

# ***dCS* 1394 / USB Interface Board**

## **Service Manual**

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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.



Always use genuine replacement parts supplied by *dCS*.

### Disclaimer

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

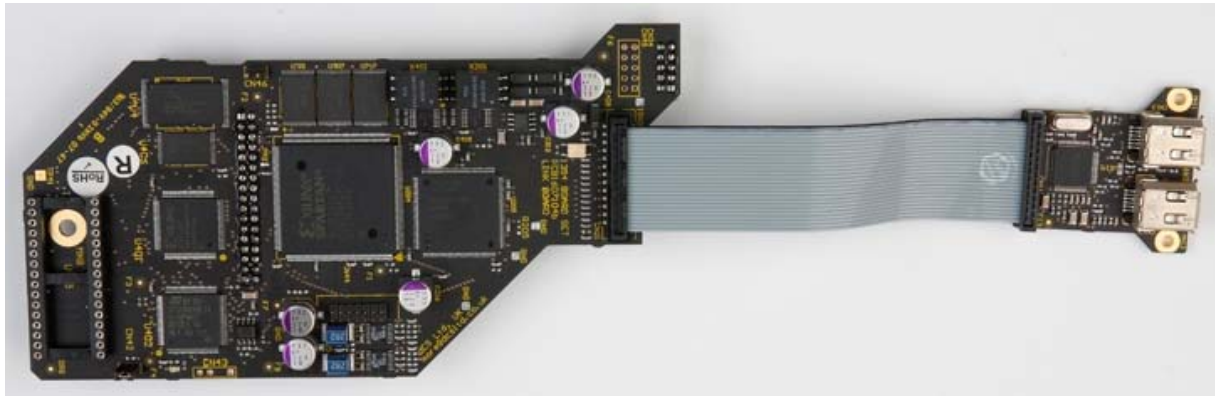
### Confidentiality



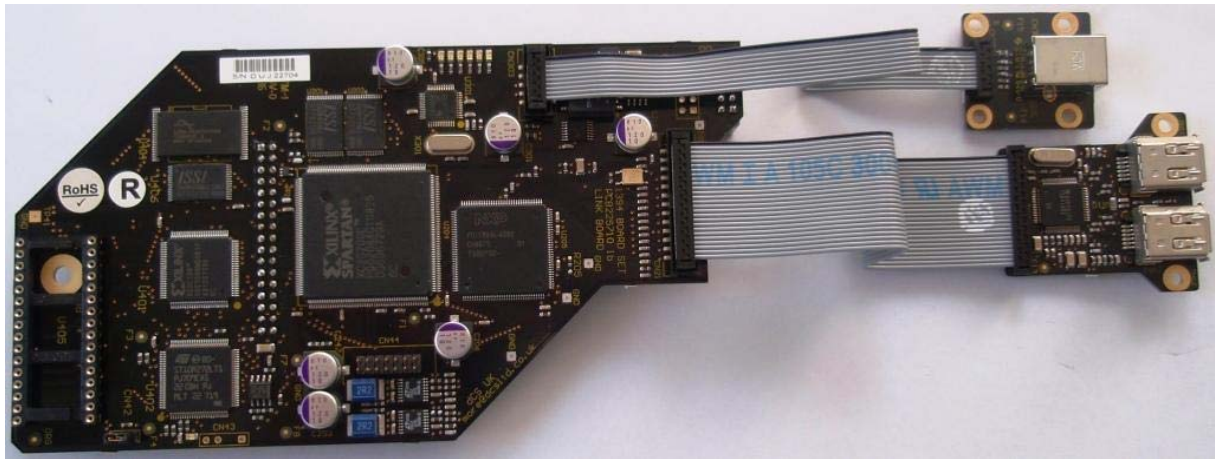
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## ASSEMBLY DESCRIPTIONS



DCS160710 – 1394 only  
Used in the *Scarlatti / Paganini Transports* and *DACs*.



