

*dCS Paganini DAC*

## **Service Manual**

**October 2011**

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## SAFETY AND CONFIDENTIALITY

### Safety Warnings



**Servicing must be carried out by qualified service personnel only.**



These products contain circuitry that operate at high voltages and/or currents. Removing safety covers can expose personnel to risk of electric shock or other injury.

Take special care when working on the Power Board, as much of the board is at high voltage.



These products contain static-sensitive devices which can be seriously damaged by incorrect handling. Observe standard anti-static precautions at all times.



This product is lead-free to comply with the RoHS directive. If soldering or de-soldering is required, SAC solder (tin / silver / copper) must be used to ensure reliable repairs.

### Disclaimer

Data Conversion Systems Ltd. accept no liability for any kind for loss, accident or injury resulting from service activities.

### Confidentiality



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If you have received this Service Manual in error, please destroy it and inform Data Conversion Systems Ltd.

## UNIT DESCRIPTION



The *dCS Paganini DAC* is a 2-channel audio DAC intended for use with a *Paganini Transport, Upsampler* and *Clock*. The unit is extensively configured by software stored in flash memory. The key features are as follows.

- The unique *dCS Ring DAC™* is a discrete balanced design, which uses no proprietary DAC chips. All data received by the DAC is oversampled to 5 bits at either 2.822 or 3.07MS/s, depending upon whether the data is based on a 44.1 or 48kHz clock.
- Industry standard PCM inputs: 2x AES3 or Dual AES on XLR3 connectors, 2x SPDIF on 2x RCA connectors.
- All PCM interfaces will accept up to 24-bit data at 32, 44.1, 48, 88.2 or 96kS/s. 176.4 & 192kS/s single wire added in issue 1.20.
- The Dual AES interface will accept up to 24-bit data at 88.2, 96, 176.4 or 192kS/s.
- IEEE1394 interface currently accepts encrypted DSD data from other *dCS* units. Connected by one of two 6-pin 1394 connectors. This interface must be assumed to be incompatible with iLink or IEEE1394 interfaces produced by other manufacturers due to proprietary encryption.
- Industry standard Word Clock Input and Output. The unit can either Slave to the audio data (not 1394), Sync to an external master clock on the Word Clock Input or act as a 44.1kHz grade 2 Master Clock, allowing a suitable source to be locked to the Word Clock Output.
- Twin crystal oscillators – one for 44.1kHz-related data, the other for 48kHz-related data. Discrete Phase-Locked-Loop circuitry.
- Separately buffered stereo Balanced output on 2x XLR3 connectors and stereo Unbalanced outputs on 2x RCA connectors. Both can output either 2V or 6V rms full-scale, set in the menu. The Balanced output stages are a discrete class-A design.
- Software may be updated by the user from a suitable CD, played on a standard CD Player or Transport. If the software has become corrupted, the unit may be re-booted from a ROM, fitted to a Programmer Board.
- All-aluminium case.

## HARDWARE AND SOFTWARE HISTORY

### Hardware History & Configuration Code

For products manufactured since early 2000, the long version of the *dCS* unit serial number may be read from the menu. This contains a great deal of information about the build standard of the unit, allowing *dCS* to advise on the suitability of software updates, whether a hardware update is advisable and (sometimes) the cause of a particular problem.

The example below is a *Paganini DAC* with serial number PDC-0S2-7G4-6C1-1C5-012-5832.

A typical serial number	This code group means:
PDC	<b>PRODUCT CODE.</b> SCK = Scarlatti Clock, SDC = Scarlatti DAC, STT = Scarlatti Transport, SUP = Scarlatti Upsampler, PPR = Puccini Player, PUU or PUC = Puccini U-Clock, PCK = Paganini Clock, PDC = Paganini DAC, PTT = Paganini Transport, PUP = Paganini Upsampler, DDC or DDP = Debussy DAC.
0S2	<b>OPTIONS CODE.</b> First character = product options (e.g. 1394 interface fitted). Second character: B = Black, S = Silver. Third character = voltage setting: 1 = 100V, 2 = 115/120V, 3 = 200V, 4 = 215/220V, 5 = 230/240V. Early versions have only 2 voltage settings: 1 = 100-120V, 4 = 200-240V.
7G4	<b>CONTROL BOARD CODE.</b> The build standard of the Control board.
6C1	<b>TOP BOARD CODE.</b> The build standard of the Ring DAC™ Board.
1C5	<b>DISPLAY BOARD CODE.</b> The build standard of the Display Board.
012	<b>CASE &amp; BASE CODE.</b> This covers the build standard of the case parts, mains transformer, Power Board, 1394 Boards, back panel wiring and anything else.
5832	<b>CONTROL BOARD SERIAL NUMBER.</b> Each Control Board has a unique serial number.

## Software History

v1.00	August 2007	This is the first issue, it includes 1394 software v3.00.
v1.01	February 2008	Corrects a faint click that sometimes occurred when locking. Brightness and Contrast settings entered using the < > buttons are now stored.
v1.10	July 2010	<b>This issue was not field released due to bugs.</b> Two additional filters at 44.1k added. "Phase invert" feature & IR code added. "Sync to Word Clock" IR code added. DSD performance improved. File system problem causing CD update problems corrected. Occasional unlocking problems addressed. EasyPlay updated for Upsampler's 1394. LEDs off feature added to Display menu.
v1.20	October 2011	Adds single wire 24/176.4 & 24/192 capability to AES, SPDIF and Word Clock inputs.

**The latest software should be loaded in all units.**

## COMMON SET-UP ERRORS

### Symptom: The unit fails to power up

- Check that the rated supply voltage stated on the back panel matches the local supply voltage.
- Ensure there is power available on the power cable, connect it to the unit. Set the back panel power switch to the I position (ON), wait 10 seconds and press the **POWER** button.
- Check that the mains fuse under the mains inlet has not blown. If it has, correct any obvious cause then replace the fuse as described in the manual.

### Symptom: The Display turns on when a control is operated, then turns off

- This happens when the Display Settings > Display On/Off menu page is set to OFF. Change the setting to ON to stop the Display blanking out.

### Symptom: The unit fails to respond to the controls

- If the indicator above the display is illuminated, press the **POWER** button once to return to normal operation.

### Symptom: The DAC fails to lock to a digital source and displays “No Input”

- Ensure the source is connected with a proper cable and selected.
- If the **1394** interface is selected, the DAC's **SYNC** setting is **WCik** and a suitable dCS source is connected, “No Input” usually indicates the DAC is not receiving a valid Word Clock.
- If there is an Upsampler in the system, make sure it is actually locked to the source.
- If there is a Master Clock in the system, make sure the data rate received by the DAC is an exact multiple of the Clock frequency. See the Clock manual for more information.

### Symptom: The DAC locks but the audio is low or absent

- Check that the indicator to the left of the **MUTE** button is off. If not, press the **MUTE** button.
- Ensure the source is sending audio data. Non Audio data can cause an automatic mute.
- Ensure the **Volume** and **Balance** Controls are correctly set.

### Symptom: The audio output is monophonic

- If the source is actually Dual AES (not just 2 single AES outputs), check that the DAC is also set to Dual AES. Check that both cables are connected and undamaged.
- If the source outputs Single AES on 2 connectors and both are connected to the DAC, make sure the DAC is also set to Single AES.

### Symptom: The Left and Right channels are swapped.

- Check that the analogue output cables are not reversed.
- If the DAC is receiving Dual AES data, make sure the data cables are not reversed.

### Symptom: The sound on one channel is low or missing

- The Output Level setting is controlled by 2 latching relays, one or both can flip over if the unit is bumped hard. To correct this, change the DAC Settings > Output Level menu page to 6V and then change it to 2V. Check that both channels are now at the same level.
- Check that the Balance control is correctly set.
- Check that the audio output cables are correctly connected and undamaged.
- It is possible to connect the balanced analogue outputs to an unbalanced input, provided that pin 3 on both XLRs is connected to ground (pin 1). Do not leave pin 3 floating, as this will make the output level unstable.



**Symptom: Crackles, pops or noise occur while playing music**

- The high level of out-of-band noise inherent in DSD modes can be demodulated by some power amplifiers. Try setting the Filter to a higher number.
- The digital audio cable connecting the source to the DAC, may be damaged, intermittent or of the wrong type. Some expensive cables are not correctly designed for digital audio use. Try another cable.
- The CD may be dirty –clean it carefully with a radial motion.
- The disc may be “copy protected”. Check that the Compact Disc Digital Audio logo is printed on the disc. If it is not, the disc is not a CD – please complain to the disc manufacturer.
- The source medium may be damaged or contain corrupted data.
- The DAC’s audio output level may be high enough to overload a preamplifier or power amplifier. Set the DAC Settings > Output Level menu page to 2V.
- Occasional clicks may be heard if the DAC is in Master Mode or is locked to a Clock, but the source equipment is not locked to the same clock. Please correct the set-up.
- The source equipment may have a very high level of jitter – servicing is required.

**Symptom: The DAC will not decode Dual AES**

- If the **DAC Settings > Dual AES** menu page is set to **OFF**, the DAC will not accept Dual AES data. Change the setting to **ON** or **AUTO**.
- If the **DAC Settings > Dual AES** menu page is set to **Auto** but the status flags in the data from the Dual AES source indicate that the data is not Dual AES, the DAC will automatically select Single AES. Change the setting to **ON** and manually select Dual AES mode.
- Make sure the source is actually generating Dual AES data.
- Check for damaged or incorrect AES cables.
- Dual AES is only available if valid AES/EBU data streams are present on both AES1 and AES2 inputs. A corrupted data stream can cause the unit to default to Single AES.

**Symptom: Using a non-dCS Transport, the DAC does not report 16/44.1**

- Some Transports (e.g. Mark Levinson ML31.7, Linn CD21) add dither, so the DAC correctly reports 17/44.1 or something similar.
- Some CD Transports upsample to 48 or 88.2kS/s, the DAC will report the format of the data it receives.

**Symptom: The DAC cannot be set to Master Mode**

- In DAC Master Mode, the DAC generates a 44.1kHz Word Clock. DAC Master Mode is only available if the DAC is locked to a data stream at 44.1, 88.2 or 176.4kS/s or DSD, generated by a source that can lock to a 44.1kHz clock.

## DISMANTLING PROCEDURE

Bear in mind that you should not have to completely dismantle the unit to carry out the repair!

Tools required:

- Ratchet screwdriver handle.
- Screwdriver bits: Allen key 1.5, 2, 2.5 & 3mm A/F, 6mm flat blade, No.1 PoziDriv.
- Nut spinners / socket spanners: 5.5mm, 7mm, 12.5mm (1/2"), 14mm (5/16") & 16mm (5/8") A/F.



Do not use ball-ended Allen keys as these can damage the screw heads.

The design of the case has changed over time, the unit you are servicing may be slightly different from that shown.

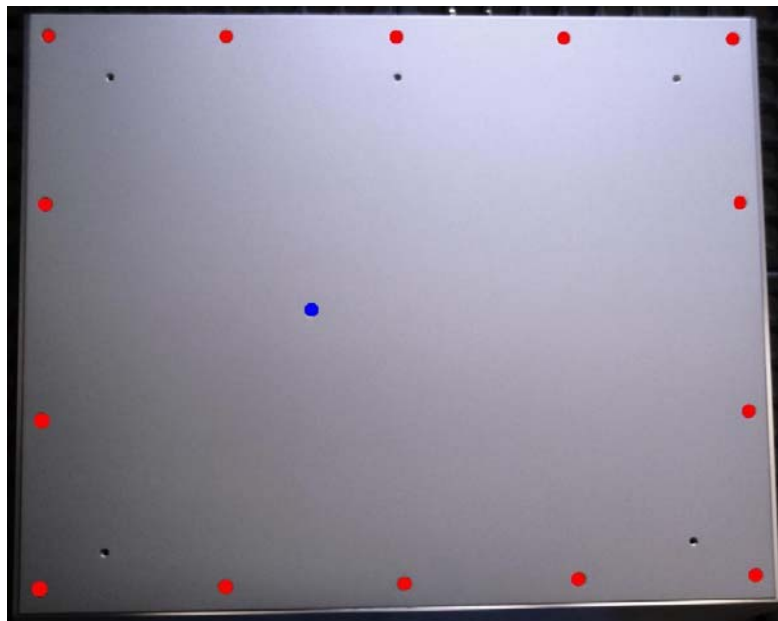


Remember to observe anti-static precautions when dismantling.

