
2241 D 1 3148 D 4 3363 B 3 5165 E 4
2251 D 1 3161 E 3 3364 A 3 5175 E 4
2252 D 1 3162 E 4 3370 A 3 5180 E 4
2253 D 1 3163 E 4 3384 A 3 5190 D 4
2254 D 1 3164 E 4 3385 A 3 5201 C 2
2255 C 1 3166 E 4 3386 A 3 5230 E 2
2256 C 1 3167 D 4 3387 B 3 5250 D 1
2257 C 1 3168 D 4 3388 B 3 5251 D 1
2270 F 1 3170 D 3 3389 A 3 5252 D 1
2271 F 1 3172 B 4 3390 A 3 5253 D 1
2273 F 1 3174 D 3 3396 A 2 5254 D 1
2280 F 4 3175 D 3 3399 A 2 5255 D 1
2281 F 4 3179 D 3 3400 A 2 5256 D 1
2284 F 4 3180 E 4 3401 A 2 5280 F 4
2286 F 4 3181 E 4 3404 B 1 5281 F 4
2302 B 2 3182 D 4 3405 B 1 5282 F 4
2303 F 4 3183 D 4 3409 B 1 5283 F 4
2307 C 2 3187 D 4 3410 B 1 5284 F 4
2308 B 2 3188 D 4 3411 B 1 5300 F 4
2309 B 2 3189 D 4 3429 A 2 5301 B 4
2314 A 4 3190 D 4 3442 A 2 5302 C 4
2315 A 4 3194 D 4 3443 A 2 5303 B 4
2320 A 4 3196 D 4 3445 A 2 5304 B 3
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2324 B 3 3207 C 1 3447 A 2 5306 B 3
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7.5.2 Mainpanel PCB layout, Component side



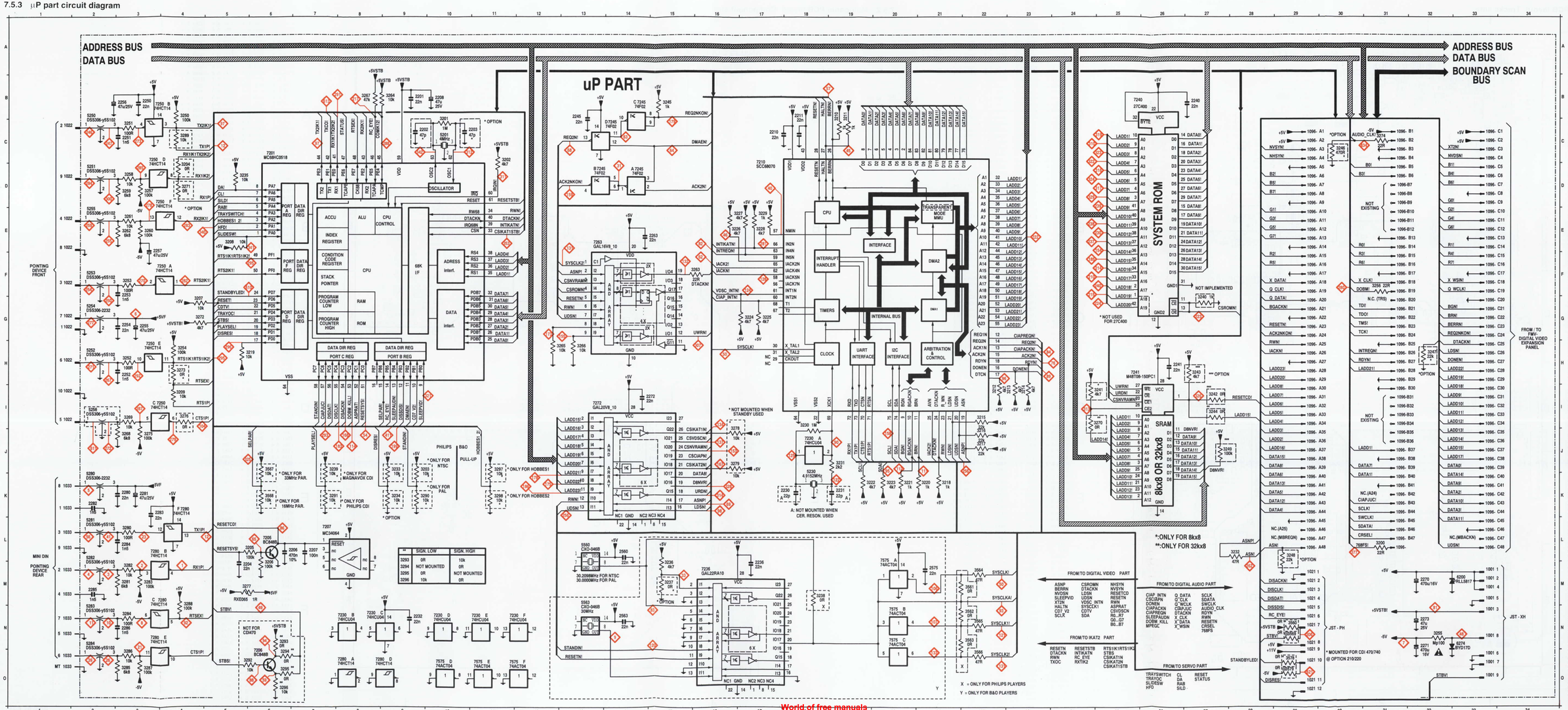
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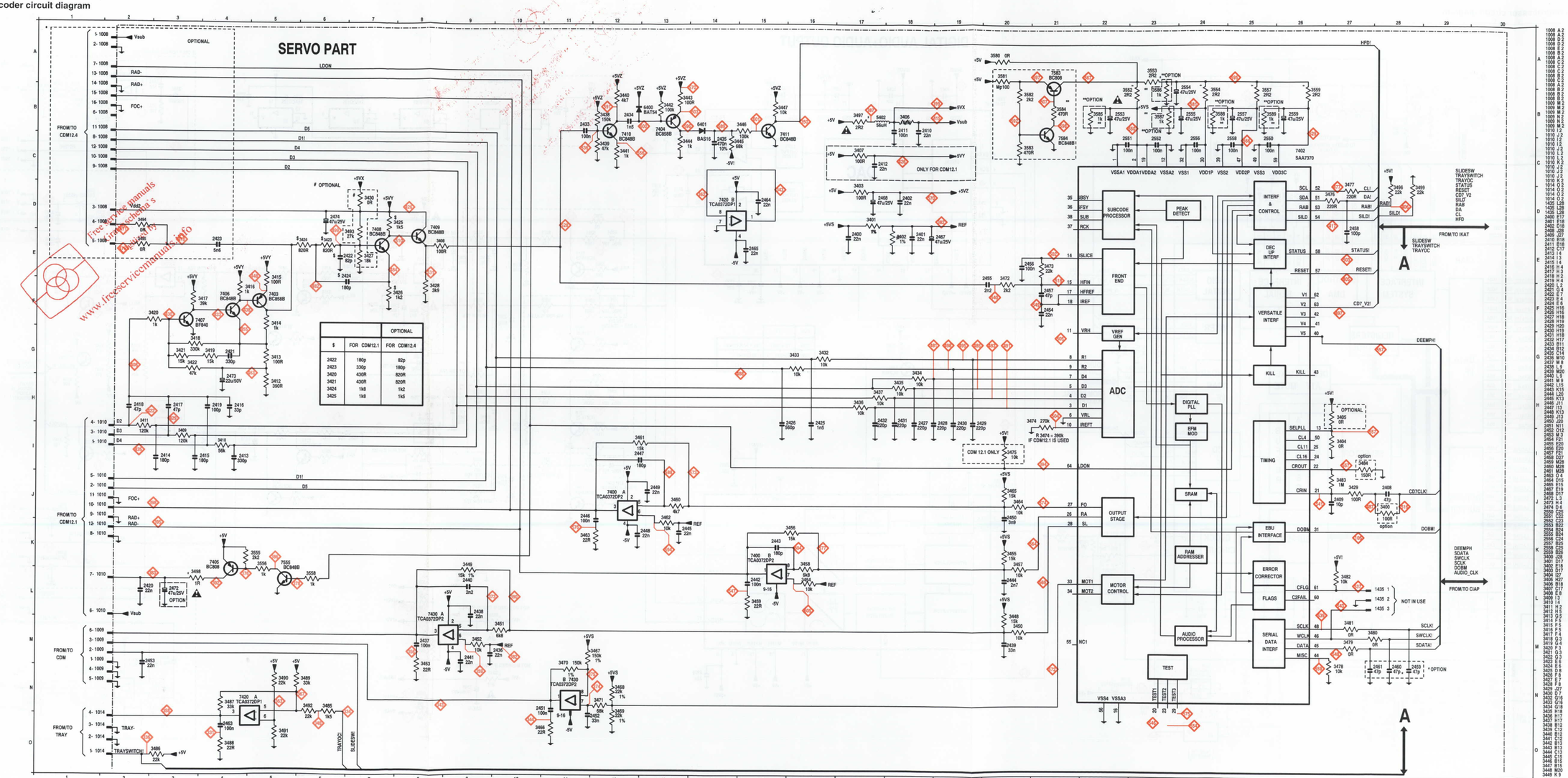
7.5.3 µP part circuit diagram