DCS225710 – 1394 & USB  
Used in the *Scarlatti / Paganini Upsamplers*.

These two board sets comprise a main 1394 interface board (LINK) and a small 1394 connector board (PHY), joined by a ribbon cable CN11/CN21. They handle the 1394 interface, running their own software. The main boards are mounted on the Control Board via CN22 and CN34, they are secured by a fixing screw inside the outline of U405 to a pillar. DCS225710 also features a USB interface, which connects to via a second ribbon cable CN302/CN303 to USB connector CN301 on a separate connector board.

+5V DC (VP5) is supplied from the Control Board, it is converted to +3V (VP3) and +1.8V (V1P8) by switch-mode regulators U208 and U213. Correct operation of the power regulators and watchdog chip U211 are indicated by PGOOD going high (+3.3V). A power supply fault causes PGOOD to go low and U401 to reset the board or prevent it booting up.

The board is supervised by a microcontroller system comprising micro U402, ISP U401, SRAM U406 and flash memory U404. During production, a configuration code is loaded into ISP U401 via CN44 and 1394 code is loaded into flash memory U404 from a ROM in programming socket U405. It is rarely necessary to reload either of these in the field, although it may be possible to corrupt the flash contents by failing to follow the CD Update instructions. Instructions for reloading the flash memory from ROM can be found in the manual for the unit. During a normal CD Update, any new 1394 code is automatically downloaded from the Control Board into U404 after the main update is complete. Note that not all CD Updates involve new 1394 code.

After the board has booted up, normal operation of the microcontroller is indicated by red LED D401 flashing once every second.

Signal processing and decoding for the 1394 interface is carried out by 1394 Link chip U205, FPGA U204 and SRAM chips U201 & U202. The Link chip connects to 1394 PHY chip U110 and the two 6-way 1394 connectors CN12 & CN13. U110 is clocked by a 24.576MHz crystal oscillator U111. U203/X201/U207 (plus U407/TR401-404/X401 on DCS160710) provide an isolated power supply to the PHY chip.

The DCS225710 main board also features a USB interface chip U301 which is clocked by 6MHz crystal X301. The 6 LEDs near U301 are used for debugging.

- D301 : Will be on when the device receives USB resume, off otherwise.
- D302 : Will be on when the device receives USB suspend, off otherwise.
- D303 : Will be off until a name requested by the host.
- D304 : Will be off, until USB configuration is set by the host.
- D305 : USB Start of Frame received – when USB is connected, it should be dimly lit.
- D306 : Pseudo Start of Frame received – should be off.

The LED sequence of a normal unit from cold, with no USB is:

- All LEDs off.
- Plug in the USB cable, D305 will start flickering as USB frames come in, then D304 & D303 will come on, and D305 will go dim.
- If you unplug the cable all the LEDs will be off, apart from D302
- When you plug the cable back in, D301 will flash briefly, then D305 flickers, followed by D304 & D303 on and D305 will go dim.

## Drawings

	Circuit diagram file	Component layout file
1394 Board	160710cd4b1.pdf	160710cl4b.pdf
1394 & USB Board	225710cd1c1.pdf	225710cl1c.pdf

## 1394 Code

The 1394 code issue loaded in the board may be checked from the unit's **Information / Version Information** menu page.

DCS160710 – used on the *Scarlatti & Paganini* Transport & DAC, the current code version is **3.01** (at the time of writing).

DCS225710 – used on the *Scarlatti & Paganini* Upsampler, the current code version is **4.01** (at the time of writing – this will be updated to 4.02 for the *Paganini* Upsampler).

Tests to date indicate that these versions are externally compatible with 1394 code **Db:2.06** used on the Classic range.