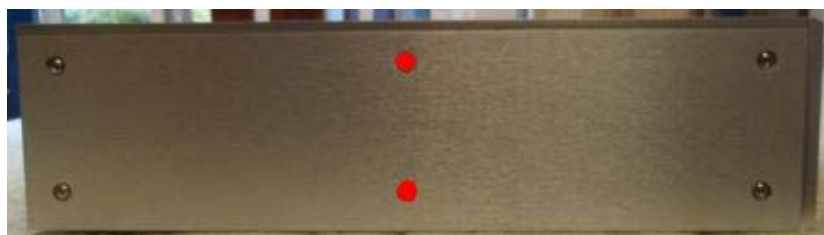
The Paganini metalwork has evolved since it was first designed, there are now 3 distinct versions in circulation, which we will describe as Mk1, Mk2 and Mk3. Disconnect all cables from the unit. Rest the unit on a soft anti-static surface to prevent damage to the finish.

### Opening the case – Mk1 - units shipped from September 2007 to March 2008

Turn the unit upside-down and remove the 14 screws from the base plate, shown in red below.



To detach the top cover, first remove the 2 screws in the middle of both side plates, shown in red below.



Inside the unit, remove the 5 screws in the well near the back panel, shown in red below.

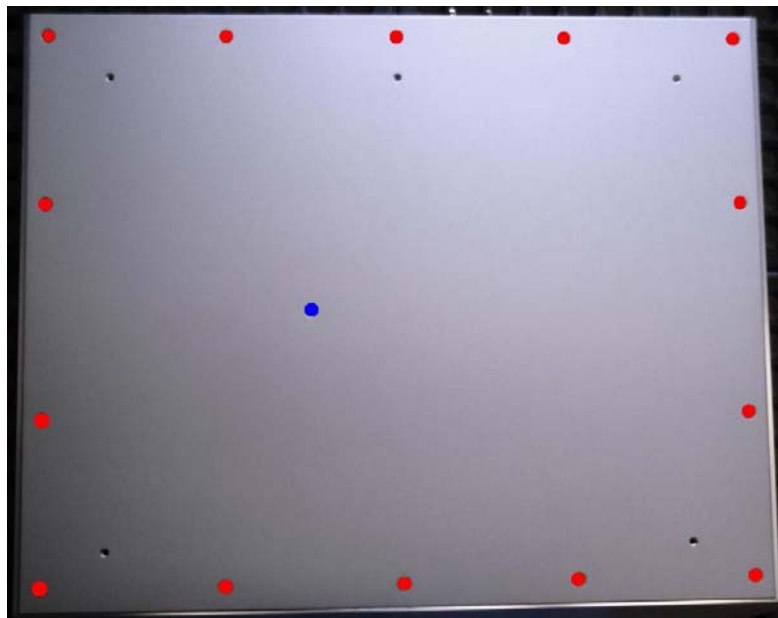


Turn the unit over and slide the top plate backwards about 10mm to clear the slot at the front of the case, then lift the top plate off, complete with 2 small brackets. This gives access to the Power Board and mains transformer.

The top edge of the front panel is attached to the chassis by 4 screws, the bottom edge is attached to a slim bracket by 4 screws. Remove the 8 screws to detach the front panel and access the Display & Switch Boards. Disconnect the ribbon cable from the Display Board.

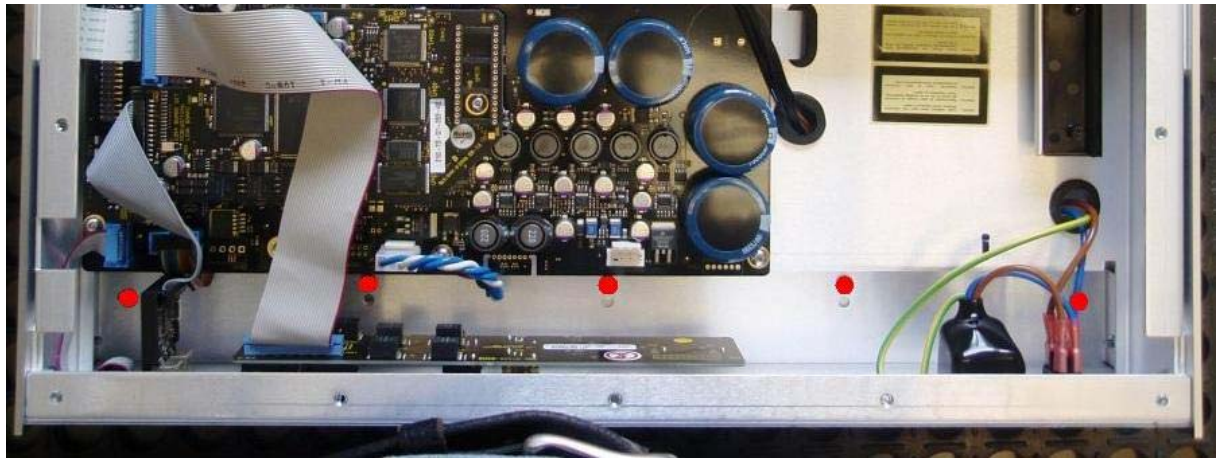
### **Opening the case – Mk2 - units shipped from March 2008 to March 2009**

Turn the unit upside-down and remove the 14 screws from the base plate, shown in red below. Remove the base plate.



To detach the top part of the case, first remove both side plates (each fixed by 6 screws).

Inside the unit, remove the 5 screws in the well near the back panel, shown in red below.

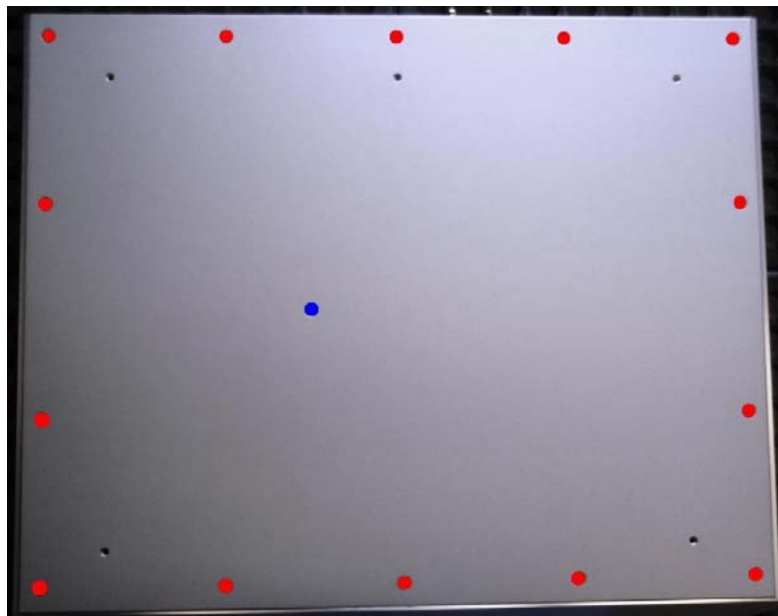


Remove the 2 nuts at the front of each side of the unit (the upper screws are accessed through slots in the side of the chassis) and a third nut near the bottom centre of the chassis. Disconnect the ribbon cable from the Display Board. Slide the upper section of the chassis back 10mm and lift it off.

The front panel bracket & front panel are secured to the top cover by 2 screws on each side. The top and bottom edges of the front panel are attached to the chassis by 4 screws each. Remove the 8 screws to detach the front panel and access the Display & Switch Boards.

### Opening the case – Mk3 - units shipped from March 2009 to present

Turn the unit upside-down and remove the 14 screws from the base plate, shown in red below. Remove the base plate.

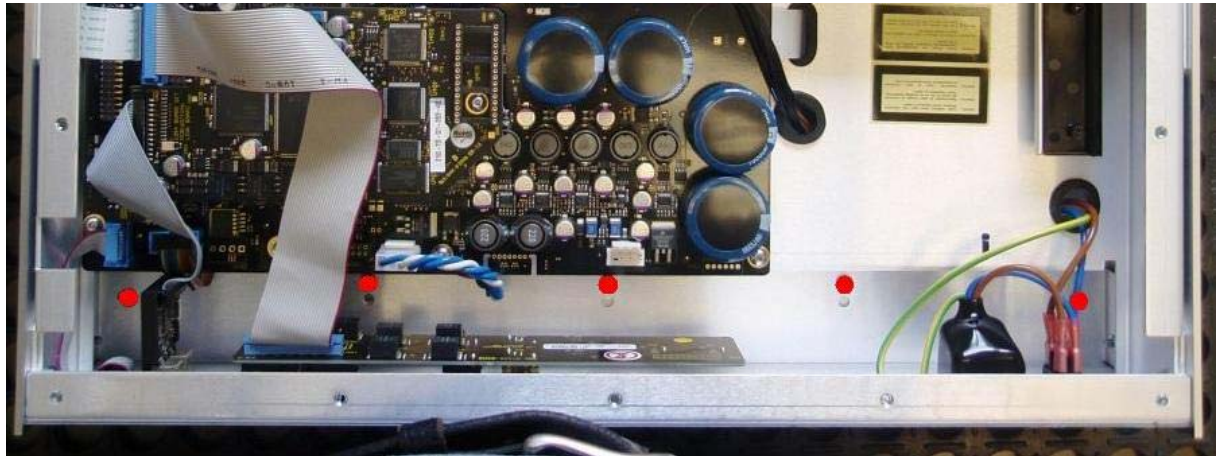




To detach the top cover, first remove the 2 screws in the middle of both side plates, shown in red below.



Inside the unit, remove the 5 screws in the well near the back panel, shown in red below.



Turn the unit over and slide the top plate backwards about 10mm to clear the slot at the front of the case, then lift the top plate off, complete with 2 brackets. This gives access to the Power Board and mains transformer.

To remove the front panel, first remove both side plates. The front panel bracket is secured to the chassis by three M4 nuts on studs: one near the bottom centre and one near the top of each side. The two (Puccini) pictures below indicate the location of the nuts with red arrows.