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7.5.4 Servo & CD Decoder circuit diagram

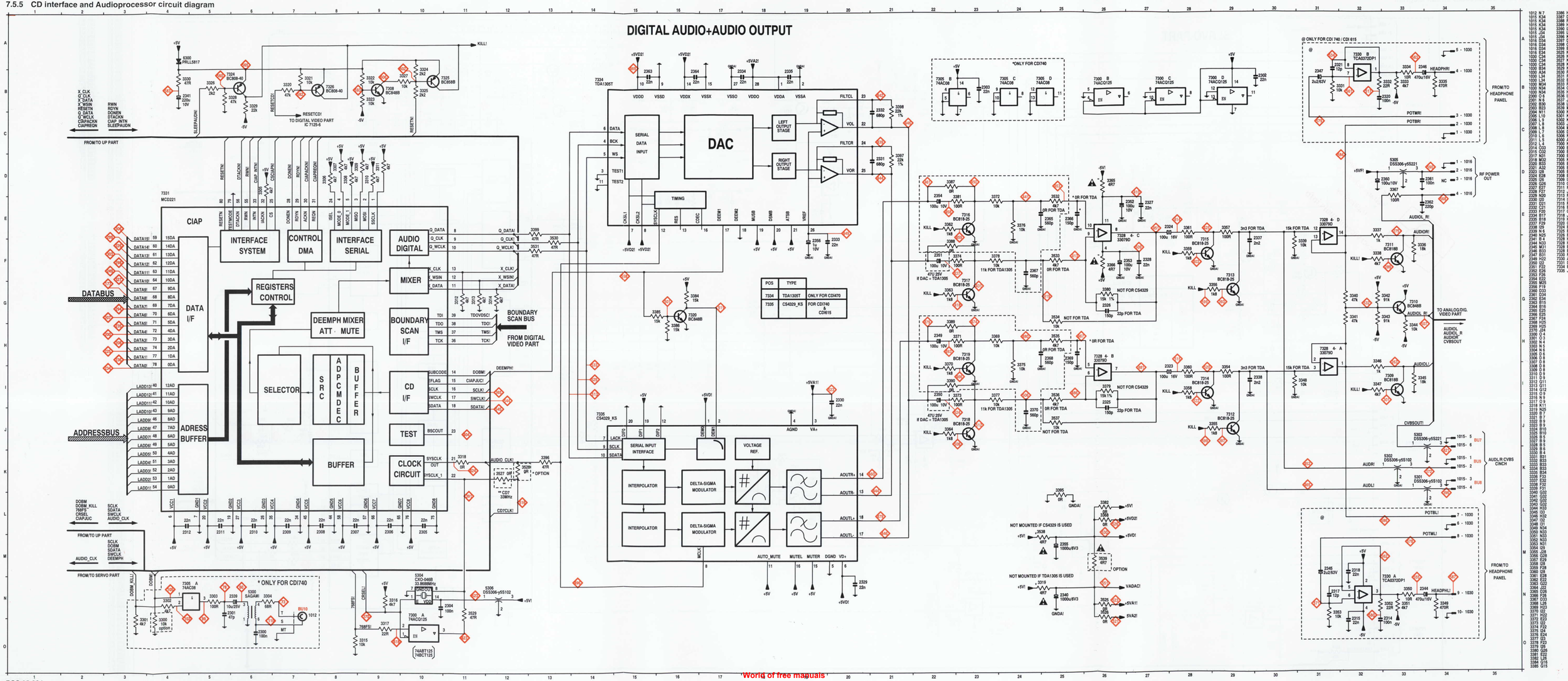


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7.5.5 CD interface and Audioprocessor circuit diagram

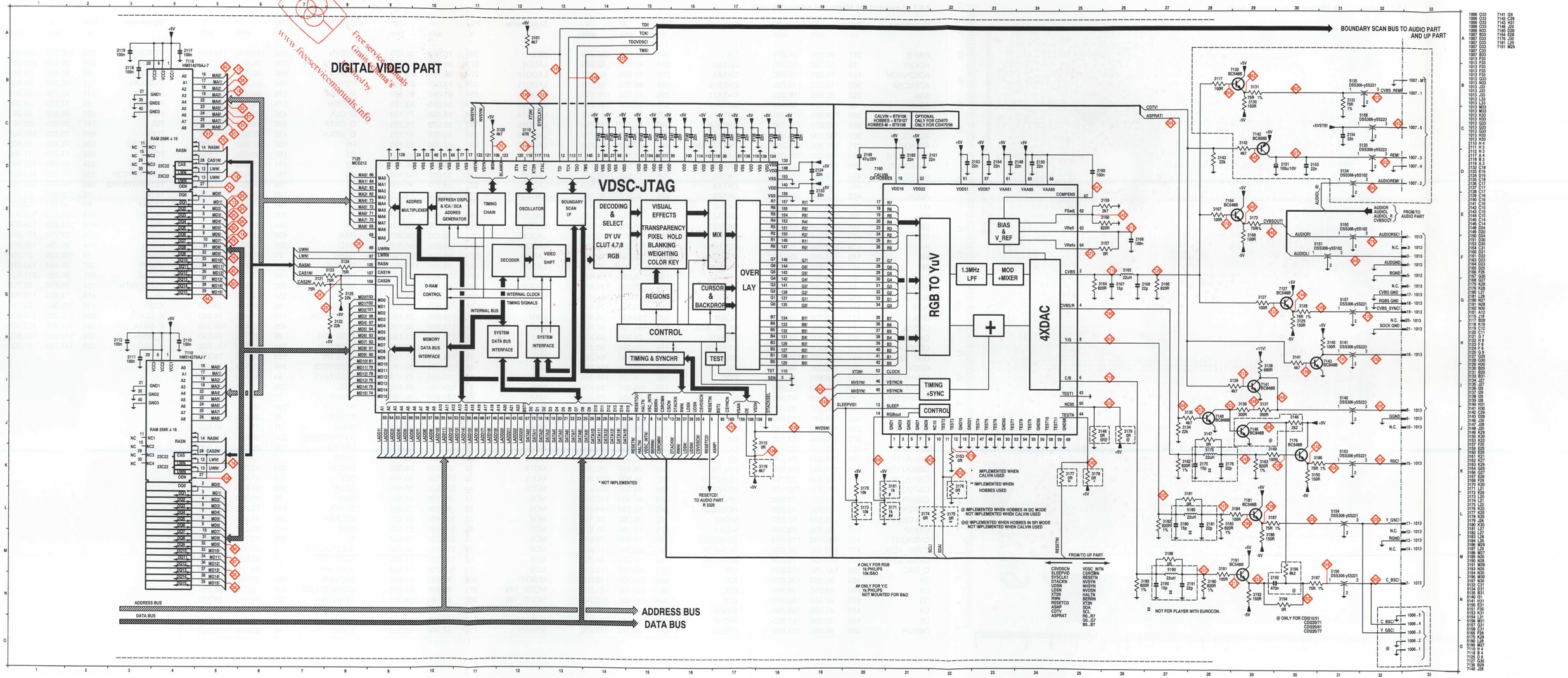


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7.5.6 Digital Video and Video Encoder circuit diagram