## HARDWARE HISTORY

The original 1394 Interface Board DCS002710 was introduced on the Elgar Plus & Delius DACs, the Purcell Upsampler and the Verdi Transport in 2001. Updated versions were used on the Verdi La Scala & Verdi Encore Transports. In 2006/7, the imposition of the RoHS Directive (which bans lead and certain other heavy metals from manufactured products) necessitated a re-design of the electronics used in all dCS products, bringing production of the “Classic” range (Elgar, Verdi, etc.) to an end, prompting the launch of Scarlatti, Paganini and Puccini.



DCS160710 & DCS225710 are similar to DCS002710, the 1394 interface board used on the Classic range, but they are not compatible with the older products.



You cannot add a USB interface to a product by replacing DCS160710 with DCS225710! If the Control Board software does not support USB, the USB interface will not work.

The 1394 Interface Boards have been steadily updated to improve reliability and accommodate new product designs. The various modification states are identified by a 3-character issue code such as **1c1**, each state is supported by a dCS Modification Note.

The Modification Notes listed below describe these build states, they are available on request where relevant.

### DCS160710

Modification notes up to **160710mn03** were actioned before the current product range was launched, and so are not relevant to field modifications. The current versions are **4a3** and **4b2**, they are equivalent.

### DCS225710

**225710mn01** was actioned before the Scarlatti Upsampler was launched, and so is not relevant to field modifications. The board version is **1b2**.

**225710mn02** updates the board layout to include mn01 and so is not relevant to field modifications. The board version is **1c1**, it is equivalent to **1b2**.

## Product-Specific Variants

None – all boards are standard.

## KNOWN FAULTS & FIXES



Verify the fault and then check the issue of software that is loaded. If updated software is available, load it and then re-check that the fault is still present.

Both USB and 1394 are BUS systems – this means you can connect other (suitable) equipment to the bus and expect it to work. It also means that a fault at one point on the bus can stop the whole interface operating!

### 1394 faults



The dCS 1394 interface uses proprietary encryption and must be assumed to be incompatible with other manufacturer's 1394/FireWire interfaces.

When diagnosing 1394 problems, it is ESSENTIAL to know which other dCS units are in the system, their serial numbers, how they are connected, clock settings, main software issues AND 1394 code issues. If you have only a small part of this information, there is a high risk that your time is being wasted, so be firm.

At present, all dCS 1394-equipped units are one of two types:

- CD Transports and Upsamplers are **Transmitters**.
- DACs are **Receivers**.

If the DAC is displaying a 1394 error message, most people assume the DAC is at fault. Since a **Receiver** is the only type of 1394 device that checks the bus for errors, the DAC is the only unit that will display an error message, even if the fault is elsewhere. A **Transmitter** unit will not report errors. It is certainly possible that the fault is in the DAC, but the error message has not proven this.

While the system is booting up, the DAC will display a variety of error messages. In a correctly set-up system, the system should settle down within a minute of power-up with the DAC displaying the name of the source (e.g. **STT**).

#### **Symptom: The DAC in 1394 mode reports “No Comms”**

The DAC's 1394 interface is not communicating with the Control Board. Possible causes are:

- The DAC's 1394 Board has stopped responding. Try re-booting the DAC.
- During a CD Update, the Control Board is too busy to service the 1394 interface, so the interface stops responding. Make sure you re-boot the unit at the end of the update, to re-start the 1394 Board.
- An unstable mains supply can cause a 1394 Board to stop responding.
- A hardware fault in the DAC (not yet seen on current products).



**Symptom: The DAC in 1394 mode reports “Search..”**

If this does not clear, the DAC has failed to find an active 1394 Transmitter (no asynchronous communications). Possible causes are:

- There is no active dCS 1394 source connected.
  - A 1394 cable connector is not fully engaged in the socket.
  - A broken 1394 cable. Substitute a spare 1394 cable.
  - The Transport or Upsampler has stopped responding. Try re-booting the whole system.
  - During a CD Update, the Control Board is too busy to service the 1394 interface, so it stops responding. Make sure you re-boot the unit at the end of the update, to re-start the 1394 Board.
  - The 1394 bus is connected in a loop rather than a tree – so the system cannot find the root. Examples of loops are: (1) two 1394 cables connected between the Transport and DAC, (2) three 1394 cables connected Transport to Upsampler to DAC to Transport. Reconnect the cables to break the loop.
  - Purcell or Verdi – if the Transmit menu page is set to “Inactive”, change the setting to “Active”.
  - At present, the dCS 1394 interface uses proprietary encryption. A 1394 (FireWire) connection from another manufacturer’s equipment will result in a permanent **Search** message.
- 
- Corruption of the 1394 code, indicated by the red LED D401 on the 1394 Board failing to flash once per second. Re-load the 1394 Board from a suitable ROM.
  - A hardware fault in one of the units (not yet seen on current products).

**Symptom: The DAC in 1394 mode reports the source name and “No Audio”**

The DAC has identified an active 1394 Transmitter but there is no audio data. Possible causes are:

- There really is no audio data – for example, the disc is not playing.
- The Transmitter is responding but isochronous communications have stopped (not yet seen on current products). This has been seen in the Classic range where the unit is left on or in sleep mode for long periods – re-boot.
- If you have more than one 1394 source connected (e.g. Transport and Upsampler), make sure the DAC is set to the right 1394 channel (e.g. **STT** or **SUP**). Select the 1394 channel with the DAC’s **INPUT** button or the Pronto’s **1394#0**, **1394#1**, ... buttons.
- A hardware fault (not yet seen on current products).

## USB Faults

To date, we have not received any reports of faults with our USB hardware.

The interface is designed to work with computers/servers fitted with USB v1.5 or later.

Operation has been tested with PCs running Windows™ Vista or Windows™ XP (SP2 or later), Apple™ Mac OS X (10.5.4 or later) and sound servers. All must be running software to stream PCM audio data via the USB interface. The operating system must be set to use the Upsampler as the default output device, as described in the Upsampler manual.

For best sonic results, disable any sample rate conversion being performed by the operating system (and QuickTime, if this is in use), as this is usually done badly. This is done by setting the output sample rate to be the same as the music file sample rate. Programs such as ASIO4ALL avoid the need for this.

When using iTunes, make sure the QuickTime word length is set to 24 bits.

There are many examples of streaming software, we have successfully used Windows Media Player 11, iTunes, FooBar and others.



dCS cannot accept responsibility for resolving IT set-up problems or bugs in third-party software.



## FAULT-FINDING GUIDE

### Identifying a unit with a genuine 1394 fault

If the system consists of a Transport & DAC and the information above did not resolve the problem, the only option is to substitute a different dCS DAC or Transport to try to identify the faulty unit.

If the system consists of a Transport, Upsampler & DAC and the above information did not resolve the problem, the following procedure will usually identify a faulty unit:

1. Connect the (Upsampling) Transport's 1394 and Word Clock to the DAC. Set the DAC to the 1394 input and sync to Word Clock. Play a disc.
2. Connect the Transport's PCM output to the Upsampler. Set the Upsampler to lock to the Transport and output DSD. Disconnect the 1394 and Word Clock cables from the Transport, connect them to the Upsampler instead.

If the DAC locks and plays music correctly in 1 but not 2, this suggests a fault in the Upsampler.

If the DAC locks and plays music correctly in 2 but not 1, this suggests a fault in the Transport.

If the DAC does not lock or play music correctly in both 1 and 2, this suggests a fault in the DAC.