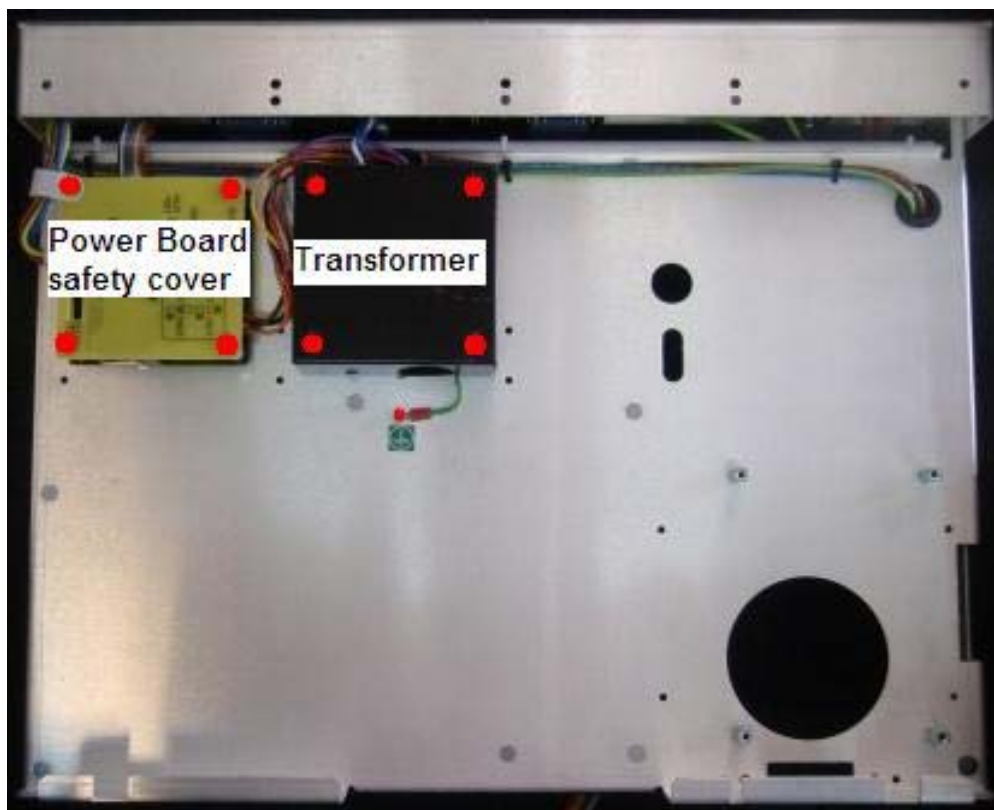
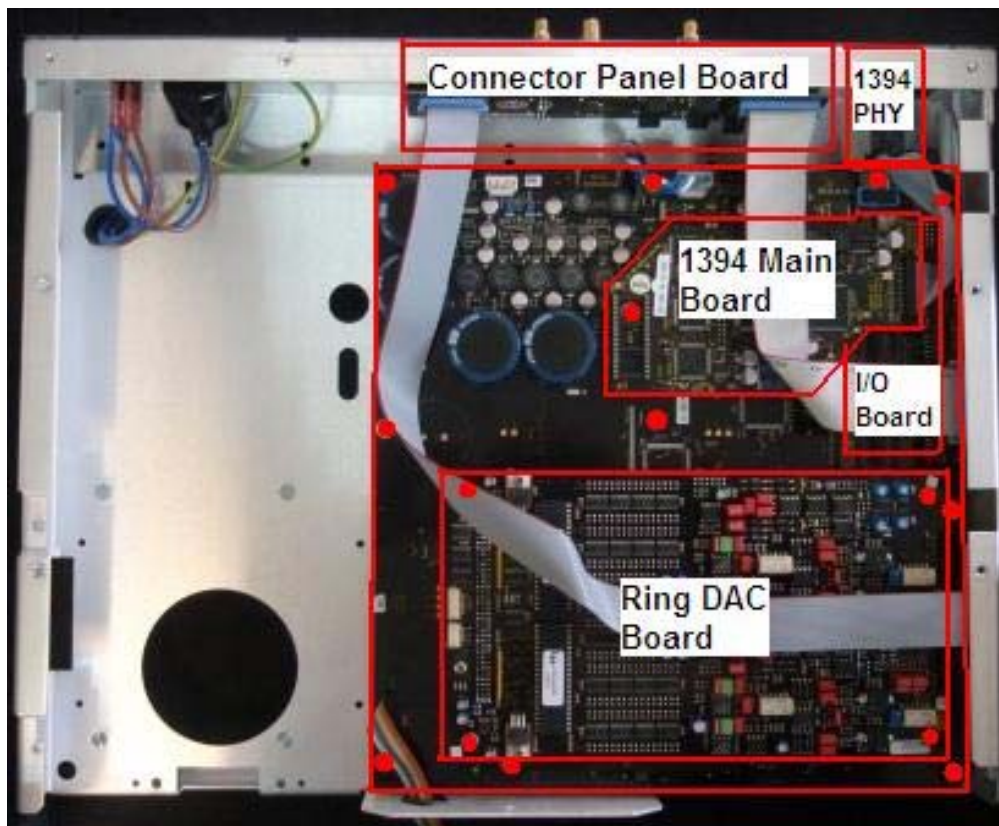


Remove the 3 nuts, then ease the front panel and its fixing bracket off the front of the unit. Carefully disconnect the ribbon linking the Display Board to the Control Board.

Detach the front panel from the bracket to expose the Display & Switch Boards.

## Identification of the sub-assemblies

The fixings are indicated by red dots.



## Removing sub-assemblies

### Top section:

The **Power Board** is protected by a yellow safety cover, fixed by a screw at each corner. The Power Board underneath is fixed by a hex pillar at each corner. Disconnect the cables and lift the board off the 4 studs.

The mains **Transformer** is fixed by a screw in each corner. Disconnect the cables from the Power Board and Control Board, then detach the green/yellow screen wire from the base plate.

### Bottom section:

Remove the 4 screws securing the **Ring DAC™ Board**. Pull the board off the large DIN connector, then detach the connector from the rear edge of the board.

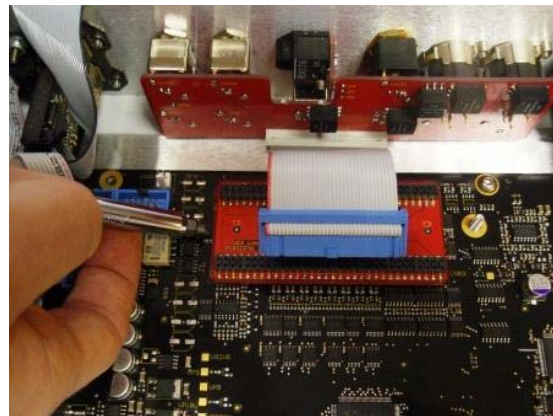
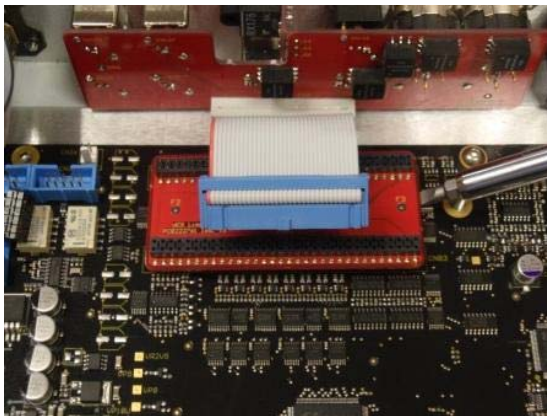
The main section of the **1394 Board** is secured by one screw and washer inside the outline of the ROM socket (U405). Remove the screw and pull the board off the Control board. The **1394 Connector Board** is attached to a bracket which is fixed to the back panel by 3 screws.

The **I/O Board** is a **very tight press-fit** onto Control Board headers CN82/83.



**This board is difficult to remove!** Careless use of tools can cause serious (and expensive) damage to the Control Board, **for which dCS shall not be liable**. If you really need to remove it and you are not confident you can do so safely, refer servicing to dCS.

First disconnect the cable to the Connector Panel Board. Use a 6mm flat-blade screwdriver to lever the right side of the board up a few mm, pivoting on the top of the stud. Carefully lever up the left side of the I/O Board in the same way, protecting the Control board with your fingers. When the I/O board has been loosened, lift it off.

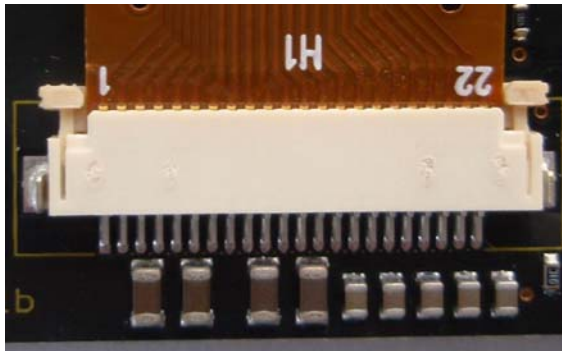


The **Control Board** is secured to the chassis by 9 screws and the pillar that supports the main 1394 Board. Disconnect all cables, remove the fixings and lift the Control Board out of the chassis.

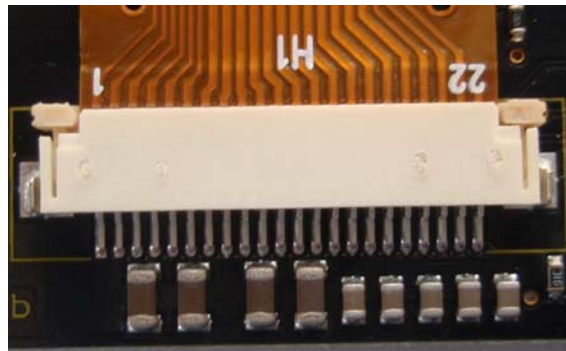
The **Connector Panel Board** is fixed to the back panel by the nuts and screws on the connectors themselves.



The **Display Board** is secured to the back face of the front panel by 4 screws and washers. Release the clamps on CN4 by gently pulling them out of the connector by a few mm. Disconnect the cable from the rotary encoder. When reassembling, take care to ensure the flat flex cable is fully engaged inside CN4 and the clamps are pushed back in.



ZIF clamp open

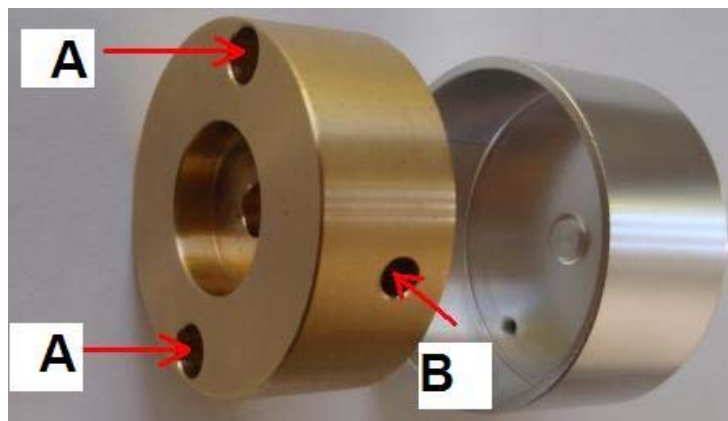


ZIF clamp closed

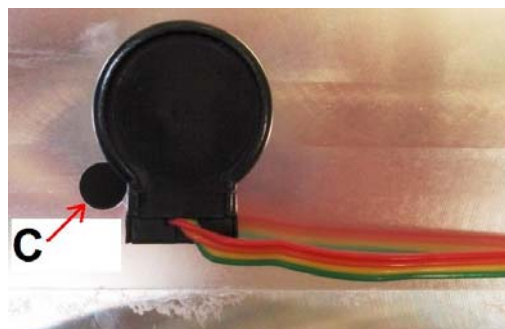
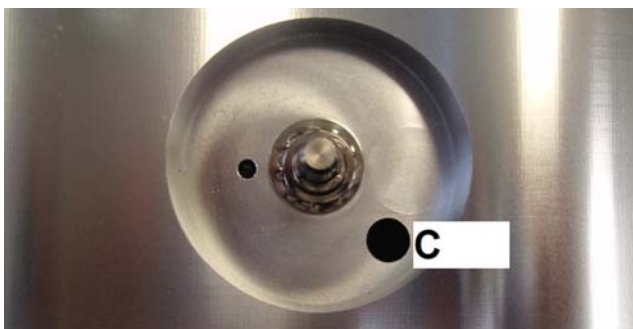
The **Switch Board** is secured to the front panel by 5 screws and washers.

The **LCD module** is clamped in place by foam pads fitted to the back of the **Display Board**. When re-fitting the LCD module, make sure it is correctly located in its machined recess before fitting the Display Board on top.

The **Control Knob** is in 2 parts – a brass core inside an aluminium cap. The 2 parts are fixed together by screws, set 180° apart, which are accessed by a hole (C) in the back face of the front panel. Rotate the knob to see the screws (A) and remove both of them. The cap will slide off the front of the core. The core is fixed to the shaft of the encoder by a grub screw (B), use a 1.5mm Allen key to release this. Slide the core off the shaft.



Remove the nut and star washer to release the **Encoder** from the front panel.