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7.5.7 Layout of the Mainpanel measuring pads



7.5.7 Layout of the Mainpanel measuring pads

Signalname	Pad nr.	X-axis	Y-axis	Signalname	Pad nr.	X-axis	Y-axis	Signalname	Pad nr.	X-axis	Y-axis	Signalname	Pad nr.	X-axis	Y-axis	Signalname	Pad nr.	X-axis	Y-axis
768FS	377	92.250	154.650	DA	388	61.200	162.450	KILL	599	70.950	232.650	NVSYN	265	120.450	110.100	STROBEDSA	335	125.550	142.650
ACK2N	76	32.100	42.000	DATA0	234	42.450	92.850	LADD1	319	84.300	137.250	PLAYSEL	290	35.850	127.200	SWCLK	544	70.500	216.300
ACK2NKON	159	74.250	72.000	DATA1	236	35.550	93.150	LADD10	222	66.150	90.150	POTBL	586	92.850	229.800	SYSCLK	50	61.650	34.650
ACKNDSA	360	118.500	149.700	DATA10	249	30.750	98.550	LADD11	238	63.600	93.150	POTBR	584	84.450	229.800	SYSCLK1	121	100.500	59.850
ASN	262	22.650	106.050	DATA11	298	73.050	129.600	LADD12	230	61.050	91.350	POTML	578	96.900	226.650	SYSCLK2	131	55.200	63.900
ASNP	69	116.400	39.900	DATA12	303	75.600	131.250	LADD13	237	58.500	93.150	POTMR	579	78.000	226.950	SYSCLKA	93	77.100	49.350
ASPRAT	269	128.550	112.050	DATA13	226	33.150	91.050	LADD14	154	53.400	71.100	Q_CLK	436	73.950	179.100	TCK	127	95.550	62.250
AUDIOL	263	142.800	108.750	DATA14	299	80.700	129.750	LADD15	185	53.550	76.200	Q_DATA	428	69.600	175.800	TDI	141	78.900	69.150
AUDIOL_R	507	132.000	203.850	DATA15	306	82.650	132.750	LADD16	214	50.850	87.750	Q_WCLK	432	75.300	176.850	TDO	385	70.500	161.400
AUDIOR	275	142.800	114.750	DATA1_TRANS	339	122.850	143.700	LADD17	210	48.300	86.100	R0	152	87.600	70.050	TDOVDSC	136	78.450	66.600
AUDIOREM	494	139.650	198.000	DATA2	225	21.750	90.750	LADD18	240	72.450	93.150	R1	157	90.000	71.550	TMS	156	77.700	71.400
AUDIORSC	276	147.750	115.200	DATA2_REC	345	121.650	146.100	LADD19	215	75.600	88.200	R2	171	87.900	73.350	TRAYOC	334	50.250	142.350
AUDIO_CLK	434	79.200	177.150	DATA3	208	19.500	85.950	LADD2	310	87.000	133.950	R3	181	94.050	75.150	TRAYSWITCH	336	11.250	143.250
AUDL	465	121.650	187.500	DATA4	200	27.450	82.950	LADD20	224	74.100	90.600	R4	189	94.050	77.850	TS1IK1RTS1IK2	295	60.600	128.100
AUDR	452	122.100	182.850	DATA5	235	30.600	93.150	LADD21	178	63.600	74.250	R5	195	94.050	80.550	TX1P	12	130.650	20.250
B0	151	110.700	69.900	DATA6	207	33.900	85.800	LADD22	175	60.600	73.800	R6	194	97.350	80.250	TX2IK1	97	30.750	50.700
B1	166	107.850	72.600	DATA7	294	44.550	128.100	LADD23	186	61.650	76.200	R7	201	97.200	83.100	TXCO	613	124.200	132.300
B2	150	107.700	69.900	DATA8	177	44.850	74.250	LADD3	323	89.100	138.450	RA	564	37.050	221.700	TXLC	612	124.200	129.600
B3	174	105.300	73.650	DATA9	327	76.350	139.650	LADD4	322	92.100	138.300	RAB	406	65.100	168.600	UDSN	256	27.750	101.250
B4	176	102.750	73.800	DEEMPH	558	52.200	219.150	LADD5	316	94.650	136.050	RAD-	395	4.350	163.050	URDN	314	90.750	135.450
B5	149	103.950	69.900	DISACKN	168	8.250	73.050	LADD6	324	95.850	138.750	RASN	70	120.600	40.050	UWN	19	108.600	21.300
B6	187	101.850	76.350	DISCLK	183	8.250	75.750	LADD7	317	98.400	136.950	RC_EYE	217	8.250	89.100	UWRN	307	93.450	133.350
B7	180	99.600	75.000	DISDAT	190	8.250	78.450	LADD8	329	100.950	139.650	RDYN	89	23.700	46.950	VADAC	551	86.250	217.950
BERRN	57	26.250	36.900	DISRES	309	38.100	133.800	LADD9	239	68.700	93.150	REF	382	49.800	158.550	VDSC_INTN	124	78.750	60.750
BGACKN	112	26.700	56.550	DISSDIS	199	8.250	81.450	LDON	394	4.350	159.300	REM	552	142.200	218.100	Vsub	415	4.350	170.700
BGN	117	25.200	58.800	DMAEN	64	75.750	38.100	LDSN	98	54.600	51.300	REQ2N	68	33.150	39.450	XT2N	130	115.350	63.750
BRN	111	23.700	55.800	DOBM	105	130.650	53.400	LWN	16	105.900	21.150	REQ2NKON	179	77.400	74.550	X_CLK	286	115.200	125.850
CAS1N	74	123.600	41.400	DOBM_KILL	114	134.700	56.700	MA0	66	112.350	38.700	RESET	405	62.400	168.300	X_DATA	297	114.900	128.400
CAS2N	109	107.400	55.200	DONEN	103	24.300	53.100	MA1	17	111.750	21.150	RESETCD	86	105.150	46.050	X_WSIN	302	113.850	130.800
CD7CLK	516	65.400	205.800	DTACKN	119	70.350	59.250	MA2	58	117.000	36.900	RESETCD	304	109.400	131.562	Y_GSC	229	147.750	91.200
CD7_V2	497	49.050	198.900	DTACKP	132	33.900	64.200	MA3	18	114.450	21.150	RESETN	188	106.800	76.350				
CDTV	216	125.700	88.200	FO	574	37.500	224.250	MA4	52	105.150	35.700	RESETSTB	346	125.550	146.400				
CIAPACKN	84	28.800	45.750	FOC-	398	4.350	165.900	MA5	47	120.600	33.450	RESETSYS	54	95.400	36.300				
CIAPJUC	293	54.750	127.950	G0	148	100.950	69.900	MA6	51	123.150	34.800	RSC	205	147.750	85.200				
CIAPREQN	91	30.900	47.550	G1	163	99.450	72.300	MA7	53	120.600	36.150	RTS1P	72	38.850	40.500				
CIAP_INTN	67	35.850	39.300	G2	147	98.250	69.900	MA8	61	123.150	37.950	RTS2IK1	282	65.250	117.900				
CL	332	56.850	140.850	G3	162	96.750	72.300	MD0	29	93.750	25.950	RTSEX	92	28.050	49.050				
COMIK12	288	120.750	126.150	G4	146	95.550	69.900	MD1	13	94.650	20.550	RWN	71	27.150	40.500				
CRSEL	370	100.650	153.450	G5	164	94.050	72.450	MD10	87	127.350	46.200	RX1IK1TX2IK2	291	130.650	127.200				
CSCIAPN	165	33.150	72.600	G6	145	92.850	69.900	MD11	42	111.600	31.800	RX1IK2	100	28.350	51.900				
CSIKAT1N	134	43.500	64.500	G7	140	90.000	68.700	MD12	35	111.900	29.100	RX1P	1	119.400	8.850				
CSIKAT1SB	614	126.450	135.300	HALTN	45	26.850	32.550	MD13	32	109.500	28.050	RX2IK1	283	45.900	118.050				
CSIKAT2N	167	42.600	72.750	HEADPHL	587	96.900	229.800	MD14	38	105.750	30.450	SCL	158	81.450	71.850				
CSIKAT2STB	305	130.200	132.150	HEADPHR	585	88.350	229.800	MD15	44	103.800	32.400	SCLK	365	81.600	151.500				
CSNVRAMN	153	29.550	70.650	HFD	350	61.500	147.750	MD2	24	95.100	23.400	SDA	95	59.250	49.950				
CSROMN	223	49.650	90.300	HOBBES1_2	340	56.550	144.450	MD3	30	96.600	25.950	SDATA	545	73.200	216.300				
CSVDSCN	137	59.100	67.650	IACK2	62	30.000	38.100	MD4	28	101.400	25.200	SELPAR	325	48.600	139.050				
CTS1P	104	30.900	53.250	IACKN	126	70.950	61.800	MD5	20	100.950	21.900	SILD	417	65.250	171.300				
CVBSOUT	440	139.500	179.850	INTIKAT2N	46	54.900	32.550	MD6	14	103.200	20.550	SL	569	39.750	222.900				
CVBS_REM	473	139.650	192.000	INTIKATN	281	120.300	117.450	MD7	79	112.200	42.750	SLEEPAUDN	411	69.450	169.200				
CVBS_SYNC	170	147.750	73.200	INTREQN	82	58.350	44.700	MD8	80	107.700	44.250	SLEEPVID	321	52.650	138.000				
C_BSC	260	147.750	103.200	IO1	333	129.750	142.200	MD9	75	107.700	41.550	SLIDESW	341	23.100	144.900				
D1	488	35.550	196.800	IO2	355	129.300	148.800	MISOIN	368	87.150	151.950	SSCLKIN	351	87.750	148.350				
D2	490	50.850	196.950	IO3	364	128.400	151.350	MODE_0IN	371	85.200	153.600	STANDBYLED	621	8.250	95.250				
D3	475	46.350	192.600	IO4	369	130.800	152.400	MODE_1IN	380	87.150	155.250	STANDIN	120	54.300	59.700				
D4	470	41.100	189.600	IRQ2N	318	132.000	136.950	MOSIIN	354	84.450	148.800	STATUS	503	52.500	201.900				
D5	468	37.350	187.800	IRQIN	311	60.450	134.400	NHSYN	193	114.600	80.100	STBS	113	18.000	56.700				
D8NVR	328	80.550	139.650	ISELIN	420	76.350	172.800	NVDSN	135	87.300	65.850	STBV	49	22.650	34.500				