### Symptom: The 1394 interface does not work.

- Try the other 1394 port. If this works, the fault is likely to be on the 1394 Connector Board.
- If red LED D401 is not flashing after boot-up, the 1394 code may have been corrupted. Re-load from a suitable 1394 ROM. If the ROM does not load or loads up but does not solve the problem, this indicates a hardware fault.
- After the unit has booted up, measure the DC voltages at the locations listed below:

Location on 1394 Interface Board	Typical DC Voltage
U213 pin 16 (VP5) to chassis	+4.96
C203+ (VP3) to chassis	+3.38
C247+ (V1P8) to chassis	+1.76
C212+ (IVP3) to C212- (IGND)	+3.30
U211 pin 5 (PGOOD)	+3.38
Location on 1394 Connector Board	
U110 pin 61/62 (VP3I) to pin 63/64 (IGND)	+3.30

- Use an oscilloscope to check for clocks:

Location on 1394 Interface Board	Frequency MHz
U209 pin 4 (CLK24)	22.6 or 24.6
U208 pin 6 (PSUSYNC)	1.4
Location on 1394 Connector Board	
U110 pins 59 & 60	24.6
Location on 1394 / USB Interface Board	
U301 pins 46 & 47	6.0

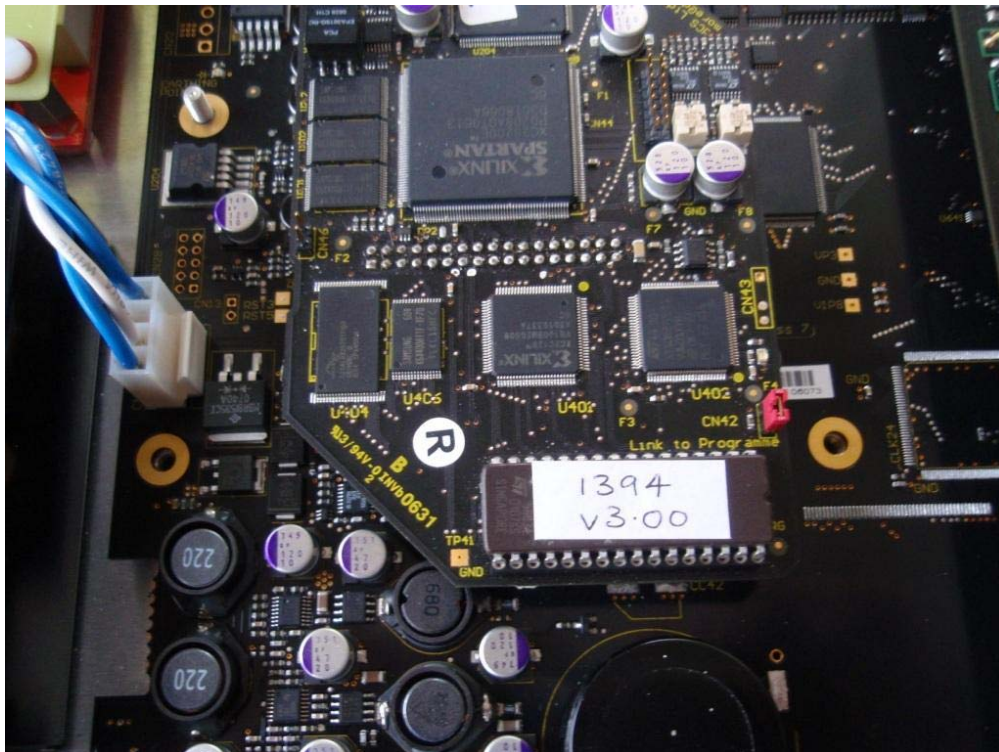
## Re-loading the 1394 code

If the 1394 Board stops responding permanently, 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**" (or later) which is loaded with basic 1394 code and a 2-way jumper.



Note that 1394 code v1 and v2 are NOT compatible with Scarlatti/Paganini and must not be loaded into current 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.
- Open the case, disconnect the Display Board ribbon cable and remove the top cover.
- Fit the **1394 v3** ROM to the socket U405 on the 1394 main board, ensuring that the notched end is towards the RIGHT-hand side. Fit the red 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.
- Reassemble the unit, remembering to re-connect the cable to the Display Board.
- Power up the unit and select the 1394 input.

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 3.01 (or later) for DACs and Transports, 4.01 (or later) for Upsamplers.
- Check that the unit is operating correctly.