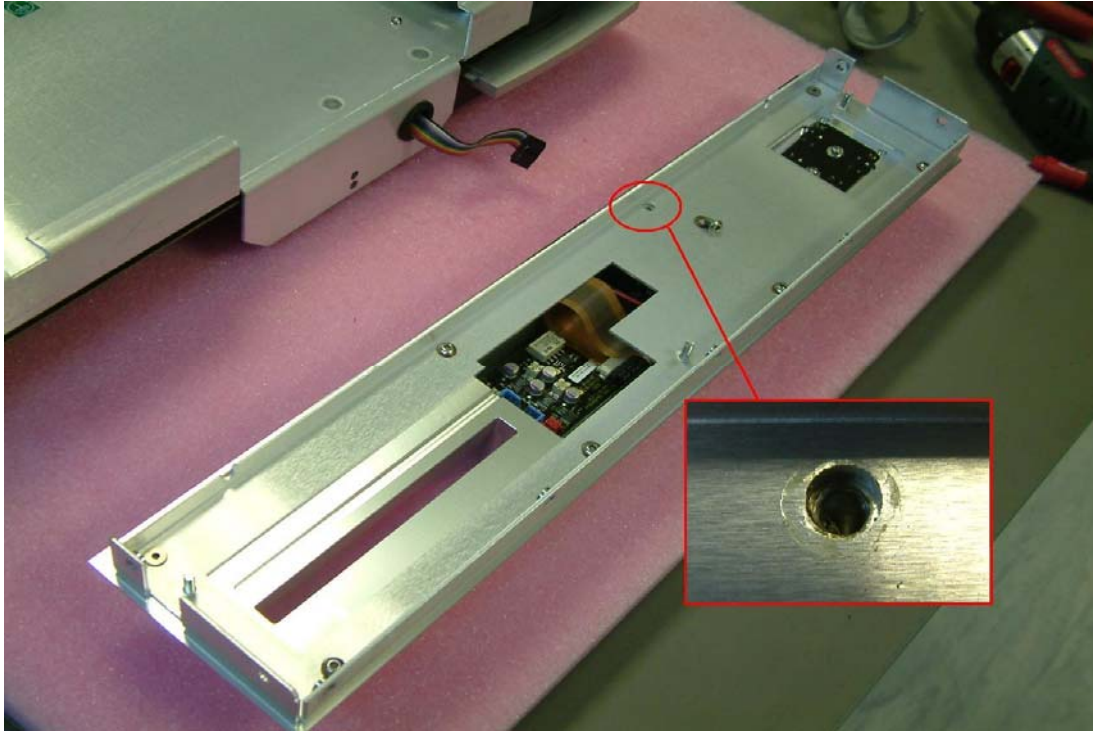


## REASSEMBLY OVERVIEW

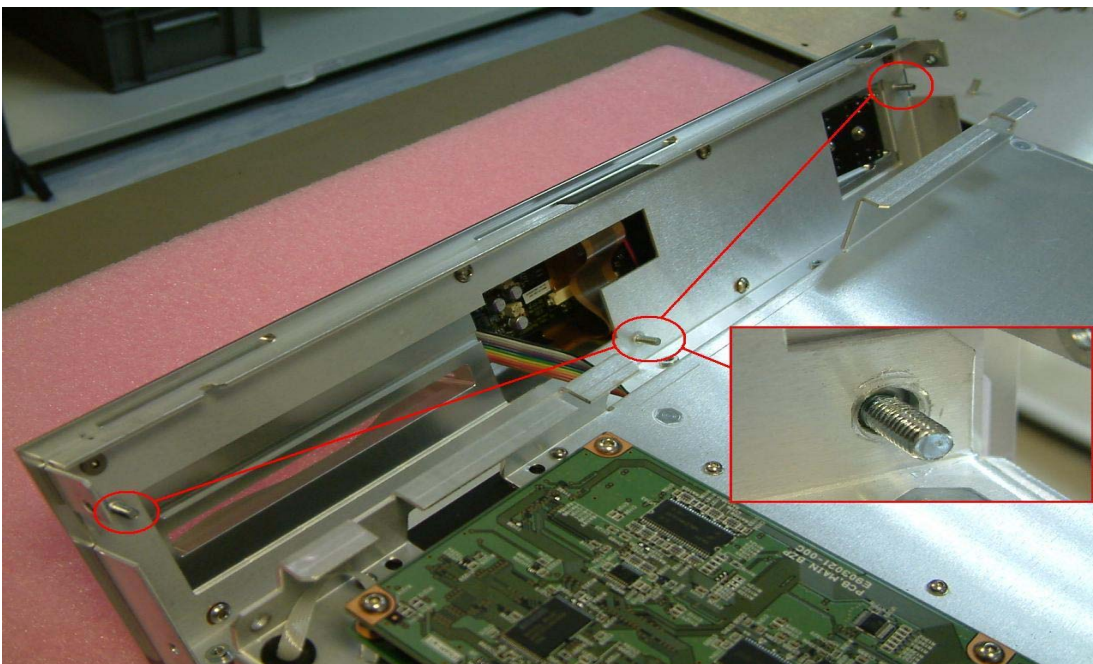
This section deals with squaring and aligning the case parts for when a high degree of dismantling has been necessary. These instructions were written primarily for the Mk3 case (units shipped from March 2009 onwards). (The pictures show a Puccini Player, but the case design is the same.)

### Front panel

Secure the front panel to the front bracket using M4x6 button head screws. As shown below, align the front panel screw holes to the holes in the bracket before tightening.

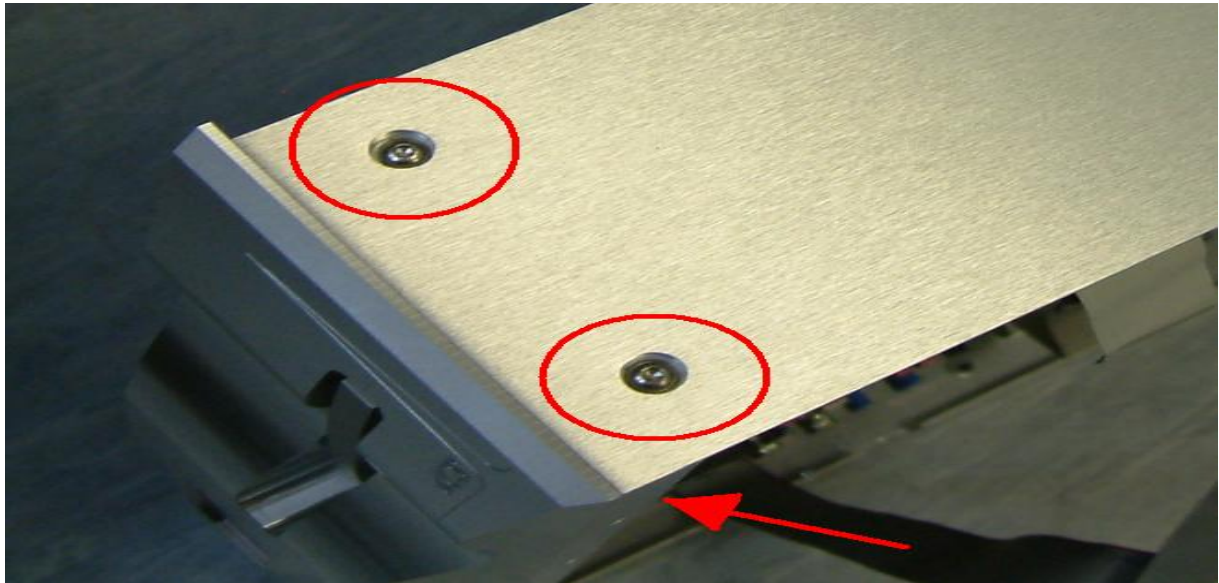


Align the 3 front panel assembly securing studs centrally through the chassis holes and secure with M4 nuts.

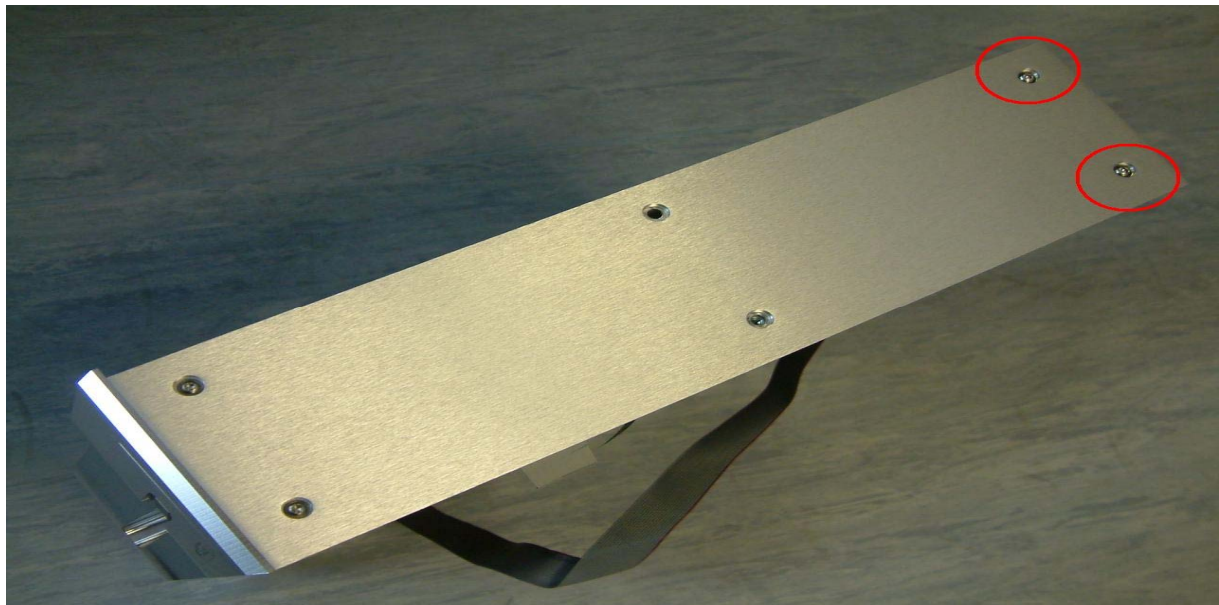


## Side cheeks

Align a side cheek to the front panel, keeping the bottom corner of the side cheek flush with the bottom corner of the front panel, secure using the two front screws only.



Align the rear chassis holes with the side cheek and secure using two M4 screws.

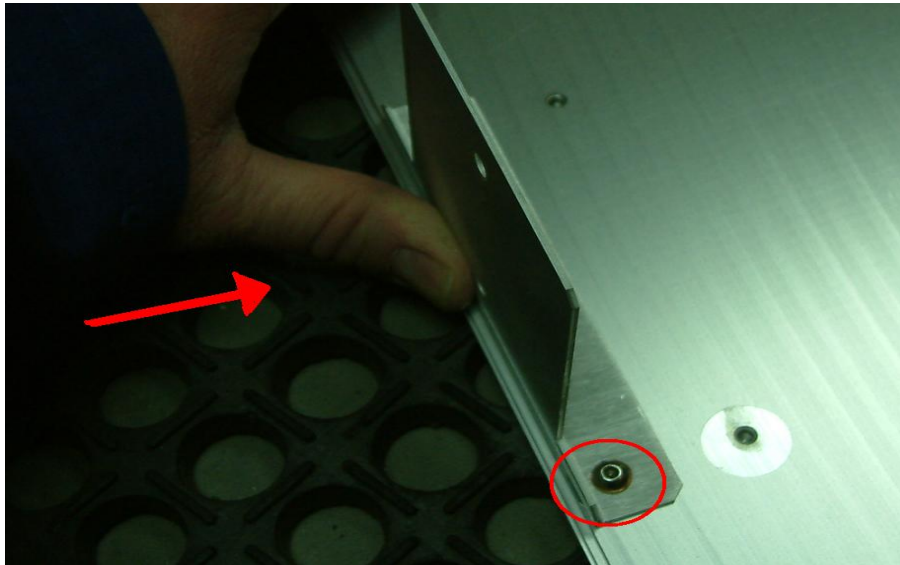


Repeat for the other side cheek.