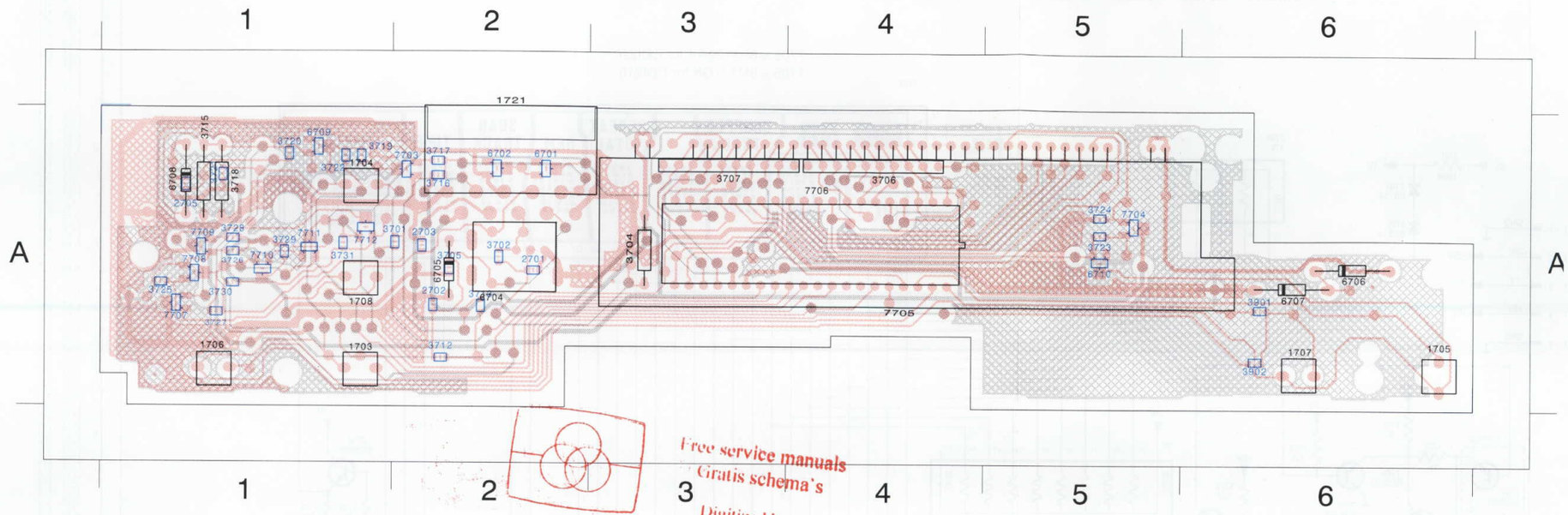
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7.6 CONTROL & DISPLAY PANEL