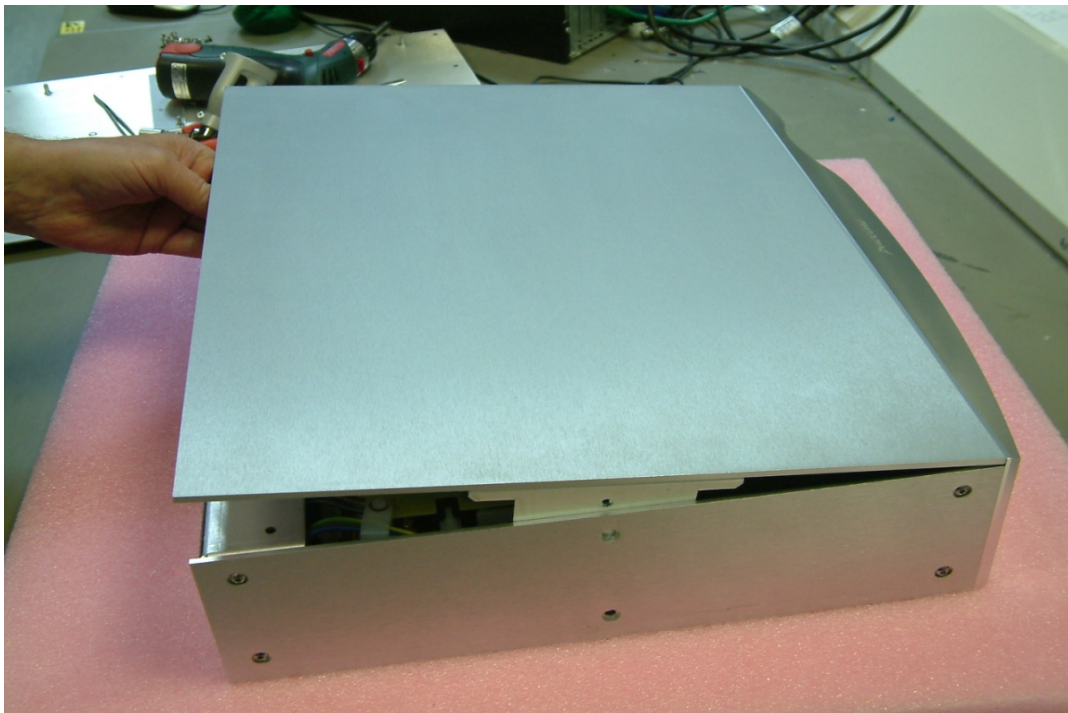


## Top plate

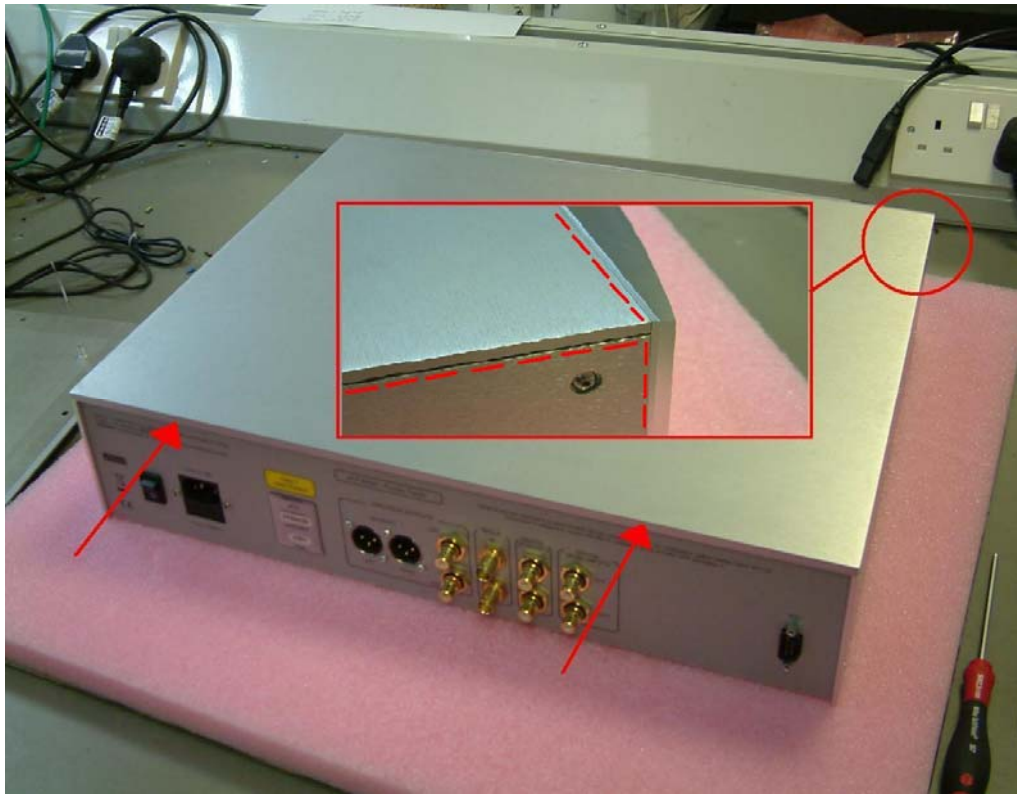
Fit the top plate brackets using M4x6 screws and flat washers. Push the bracket inwards towards the centre of the plate as the screws are tightened.



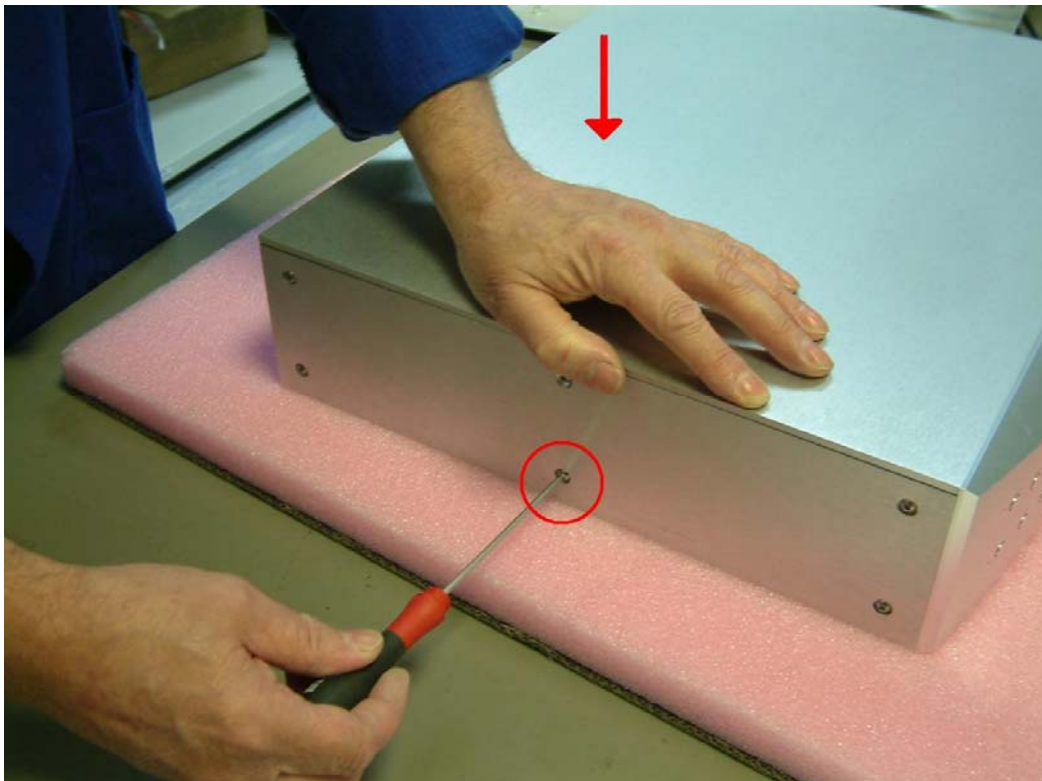
Fit the top plate to the unit, taking care that the top plate brackets do not scratch the outer faces of the side cheeks. Locate the tabs at the front edge of the top plate into the slots in the front panel – this is easier if the panel is inserted at a shallow angle rather than slid in flat.



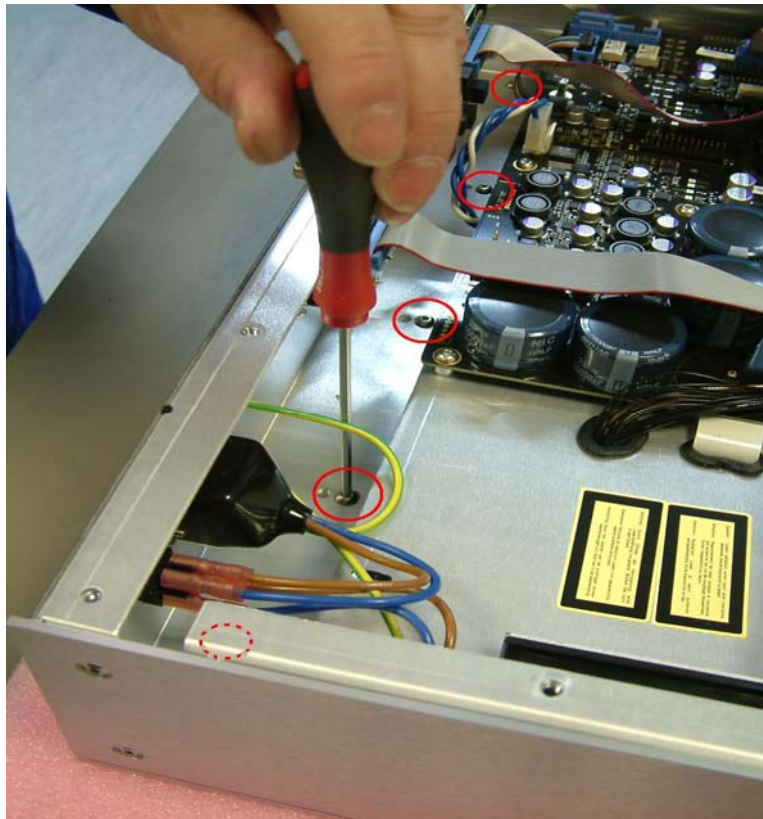
Move the top plate into position by pushing from the rear edge, ensuring that there are no visible gaps where the top plate meets the front panel. Check that the joints between the top plate and side cheeks are tight as shown in the inset below.



Apply hand pressure to keep the joints closed, insert an M4 screw into the lower hole of each side cheek.



Check the unit to ensure all joins are square, then fit M4 screws in the remaining hole in each side cheek. Turn the unit over and fit the five M4x6 screws and washers into the inside face of the chassis to secure the top plate.



## Base Plate

Finally, fit the base plate using twelve M4x8 countersunk screws and two M4x12 countersunk screws where shown below.





## SUBASSEMBLY DETAILS

Subassemblies which are common to other products are detailed in separate Service Manuals.

### Common Subassemblies

#### Control Board DCS156541 v7



The Control Board carries out all the digital processing and provides regulated DC to the unit. This board is common to most other current *dCS* products, it is configured by software. To date, the 7G or 7J versions of this board has been used on all *Paganini DACs*.

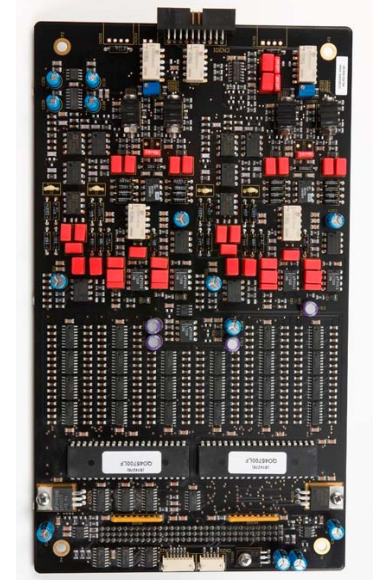
The circuit diagram file is 156540cd7g4.pdf.

The component layout file is 156540cl7g.pdf.

Earlier versions of this board were used on the Classic range.

This board is detailed in the separate **Control Board v7 Service Manual**.

#### Ring DAC™ Board DCS002520



The Ring DAC™ Board takes 2-channel 5-bit data from the Control Board and the Ring DAC™ circuit converts it to analogue. This board is common to all current *dCS* DACs / Players. To date, the 6C and 6E versions of this board have been used on all *Paganini DACs*. 6E adds 2 connectors to suit the *Puccini Player*.

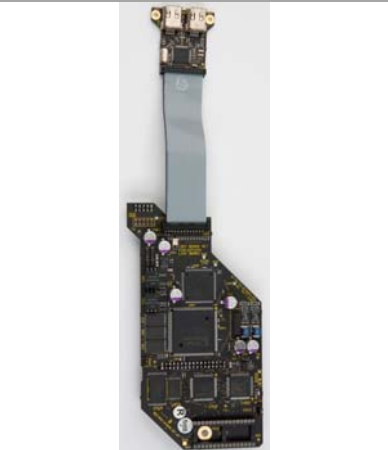
The circuit diagram file is 002520cd6e1.pdf.

The component layout file is 002520cl6e.pdf.

Earlier versions of this board were used on *Elgar* and *Elgar Plus* DACs.

This board is detailed in the separate **Ring DAC™ Board Service Manual**.

#### 1394 Interface Board set DCS160710



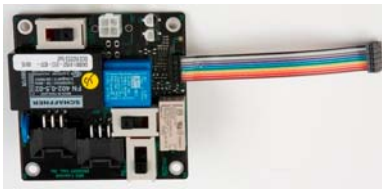
This assembly comprises a main 1394 interface board (LINK) and a small 1394 connector board (PHY), joined by a ribbon cable. It handles the 1394 interface, running its own software, which is downloaded from the Control Board as necessary. The same board set is used in the *Scarlatti DAC* and *Scarlatti / Paganini Transport*, it is NOT compatible with the Classic range.

The circuit diagram file is 160710cd4b1.pdf.

The component layout file is 160710cl4b.pdf.

This board is detailed in the separate **1394-USB Interface Board Set Service Manual**.

### Power Board DCS152223



This board filters the mains supply and allows the power to be switched on/off safely from the front panel POWER button. The connection of the mains supply to the Mains Transformer primaries is set by 3 slide switches. It is common to most current products. The Power Board is covered by a yellow insulator board for safety. Several earlier versions of this board were used on the Classic range.