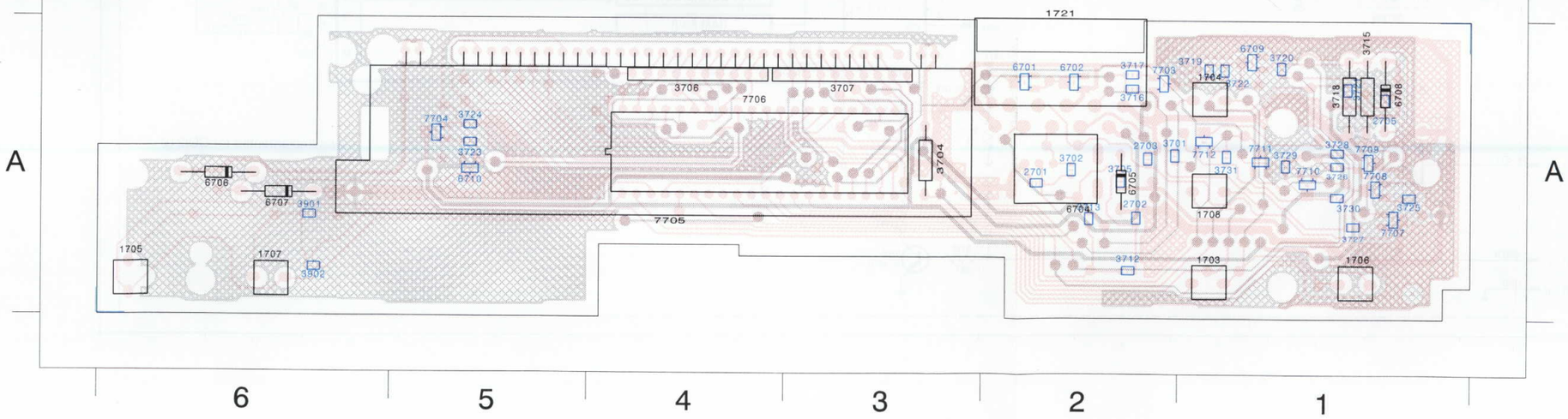
7.6.1 Control & Display PCB

1703 A 1 1706 A 1 1721 A 2 2703 A 2 3702 A 2 3706 A 4 3713 A 2 3717 A 2 3720 A 1 3723 A 5 3726 A 1 3729 A 1 3901 A 6 6702 A 2 6706 A 6 6709 A 1 7704 A 5 7707 A 1 7710 A 1
1704 A 1 1707 A 6 2701 A 2 2705 A 1 3704 A 3 3707 A 3 3715 A 1 3718 A 1 3721 A 1 3724 A 5 3727 A 1 3730 A 1 3902 A 6 6704 A 2 6707 A 6 6710 A 5 7705 A 4 7708 A 1 7711 A 1
1705 A 6 1708 A 1 2702 A 2 3701 A 2 3705 A 2 3712 A 2 3716 A 2 3719 A 1 3722 A 1 3725 A 1 3728 A 1 3731 A 1 6701 A 2 6705 A 2 6708 A 1 7703 A 2 7706 A 4 7709 A 1 7712 A 1



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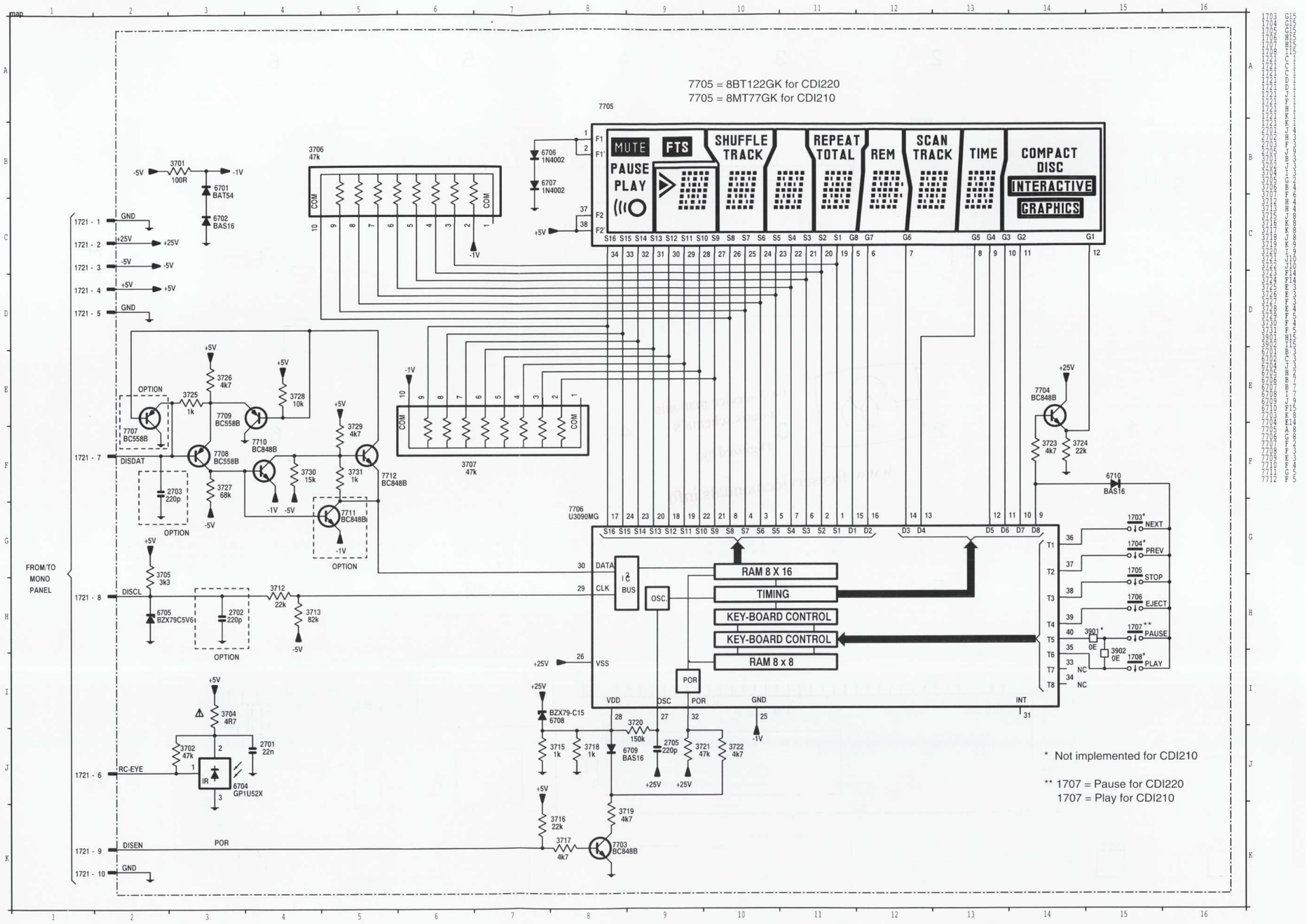
7710 A 1 7707 A 1 7704 A 5 6709 A 1 6706 A 6 6702 A 2 3901 A 6 3729 A 1 3726 A 1 3723 A 5 3720 A 1 3717 A 2 3713 A 2 3706 A 4 3702 A 2 2703 A 2 1721 A 2 1706 A 1 1703 A 1
7711 A 1 7708 A 1 7705 A 4 6710 A 5 6707 A 6 6704 A 2 3902 A 6 3730 A 1 3727 A 1 3724 A 5 3721 A 1 3718 A 1 3715 A 1 3707 A 3 3704 A 3 2705 A 1 2701 A 2 1707 A 6 1704 A 1
7712 A 1 7709 A 1 7706 A 4 7703 A 2 6708 A 1 6705 A 2 6701 A 2 3731 A 1 3728 A 1 3725 A 1 3722 A 1 3719 A 1 3716 A 2 3712 A 2 3705 A 2 3701 A 2 2702 A 2 1708 A 1 1705 A 6



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7.6.2 Control & Display circuit diagram



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8 PARTSLIST

8.1 Partslist of the cabinet

Item	Codenumber	Description
1	4822 444 40684	Front assy
9	4822 410 62821	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
63		Bracket
65	4822 444 40799	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 60936	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
190		Saddle edging
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
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 /60
301	4822 321 11159	Mainscord /65
302	4822 321 20308	Audio cord set
309	4822 736 22618	Dir. for use mono 4/210
315	4822 321 61579	Video cord set
318	4822 218 10576	IR-remote Control
1005	4822 214 52306	Power supply unit
BU11	4822 321 63057	MINIDINN assy

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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 30278	CDM 12.1
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		
1705	4822 276 13114	TACT SWITCH		
1706	4822 276 13114	TACT SWITCH		
1707	4822 276 13114	TACT SWITCH		
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		PROCESS CHIP 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 214 52133	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
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 Partslist of the Main panel