The circuit diagram file is 152223cd5a1.pdf (current version).

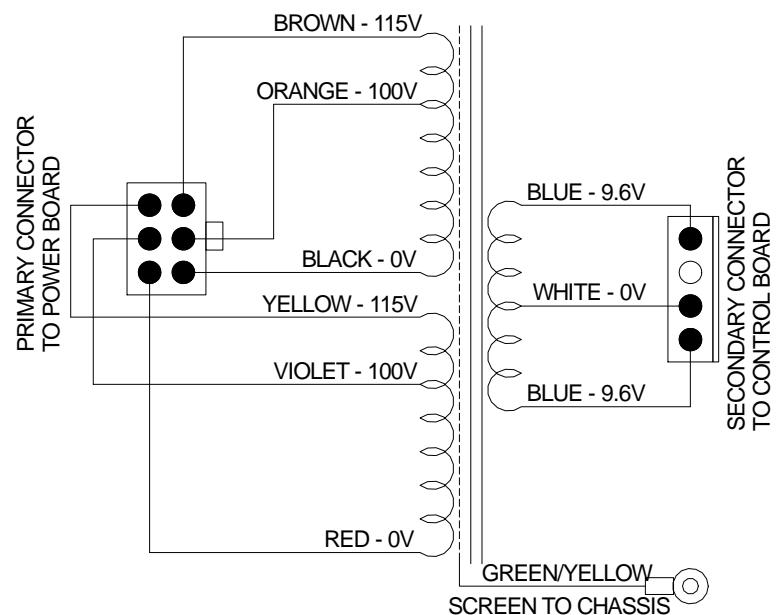
The component layout file is 152223cl5a.pdf (current version).

This board is detailed in the separate **Power Board Service Manual**.

### Mains Transformer DCS002896



This transformer is common to all current products except the *Puccini U-Clock*. The twin primaries allow the transformer to be configured for 100, 115/120, 200, 215/220 or 230/240V.



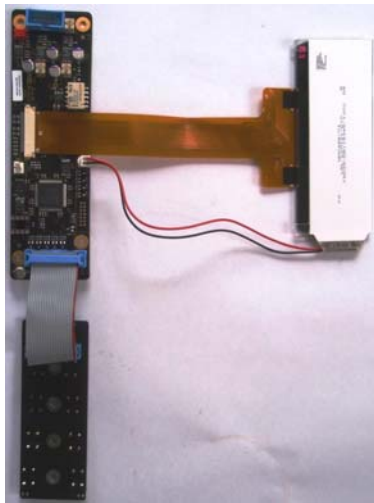
Early versions of this transformer had four primary wires instead of six and offered two ranges: 100-120V and 200-240V. The Power Board used with this early type should be set to 115/120V or 230/240V ONLY (not 100V or 215/220V – otherwise the unit will not power up).

TYPICAL winding resistances are:

- Black to Orange or Red to Violet: 22 ohms
- Black to Brown or Red to Yellow: 25 ohms
- Blue to White: 0.15 ohms

Note that there is a considerable resistance variation from one transformer to another.

### Display Board DCS300750 / Switch Board DCS300755



The Display Board drives the LCD display module MOD0160008 (shown at the right side of the picture) and carries the IR receiver. The Switch Board (shown at the lower left side) carries the switches and LEDs, it connects to the Display Board. Switches and LEDs are fitted to the Switch Board to suit the product. The same boards are used on the *Paganini* series and *Puccini Player*.

To date, the 1A or 1B versions of the Display Board (version 1D will be introduced soon) and the 1A version of the Switch Board have been used on all *Paganini DACs*. The differences between these versions are minor.

CN1 connects to the rotary encoder.

CN2 connects to Control Board CN16. This carries power (+5V / 0V), data, clock, IR remote control and power on/off signals.

CN4 & CN5 connect to the LCD display module.

CN8 connects to the Switch Board.

The circuit diagram files are 300750cd1c1.pdf & 3007551a1.pdf.

The component layout files are 300750cl1c.pdf & 3007551a.pdf.

These boards are detailed in the separate **Display Board Service Manual**.

### I/O Board DCS301761



This board fits onto the I/O header CN82 on the Control Board. CN1 connects to the ribbon cable from CN14 on the Connector Panel board.

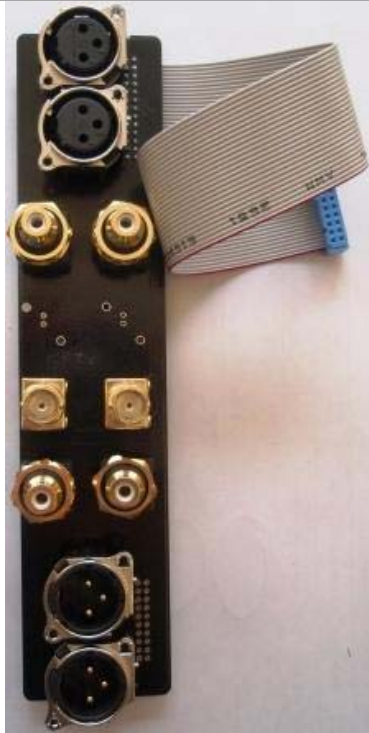
The retention force of CN82 is VERY high. Take great care to avoid damage if it is necessary to detach this board from the Control Board.

The circuit diagram file is 301761cd1a1.pdf.

The component layout file is 301761cl1a.pdf.



### Connector Panel Board DCS300765



This board carries the digital I/O connectors and some digital interface components. The AES and SPDIF interfaces (CN7-12) are isolated with pulse transformers T101-106. All digital connections are brought out on ribbon cable CN14, which connects to CN102 on the I/O Board. The Analogue outputs from CN301 on the Ring DAC Board connect via ribbon cable CN13.

This board is common to the *Paganini Transport / DAC / Upsampler* and the *Puccini Player*. Connectors are fitted to the board as required to suit the model.

The circuit diagram file is 300765cd1a1.pdf.

The component layout file is 300765cl1a.pdf.

## FAULT-FINDING

### Known Faults and Solutions

**Make sure the latest software is loaded.**

**Symptom: Display contrast is poor and cannot be improved**

- Usually caused by a fault on the Display Board (80%), occasionally caused by a fault in the LCD module (20%) – see the **Display Boards Service Manual**.

**Symptom: The rotary encoder operates in only one direction or not at all**

- Caused by either failure of the encoder or a bad connection at the red connector. Replace the encoder assembly.

### Fault Finding Guide

**Symptom: The mains fuse blows**

This can be caused by a brief mains voltage surge. Check that the voltage setting is correct, then fit a new fuse of the correct type (20x5mm T0.5A L). If the new fuse does not blow, soak for 24 hours to verify the fix.

If the new fuse blows, the most likely causes are:

- Incorrect voltage setting. See the Power Board Service Manual for details.
- A damaged surge arrestor on the Power Board. See the Power Board Service Manual.
- The mains transformer short-circuits. This is VERY RARE, so please do not make assumptions! Test the transformer against the circuit diagram on page **23**, checking for short-circuits. Note that the secondary windings (Blue and White wires) have a very low resistance.

To date, we have never seen a fault in the rest of the unit that causes the mains fuse to blow.

**Symptom: The unit fails to power up**

- Is AC reaching the Power Board? If not, check the mains wiring and mains fuse.
- Is the full mains voltage AC passing through the Power Board to the mains transformers? If not, make sure the Power Board is turned on and find the point at which the circuit is broken.
- Is low voltage AC reaching Control Board at connector CN17? With nominal mains voltage, the AC voltage (referred to the chassis) at pins 1 & 4 (blue wires) should be 10V and at pin 2 (white wire) should be 0V. If the voltage is substantially different, check the transformers for signs of overheating.
- To check the Control Board Power Supply circuitry, measure the DC voltages between GND (or the chassis) and the various square test point pads around the board. You will have to lift the 1394 main board clear to do this (switch off the power first!). Typical measurements are:

Name	DC Voltage
VR2V5	+2.500V
VP5	+5.0V
VP9	+8.5V
VP18U	+17.9V

Name	DC Voltage
VP5PSU	+5.0V
VP3PSU	+3.4V
VP3	+3.3V
V1P8	+1.8V

Name	DC Voltage
VN18U	-18.1V *
VP6U	+6.8V
VN8X	-5.9V

\* Note that VN18U remains disabled until the Control Board has booted up.

If any of these measurements are different by more than 5%, this indicates a fault in the power supply or that the power supply is being overloaded by the circuitry it is supplying. Power down, disconnect the 1394 Board and Ring DAC Board, then check to see if this has corrected the voltages.

- If power is reaching the Control Board, check the behaviour of the red diagnostic LED, located near the front right corner of the Control Board. When power is applied, the LED should flash once and then flash twice a few seconds later. It should remain off for about 20 seconds while the board boots up, then turn on. If this does not happen but there is some LED activity, the microcontroller is not running. Try reloading the software from ROM, as described on page **34**.
- Detach the DAC Analogue Board from the Control Board and move it out of the way. At the rear right corner of the Control Board, you will see 2 metal-cased crystal oscillators X01 and X02. There is provision for 4 crystals on the board, a red LED behind each turns on when the crystal is powered. At power up, the LED behind X02 should turn on and stay on. During boot-up, the LEDs behind the other 3 crystal positions should flash together on 2 occasions. Check that a 22.6MHz clock appears at U626 pins 3 & 4. If not, X02 or U613 may be faulty.
- If the Control Board microcontroller is running, CN12 may be connected to a PC running Hyperterminal to extract diagnostic information from the Control Board. Please see the **Control Board v7Service Manual** for more information.

**Symptom: The unit fails to lock at some sample rates**

- Check that the clocking arrangements are consistent with the data rate. For example, the DAC cannot lock to a clock at 44.1kHz while receiving data at 48, 96 or 192kS/s, because the two rates are not exact multiples.
- Select the required input and set the SYNC source to Audio. If the unit locks correctly to incoming data at 44.1, 88.2, 176.4kS/s or DSD but not to incoming data at 32, 48, 96 or 192kS/s, this suggests a fault near crystal X01.
- Select the required input and set the SYNC source to Audio. If the unit locks correctly to incoming data at 32, 48, 96 or 192kS/s, but not to incoming data at 44.1, 88.2, 176.4kS/s or DSD, this suggests a fault near crystal X02.

**Further tests**

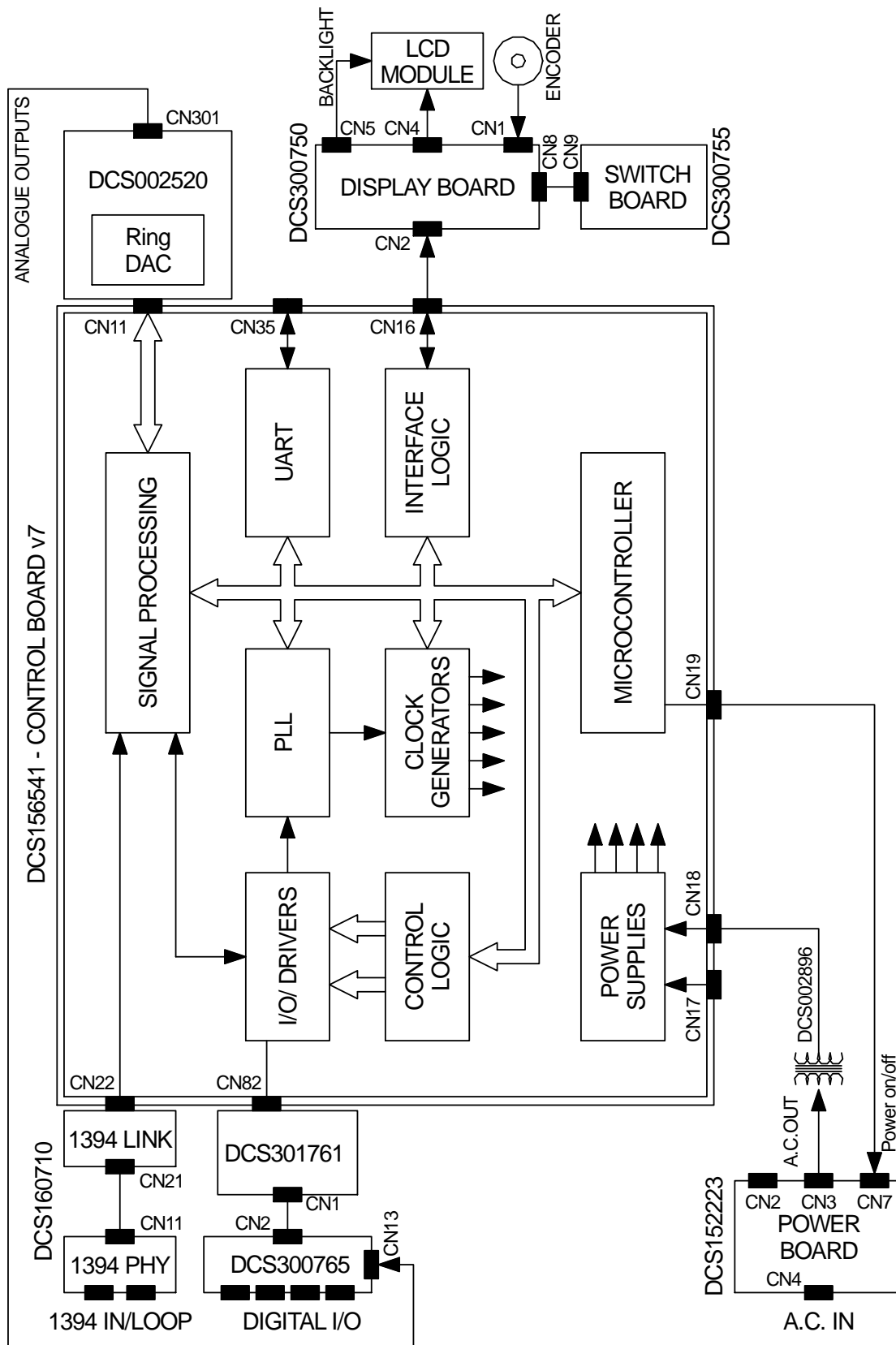
In most cases, the above information will be sufficient to get an unresponsive unit up and running, or indicate a serious fault on the Control Board – which is normally dealt with at *dCS*.