Item	Codenumber	Description		
1001		9P M 2.50		
1009		6P M 2.50		
1010		12P F 1.25		
1014		4P M 2.50		
1015		3P FDWHYE		
1016	4822 267 31772	1P F 2.5		
1021		12P M 2.00		
1022		10P M 2.00		
1033	4822 267 51216	8P Minidinn		
1096		120P M 2.00		
1470	5322 255 44217	40P DIPL		
2110	4822 122 33496	100n	63V	10%
2111	4822 122 33496	100n	63V	10%
2112	4822 122 33496	100n	63V	10%
2117	4822 122 33496	100n	63V	10%
2118	4822 122 33496	100n	63V	10%
2119	4822 122 33496	100n	63V	10%
2132	4822 122 32654	22n	63V	10%
2133	4822 122 32654	22n	63V	10%
2134	4822 122 32654	22n	63V	10%
2135	4822 122 32654	22n	63V	10%
2136	4822 122 32654	22n	63V	10%
2137	4822 122 32654	22n	63V	10%
2138	4822 122 32654	22n	63V	10%
2139	4822 122 32654	22n	63V	10%
2140	4822 122 32654	22n	63V	10%
2141	4822 122 32654	22n	63V	10%
2142	4822 122 32654	22n	63V	10%
2143	4822 122 32654	22n	63V	10%
2144	4822 122 32654	22n	63V	10%
2145	4822 122 32654	22n	63V	10%
2146	4822 122 32654	22n	63V	10%
2148	4822 122 32654	22n	63V	10%
2149	4822 124 80483	47µ	6V3	20%
2150	4822 122 32654	22n	63V	10%
2160	4822 122 32654	22n	63V	10%
2161	4822 122 32654	22n	63V	10%
2163	4822 122 32654	22n	63V	10%
2164	4822 122 32654	22n	63V	10%
2165	4822 122 33496	100n	63V	10%
2166	4822 122 33496	100n	63V	10%
2201	4822 122 32654	22n	63V	10%
2204	4822 122 32654	22n	63V	10%
2206	4822 126 12549	470n	25V	10%
2207	4822 122 33496	100n	63V	10%
2208	4822 124 41527	47µ	25V	20%
2210	4822 122 32654	22n	63V	10%
2211	4822 122 32654	22n	63V	10%
2232	4822 122 32654	22n	63V	10%
2240	4822 122 32654	22n	63V	10%
2241	4822 122 32654	22n	63V	10%
2245	4822 122 32654	22n	63V	10%
2250	4822 122 32654	22n	63V	10%
2251	5322 122 31865	1n5	63V	10%
2252	5322 122 31865	1n5	63V	10%
2253	5322 122 31865	1n5	63V	10%
2254	4822 122 32654	22n	63V	10%
2255	4822 124 41527	47µ	25V	20%
2256	4822 124 41527	47µ	25V	20%

Item	Codenumber	Description		
2257	4822 124 41527	47µ	25V	20%
2263	4822 122 32654	22n	63V	10%
2270	4822 124 41989	470µ	16V	20%
2271	4822 124 41989	470µ	16V	20%
2272	4822 122 32654	22n	63V	10%
2273	4822 124 80483	47µ	6V3	20%
2280	4822 122 32654	22n	63V	10%
2281	4822 124 80483	47µ	6V3	20%
2282	5322 122 31865	1n5	63V	10%
2283	4822 122 32654	22n	63V	10%
2284	5322 122 31865	1n5	63V	10%
2285	5322 122 31865	1n5	63V	10%
2286	5322 122 31865	1n5	63V	10%
2304	4822 122 33496	100n	63V	10%
2305	4822 122 32654	22n	63V	10%
2306	4822 122 32654	22n	63V	10%
2307	4822 122 32654	22n	63V	10%
2308	4822 122 32654	22n	63V	10%
2309	4822 122 32654	22n	63V	10%
2310	4822 122 32654	22n	63V	10%
2311	4822 122 32654	22n	63V	10%
2312	4822 122 32654	22n	63V	10%
2323	4822 124 22339	100µ	16V	
2324	4822 124 22339	100µ	16V	
2325	5322 122 32658	22p	63V	5%
2326	5322 122 32658	22p	63V	5%
2327	4822 122 32654	22n	63V	10%
2328	4822 122 32654	22n	63V	10%
2331		680p	63V	2%
2332		680p	63V	2%
2333	4822 122 32654	22n	63V	10%
2334	4822 122 32654	22n	63V	10%
2335	4822 122 32654	22n	63V	10%
2337	5322 122 33897	3n3	63V	5%
2338	5322 122 33897	3n3	63V	5%
2340	4822 124 80602	1000µ	6V3	
2341	4822 124 80144	220µ	25V	
2350	4822 124 41527	47µ	25V	
2351	4822 124 41527	47µ	25V	
2352	4822 124 41528	100µ	25V	
2353	4822 124 41528	100µ	25V	
2355	4822 124 80602	1000µ	6V3	20%
2356	4822 124 41969	1µ	50V	20%
2360	4822 124 41528	100µ	25V	20%
2361	4822 122 33496	100n	63V	10%
2362	4822 122 33575	220p	63V	5%
2363	4822 122 32654	22n	63V	10%
2364	4822 122 32654	22n	63V	10%
2366	4822 051 20008	0R05		
2369	4822 051 20008	0R05		
2400	4822 122 32654	22n	63V	10%
2401	4822 122 32654	22n	63V	10%
2402	4822 122 32654	22n	63V	10%
2408	5322 122 32452	47p	63V	5%
2410	4822 122 32654	22n	63V	10%
2411	4822 122 33496	100n	63V	10%
2412	4822 122 32654	22n	63V	10%
2413	5322 122 31863	330p	63V	5%
2414	4822 126 10326	180p	63V	5%

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Item	Codenumber	Description		
2415	4822 126 10326	180p	63V	5%
2416	5322 122 32659	33p	63V	5%
2417	5322 122 32452	47p	63V	5%
2418	5322 122 32452	47p	63V	5%
2419	5322 122 32531	100p	63V	5%
2420	4822 122 32654	22n	63V	10%
2421	5322 122 31863	330p	63V	5%
2422	4822 126 10326	180p	63V	5%
2424	5322 122 31863	330p	63V	5%
2425	5322 122 31865	1n5	63V	10%
2426	5322 116 80853	560p	63V	5%
2427	4822 122 33575	220p	63V	5%
2428	4822 122 33575	220p	63V	5%
2429	4822 122 33575	220p	63V	5%
2430	4822 122 33575	220p	63V	5%
2431	4822 122 33575	220p	63V	5%
2432	4822 122 33575	220p	63V	5%
2433	4822 122 33496	100n	63V	10%
2434	5322 122 31865	1n5	63V	10%
2435	4822 126 12549	470n	25V	10%
2436	4822 122 32654	22n	63V	10%
2437	4822 122 33496	100n	63V	10%
2438	4822 122 32654	22n	63V	10%
2439	4822 122 33342	33n	63V	10%
2440	4822 122 33127	2n2	63V	10%
2441	4822 122 32654	22n	63V	10%
2442	4822 122 33496	100n	63V	10%
2443	4822 126 10326	180p	63V	5%
2444	4822 122 32627	2n7	63V	10%
2445	4822 122 32654	22n	63V	10%
2446	4822 122 33496	100n	63V	10%
2447	4822 126 10326	180p	63V	5%
2448	4822 122 32654	22n	63V	10%
2449	4822 122 32654	22n	63V	10%
2450	5322 126 10465	3n9	63V	10%
2451	4822 122 33496	100n	63V	10%
2452	4822 122 33342	33n	63V	10%
2453	4822 122 32654	22n	63V	10%
2454	4822 122 32654	22n	63V	10%
2455	4822 122 33127	2n2	63V	10%
2456	4822 122 33496	100n	63V	10%
2457	5322 122 32452	47p	63V	5%
2463	4822 122 33496	100n	63V	10%
2464	4822 122 32654	22n	63V	10%
2465	4822 122 32654	22n	63V	10%
2467	4822 124 41527	47µ	25V	
2468	4822 124 41527	47µ	25V	20%
2473		22µ	50V	20%
2474	4822 124 41527	47µ	25V	20%
2550	4822 122 33496	100n	63V	10%
2551	4822 122 33496	100n	63V	10%
2552	4822 122 33496	100n	63V	10%
2553	4822 124 41527	47µ	25V	20%
2554	4822 124 41527	47µ	25V	20%
2555	4822 124 41527	47µ	25V	20%
2556	4822 122 33496	100n	63V	10%
2557	4822 124 41527	47µ	25V	20%
2558	4822 122 33496	100n	63V	10%
2559	4822 124 41527	47µ	25V	20%
2560	4822 122 32654	22n	63V	10%