For faults which affect the analogue outputs, please refer to the **Ring DAC™ Board Service Manual**, as this is the most likely location of the fault.

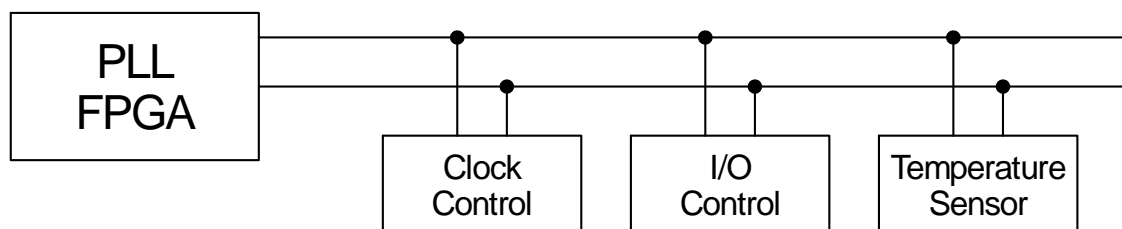
For faults which are restricted to the 1394 interface, please refer to the **1394-USB Interface Board Service Manual**.

If the Display Board is not working correctly but the unit is still working correctly as a Transport, please refer to the **Display Board Service Manual**. Note that an intermittent ribbon cable connection to the Control Board is a fairly common cause of Display Board problems.

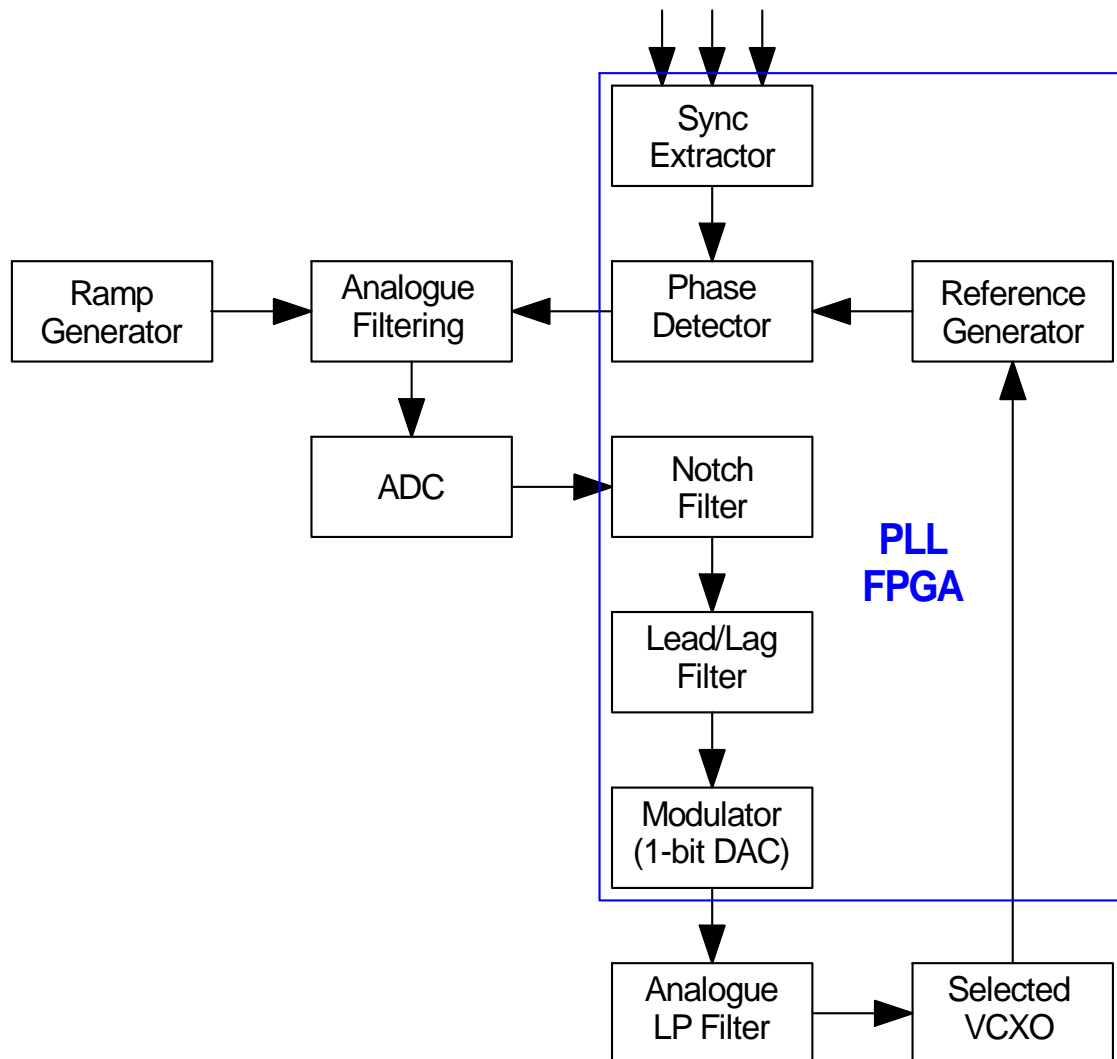
## BLOCK DIAGRAM



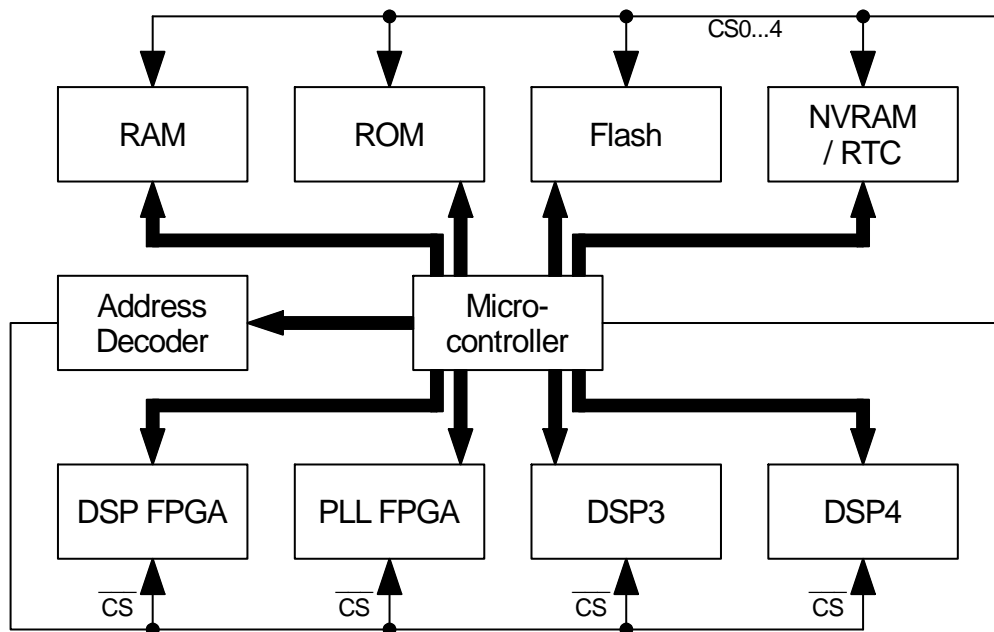
## PCM Audio Path



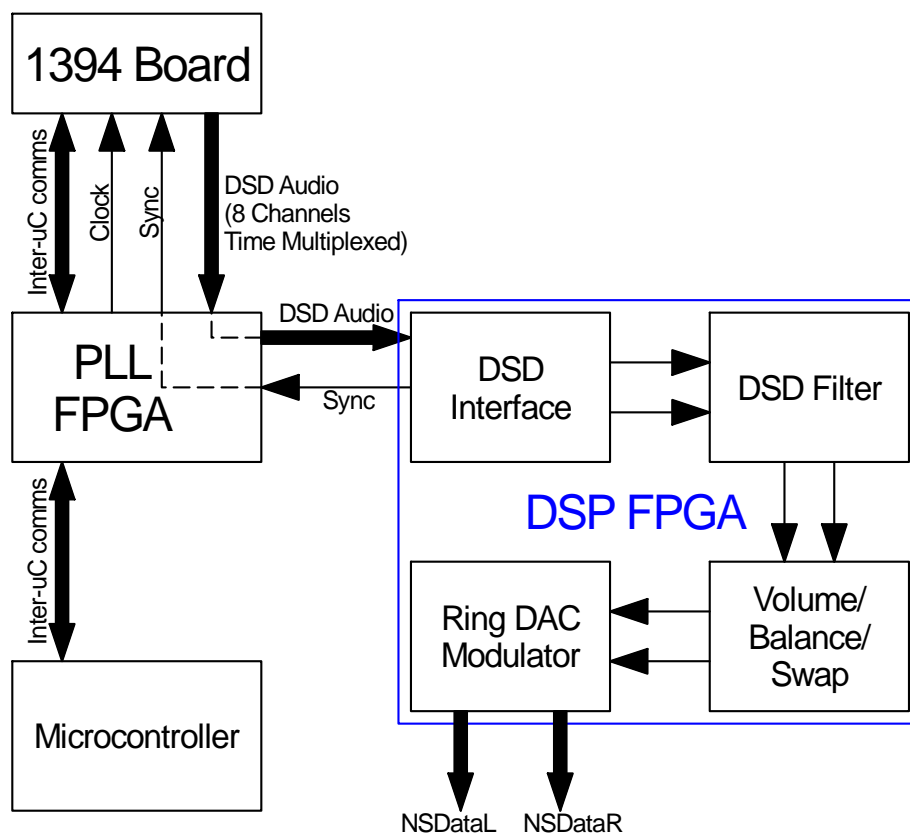
## PLL



## UA & UD



## 1394 Interface



## CD UPDATE PROCEDURE

### dCS Paganini DAC v1.20 Software Update



If you are loading a software version later than 1.20, follow the instructions provided with the disc.

Please read these instructions through fully at least once before running the update.

The CD supplied with these instructions enables the software in any *dCS Paganini DAC* to be updated to version 1.20. *dCS* contact information is given at the end of this document.

The actual displays shown on your *Paganini DAC* during the upgrade may vary slightly depending on what version software is currently installed. If this occurs, it is not a cause for concern.