Item	Codenumber	Description	
3101	4822 051 20472	4k7	5%
3115	4822 051 20008	0R05	
3119	4822 051 20399	47R	5%
3120	4822 051 20472	4k7	5%
3121		75R	1%
3122	4822 051 20223	22k	5%
3123		75R	1%
3124		75R	1%
3125	4822 051 20223	22k	5%
3153	4822 051 20008	0R05	
3157	4822 051 20008	0R05	
3159		4k42	1%
3160	4822 117 10361	680R	1%
3162	4822 051 20471	470R	5%
3164	4822 117 11454	820R	1%
3166	4822 117 11454	820R	1%
3167	4822 051 20101	100R	5%
3168	4822 051 20151	150R	5%
3171	4822 051 20102	1k	5%
3172		75R	1%
3173	4822 051 20103	10k	5%
3174	4822 051 20008	0R05	
3175	4822 051 20008	0R05	
3177	4822 051 20008	0R05	
3179	4822 051 20008	0R05	
3182	4822 051 20471	470R	5%
3189	4822 051 20471	470R	5%
3200	4822 051 20229	22R	5%
3201	4822 051 20105	1M	5%
3202	4822 051 20472	4k7	5%
3204	4822 051 20008	0R05	
3205	4822 051 20104	100k	5%
3206	4822 051 20104	100k	5%
3207	4822 051 20103	10k	5%
3208	4822 051 20103	10k	5%
3209	4822 051 20103	10k	5%
3210	4822 051 20102	1k	5%
3211	4822 051 20102	1k	5%
3212	4822 051 20472	4k7	5%
3213	4822 051 20472	4k7	5%
3214	4822 051 20472	4k7	5%
3215	4822 051 20223	22k	5%
3216	4822 051 20223	22k	5%
3217	4822 051 20223	22k	5%
3218	4822 051 20102	1k	5%
3219	4822 051 20103	10k	5%
3220	4822 051 20102	1k	5%
3221	4822 051 20102	1k	5%
3222	4822 051 20472	4k7	5%
3223	4822 051 20472	4k7	5%
3224	4822 051 20472	4k7	5%
3225	4822 051 20472	4k7	5%
3226	4822 051 20472	4k7	5%
3227	4822 051 20472	4k7	5%
3228	4822 051 20472	4k7	5%
3229	4822 051 20102	1k	5%
3230	4822 051 20105	1M	5%
3231	4822 051 20222	2k2	5%
3232	4822 051 20399	47R	5%
3234	4822 051 20103	10k	5%

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Item	Codenumber	Description		
3235	4822 051 20103	10k		5%
3238	4822 051 20008	0R05		
3241	4822 051 20472	4k7		5%
3245	4822 051 20102	1k		5%
3250	4822 051 20104	100k		5%
3251	4822 051 20101	100R		5%
3252	4822 051 20101	100R		5%
3253	4822 051 20101	100R		5%
3254	4822 051 20104	100k		5%
3255	4822 252 51173	65V	1.0A	
3256	4822 051 20229	22R		5%
3257	4822 051 20104	100k		5%
3258	4822 051 20103	10k		5%
3259	4822 051 20682	6k8		5%
3260	4822 051 20104	100k		5%
3261	4822 051 20103	10k		5%
3262	4822 051 20682	6k8		5%
3263	4822 051 20229	22R		5%
3264	4822 051 20103	10k		5%
3265	4822 051 20103	10k		5%
3266	4822 051 20103	10k		5%
3267	4822 117 10834	47k		5%
3268	4822 051 20682	6k8		5%
3269	4822 051 20103	10k		5%
3272	4822 051 20472	4k7		5%
3274	4822 051 20229	22R		5%
3275	4822 051 20104	100k		5%
3277	4822 116 40238	PTC	0R46	
3278	4822 051 20103	10k		5%
3279	4822 051 20103	10k		5%
3280	4822 051 20101	100R		5%
3281	4822 051 20682	6k8		5%
3282	4822 051 20103	10k		5%
3283	4822 051 20104	100k		5%
3284	4822 051 20101	100R		5%
3285	4822 051 20682	6k8		5%
3286	4822 051 20103	10k		5%
3287	4822 051 20104	100k		5%
3288	4822 051 20104	100k		5%
3290	4822 051 20103	10k		5%
3291	4822 051 20103	10k		5%
3297	4822 051 20103	10k		5%
3300	4822 051 20103	10k		5%
3305	4822 051 20472	4k7		5%
3306	4822 051 20472	4k7		5%
3307	4822 051 20472	4k7		5%
3308	4822 051 20472	4k7		5%
3309	4822 051 20472	4k7		5%
3310	4822 051 20472	4k7		5%
3311	4822 051 20472	4k7		5%
3312	4822 051 20472	4k7		5%
3313	4822 051 20472	4k7		5%
3314	4822 051 20472	4k7		5%
3316	4822 051 20472	4k7		5%
3318	4822 051 20008	0R05		
3320	4822 117 10834	47k		5%
3321	4822 051 20103	10k		5%
3322	4822 051 20103	10k		5%
3323	4822 051 20103	10k		5%
3324	4822 051 20222	2k2		5%

Item	Codenumber	Description	
3325	4822 051 20222	2k2	5%
3326	4822 051 20222	2k2	5%
3327	4822 051 20103	10k	5%
3328	4822 117 10834	47k	5%
3329	4822 051 20223	22k	5%
3330	4822 116 52195	47R	5%
3339	4822 116 83933	15k	1%
3340	4822 117 10834	47k	5%
3341	4822 117 10834	47k	5%
3342		91k	1%
3343		91k	1%
3344	4822 051 20103	10k	5%
3348	4822 116 83933	15k	1%
3354	4822 117 11373	100R	1%
3355	4822 051 20182	1k8	5%
3356	4822 051 20182	1k8	5%
3357	4822 117 11373	100R	1%
3358	4822 051 20182	1k8	5%
3359	4822 051 20182	1k8	5%
3360	4822 117 11373	100R	1%
3361	4822 117 11373	100R	1%
3363	4822 051 20182	1k8	5%
3364	4822 051 20182	1k8	5%
3365	4822 117 11152	4R7	5%
3366	4822 117 11152	4R7	5%
3367	4822 051 20101	100R	5%
3368	4822 051 20008	0R05	
3373	4822 117 11373	100R	1%
3374	4822 117 11373	100R	1%
3377	4822 117 10833	10k	1%
3378	4822 117 10833	10k	1%
3379	4822 116 83933	15k	1%
3380	4822 116 83933	15k	1%
3395	4822 051 20008	0R05	
3396	4822 051 20399	47R	5%
3397	4822 117 10354	22k	1%
3398	4822 117 10354	22k	1%
3399	4822 051 20399	47R	5%
3401	4822 117 11154	1k	1%
3402	4822 117 11154	1k	1%
3403	4822 051 20101	100R	5%
3404	4822 051 20008	0R05	
3406	4822 051 20101	100R	5%
3407	4822 051 20101	100R	5%
3408	4822 051 20101	100R	5%
3409	4822 051 20124	120k	5%
3410	4822 051 20563	56k	5%
3411	4822 051 20124	120k	5%
3412	4822 051 20391	390R	5%
3413	4822 051 20101	100R	5%
3414	4822 051 20102	1k	5%
3415	4822 051 20101	100R	5%
3416	4822 051 20102	1k	5%
3417	4822 051 20393	39k	5%
3418	4822 051 20334	330k	5%
3419	4822 051 20153	15k	5%
3420	4822 051 20102	1k	5%
3421	4822 051 20153	15k	5%
3422	4822 117 10834	47k	5%
3423	4822 117 11452	430R	1%