#### Update Procedure

- Disconnect any 1394 cables from the DAC.
- Mute your power amplifier.
- Load the *dCS* Update CD into the Transport, making sure it is in **STOP** mode. The disc must **not** be playing.
- Connect the Transport's AES or RCA output to the matching input of the DAC and use the **Input** button to select that input. If necessary, use the **Sync** button to set the DAC to **Audio** sync mode. The DAC should lock and display **00/44.1**.
- Open the *Paganini DAC*'s menu by pressing the **Menu** button on the front panel. Press the **Menu** button again to select the **Information** menu. Press the **→** button 3 times to highlight the **CD Update** page and press the **Menu** button to start the update. The display sequence is shown below, with approximate times.

00:00    **Please wait** - **Please start CD** are displayed in sequence.

Press the Transport's **Play** button. The update is largely automatic from this point.

00:15    **Scanning** – **OK** are displayed in sequence.

If there is anything wrong with the *dCS* CD that has been loaded, or it does not match the product, or the new software will not run without a hardware update, the unit will display **Wrong Disc!** and revert to normal operation. Don't worry – the internal software is unchanged. If either of the above cases occur contact your *dCS* distributor or *dCS*.

00:35	<b>Ver 1.20</b>	
01:25	<b>1/32</b>	The first block of data is read from the disc.
02:25	<b>2/32</b>	The second block of data is read ...
...		
33:25	<b>32/32</b>	The last block of data is read.
34:15	<b>Please wait</b>	<b>DO NOT SWITCH OFF.</b> The unit reboots.
34:20	<b>Paganini DAC</b>	<b>DO NOT SWITCH OFF.</b>
35:50		The unit reboots.
36:00	<b>00/44.1</b>	The unit finishes uploading the new software.

- Switch the *Paganini DAC* off (NOT just to sleep mode), wait 10 seconds, then switch on again. This re-boots the 1394 interface.

Your *Paganini DAC* is now ready for use. Remember to re-connect the 1394 cable.



## Problems?

- If the display does not change for more than 5 minutes or there is a power failure, switch off the unit at the rear panel switch, wait 10 seconds, then switch on and start the update again.
- If the disc skips or you accidentally advance the Transport, the unit will display **Skipped!** Switch off the unit at the rear panel switch, wait 10 seconds, then switch on and start the update again.
- If the **Non Seq** message appears on the display, the most likely cause is that the update CD is faulty. There is no cause to worry as the original software is backed up inside the unit. Check the disc for dirt or damage. If the disc appears to be dirty, wipe it gently from the centre outwards with a dry soft cloth. If it is damaged, contact your local *dCS* distributor or *dCS* for a replacement. If it appears to be OK, run the **CD Update** routine again to load the new software.



If your *Paganini DAC* starts up correctly but has a problem of some kind, do not repeatedly CD Update as this **cannot** solve the problem.

Routinely CD Updating with the same software is pointless and inadvisable.

## What's new in v1.20?

The new software adds some useful new features to your *Paganini DAC*. For more information, please download the latest version of the *Paganini DAC User Manual* from [www.dcsLtd.co.uk/page/support](http://www.dcsLtd.co.uk/page/support). Printed copies of the *Paganini DAC* 1.2x manual may be purchased from *dCS*.

In brief, the new features are:

1. The AES and SPDIF inputs will now operate in single-wire mode at 176.4 and 192kS/s.
2. The Word Clock input will lock to 176.4 or 192kHz word clock, as long as the data sample rate is an exact multiple.
3. Some minor bugs have been fixed.

## RE-LOADING SOFTWARE FROM ROM

### Re-loading the Control software

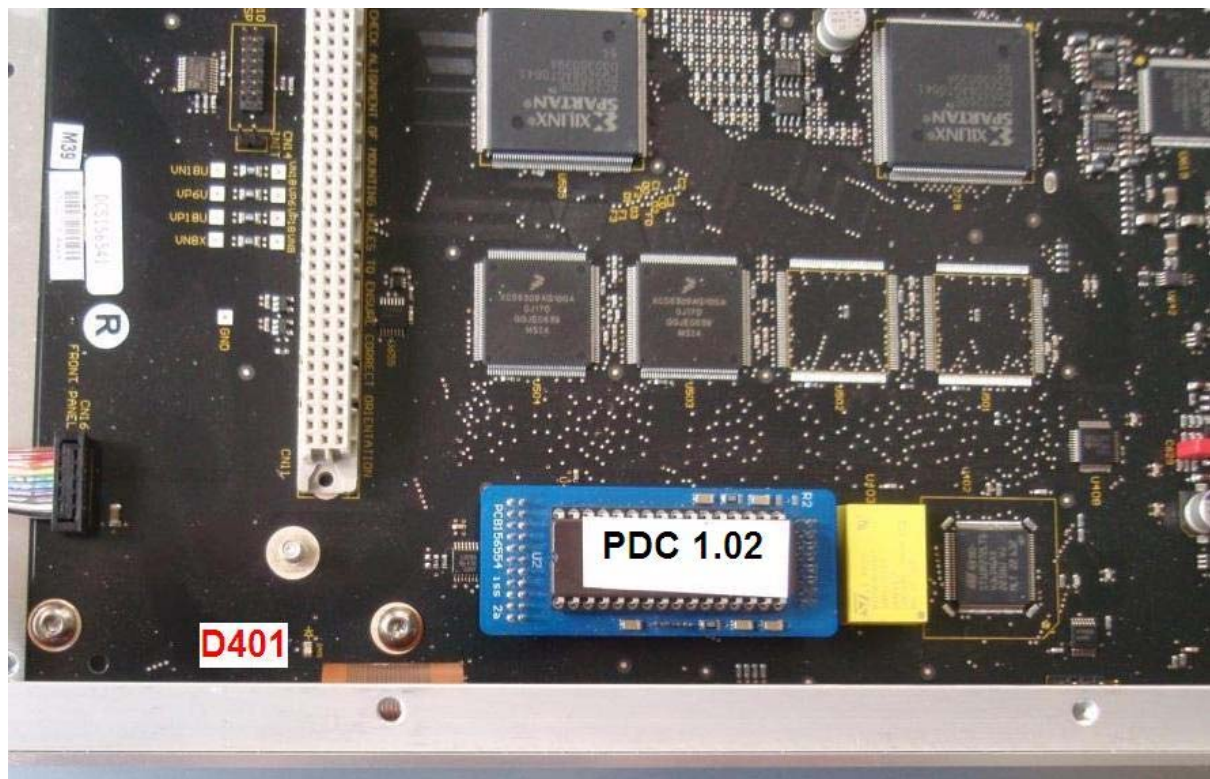
Normally, software can be updated from CD without opening the case, provided the unit boots up and runs correctly.

Occasionally, the software stored in the flash memory becomes corrupt, usually as a result of a power failure or user error while CD Updating. There is also some evidence that nearby electrical storms can do this. If the software has become corrupt, it is necessary to reload the unit from a ROM. To do this, you will need a DCS156554 programmer board and a ROM labelled "**PDC**" which is loaded with the *Paganini DAC* software. You can load an older version from ROM and then CD Update to the current version if necessary.

- Power the unit up and then pull out the power cable.
- Remove the base plate. Fit the **PDC** ROM to the socket in the programmer board, ensuring that the notched end is beside the "U2" label.



- Fit the programmer board onto the 3 headers near the edge of the Control Board, as shown below, making sure all pins fit into the sockets on the underside of the programmer board.



- Connect the power cable.

The Control Board will power up, red LED D401 will flash once and LEDs elsewhere on the board will turn on.

The loading process takes several minutes, please be patient. When it is complete, the red LED D401 will start flashing steadily.



If D401 is still off after more than 10 minutes, the software has failed to load for some reason. Pull out the power cable, make quite sure the programmer board and ROM are correctly seated and repeat the process.

- Disconnect the power cable.
- Remove the programmer board and ROM, put them somewhere safe in anti-static packaging.
- Reassemble the unit, remembering to connect the Display Board cable.
- Open the menu and check that on the **Information / Version Information** page, the **Control version** matches the ROM issue.
- Check that the unit is operating correctly.

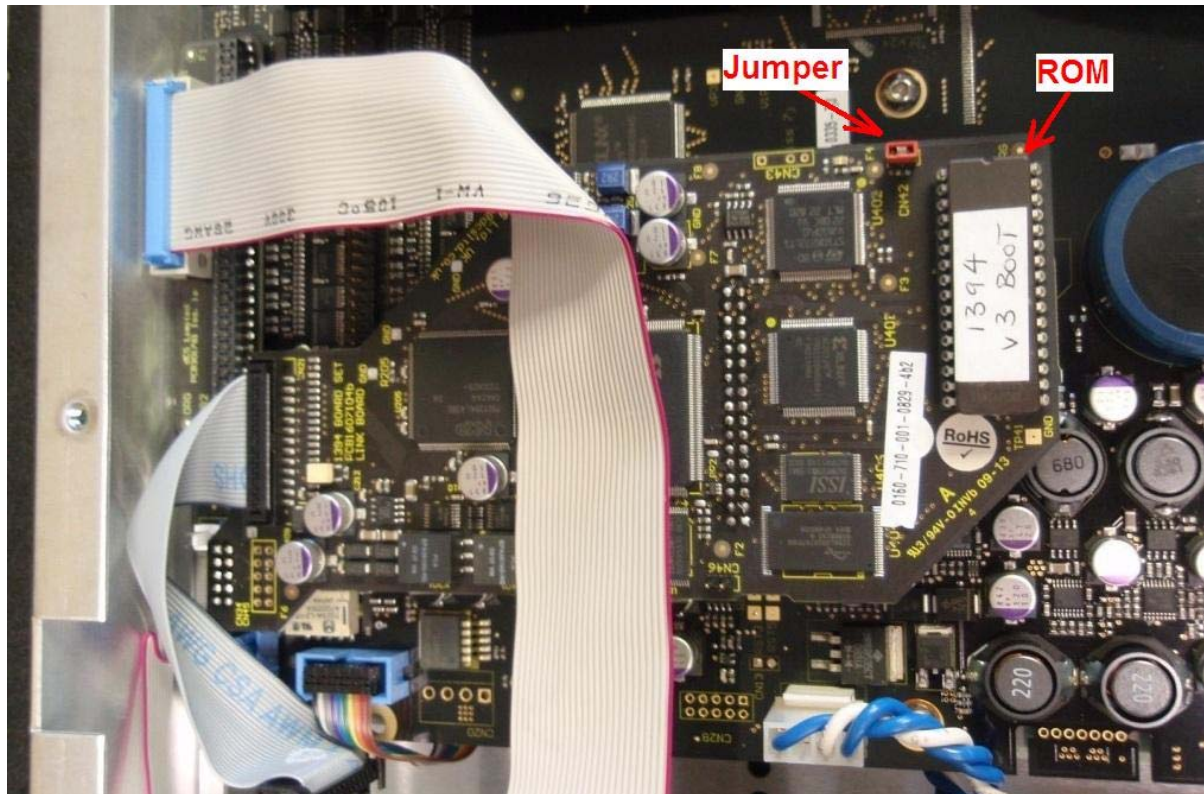
## Re-loading the 1394 code

If the 1394 Board stops responding, either due to an environmental influence or a mistake while CD Updating, the 1394 main board must be reloaded with a ROM. You will need a ROM labelled “**1394 v3 BOOT**” (which is loaded with basic 1394 code) and a 2-way jumper.



Note that 1394 code v1 and v2 are NOT compatible with Paganini and must not be loaded into Paganini products.

- First, make sure the Control software is up to date. If it is not, CD Update before proceeding.
- Power the unit up and then pull out the power cable.
- Ensure that all 1394 cables are disconnected from the unit.
- Turn the unit over and remove the base plate.
- Fit the **1394 v3** ROM to the socket U405 on the 1394 main board, ensuring that the notched end is towards CN42. Fit the jumper to the nearby programming header, CN42.
- Connect the power cable and observe the red LED near CN42.



The LED will flash once per second for about 45 seconds, then turn off. After another 35 seconds, the LED will flash rapidly to indicate the re-load is complete.

- Disconnect the power cable.
- Remove the 1394 ROM and jumper, put them somewhere safe in anti-static packaging.
- Replace the base plate.
- Power up the unit.

The 1394 Board is now loaded with a basic version of the 1394 code. Once the unit has booted up, the Control Board will download the current 1394 code automatically. The unit will display **1394 Update**, a progress bar and **Updating...**

DO NOT SWITCH OFF. The progress bar will fill in over the next 6 minutes, then **Updating...** will disappear. After another 30 seconds, the update is complete and the display will return to normal.

- Open the menu and check that on the **Information / Version Information** page, the **1394 version** is 3.00 (or later).
- Check that the unit is operating correctly.