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Item	Codenumber	Description	
3424	4822 117 11452	430R	1%
3425	4822 051 20182	1k8	5%
3426	4822 051 20182	1k8	5%
3428	4822 051 20392	3k9	5%
3429	4822 051 20008	0R05	
3432	4822 051 20103	10k	5%
3433	4822 051 20103	10k	5%
3434	4822 051 20103	10k	5%
3435	4822 051 20103	10k	5%
3436	4822 051 20103	10k	5%
3437	4822 051 20103	10k	5%
3438	4822 051 20154	150k	5%
3439	4822 117 10834	47k	5%
3440	4822 051 20472	4k7	5%
3441	4822 051 20102	1k	5%
3442	4822 051 20104	100k	5%
3443	4822 051 20101	100R	5%
3444	4822 051 20102	1k	5%
3445	4822 051 20683	68k	5%
3446	4822 051 20104	100k	5%
3447	4822 051 20103	10k	5%
3448	4822 116 83933	15k	1%
3449	4822 116 83933	15k	1%
3450	4822 051 20103	10k	5%
3451	4822 051 20682	6k8	5%
3452	4822 051 20103	10k	5%
3453	4822 051 20229	22R	5%
3454	4822 051 20103	10k	5%
3455	4822 116 83933	15k	1%
3456	4822 116 83933	15k	1%
3457	4822 051 20103	10k	5%
3458	4822 051 20682	6k8	5%
3459	4822 051 20229	22R	5%
3460	4822 051 20472	4k7	5%
3461	4822 116 83933	15k	1%
3462	4822 051 20103	10k	5%
3463	4822 051 20229	22R	5%
3464	4822 051 20103	10k	5%
3465	4822 116 83933	15k	1%
3466	4822 051 20229	22R	5%
3467		150k	1%
3468	4822 117 10354	22k	1%
3469	4822 117 10354	22k	1%
3470		150k	1%
3471	4822 051 20683	68k	5%
3472	4822 051 20222	2k2	5%
3473	4822 051 20223	22k	5%
3474	4822 051 20394	390k	5%
3475	4822 051 20103	10k	5%
3476	4822 051 20221	220R	5%
3477	4822 051 20221	220R	5%
3478	4822 051 20103	10k	5%
3479	4822 051 20008	0R05	
3480	4822 051 20008	0R05	
3481	4822 051 20008	0R05	
3482	4822 051 20103	10k	5%
3483	4822 051 20105	1M	5%
3485	4822 117 11139	1k5	5%
3486	4822 051 20223	22k	5%
3487	4822 051 20333	33k	5%

Item	Codenumber	Description	
3488	4822 051 20229	22R	5%
3489	4822 051 20333	33k	5%
3490	4822 051 20223	22k	5%
3491	4822 051 20223	22k	5%
3492	4822 051 20223	22k	5%
3496	4822 051 20223	22k	5%
3497		2R2	5%
3498	4822 117 61008	1R	5%
3499	4822 051 20223	22k	5%
3517	4822 051 20008	0R05	
3518	4822 051 20103	10k	5%
3519	4822 051 20008	0R05	
3526	4822 051 20008	0R05	
3527	4822 051 20008	0R05	
3530	4822 051 20399	47R	5%
3531	4822 051 20399	47R	5%
3533	4822 051 20008	0R05	
3536	4822 051 20008	0R05	
3538	4822 117 11152	4R7	5%
3539	4822 117 11152	4R7	5%
3552		2R2	5%
3553		2R2	5%
3554		2R2	5%
3555	4822 051 20222	2k2	5%
3556	4822 051 20102	1k	5%
3557		2R2	5%
3558	4822 051 20102	1k	5%
3559		2R2	5%
3560	4822 051 20008	0R05	
3561	4822 051 20008	0R05	
3562	4822 051 20008	0R05	
3563	4822 051 20008	0R05	
3564	4822 051 20399	47R	5%
3565	4822 051 20399	47R	5%
3566	4822 051 20399	47R	5%
3567	4822 051 20103	10k	5%
3580	4822 051 20008	0R05	
5165	4822 157 52983	22µ	10%
5201	4822 242 72527	4MHz	
5230	4822 242 81739	4MHz915	
5250		LC-filter 1000p	
5251		LC-filter 1000p	
5252		LC-filter 1000p	
5253		LC-filter 1000p	
5254	4822 157 90252	LC-filter 22000p	
5255		LC-filter 1000p	
5280	4822 157 70378	LC-filter 22n	
5281		LC-filter 1n	
5282		LC-filter 1n	
5283		LC-filter 1n	
5284		LC-filter 1n	
5301		LC-filter 1n	
5302		LC-filter 1n	
5303		LC-filter 220p	
5304	4822 242 82078	x-tal 33M8688	
5305	4822 157 70378	LC-filter 22n	
5402	4822 157 63316	56µ	10%
5560	4822 242 82079	x-tal 30MHz	

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Item	Codenumber	Description
6200	4822 130 83918	PRLL5817
6274	4822 130 82212	BYD17D
6300	4822 130 83918	PRLL5817
6400	4822 130 80622	BAT54
6401	4822 130 31928	BAS16
7110	4822 209 52847	upd424270le-80
7118	4822 209 52847	upd424270le-80
7125	4822 209 52811	VDSC xcd212fu
7160	4822 209 52771	bt9108 for /60/65
7164	4822 130 40937	BC548B
7201	4822 209 90989	IKAT
7205	5322 130 41982	BC848B
7207	4822 209 31275	MC 34064D-5
7210	4822 209 31958	scc68070cca84
7230	5322 209 11517	PC74HCU04T
7240	4822 209 52851	Syst.rom
7241	4822 209 90889	m48T08-150PC1
7245	5322 209 61434	N74F02D
7250	5322 209 71568	74HCT14D
7263	4822 209 52731	dtack GAL16V8
7272	4822 209 52732	cspal GAL20V8
7280	5322 209 71568	74HCT14D
7308	5322 130 41982	BC848B
7310	5322 130 41982	BC848B
7312	4822 130 42696	BC818-25
7313	4822 130 42696	BC818-25
7314	4822 130 42696	BC818-25
7315	4822 130 42696	BC818-25
7317	4822 130 42696	BC818-25
7318	4822 130 42696	BC818-25
7324	4822 130 42655	BC808-40
7325	5322 130 41983	BC858B
7326	4822 130 42655	BC808-40
7328	4822 209 32071	MC33079D
7331	4822 209 52562	CIAP1.5
7334	4822 209 33403	TDA1305T/N2
7400	4822 209 72587	TCA0372DP2
7402	4822 209 90341	SAA7372GP/M1
7403	5322 130 41983	BC858B
7404	5322 130 41983	BC858B
7405	4822 130 42655	BC808-25
7406	5322 130 41982	BC848B
7407	4822 130 60887	BF840
7408	5322 130 41982	BC848B
7409	5322 130 41982	BC848B
7410	5322 130 41982	BC848B
7411	5322 130 41982	BC848B
7420	4822 209 62059	TCA0372DP1
7430	4822 209 72587	TCA0372DP2
7555	5322 130 41982	BC848B

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